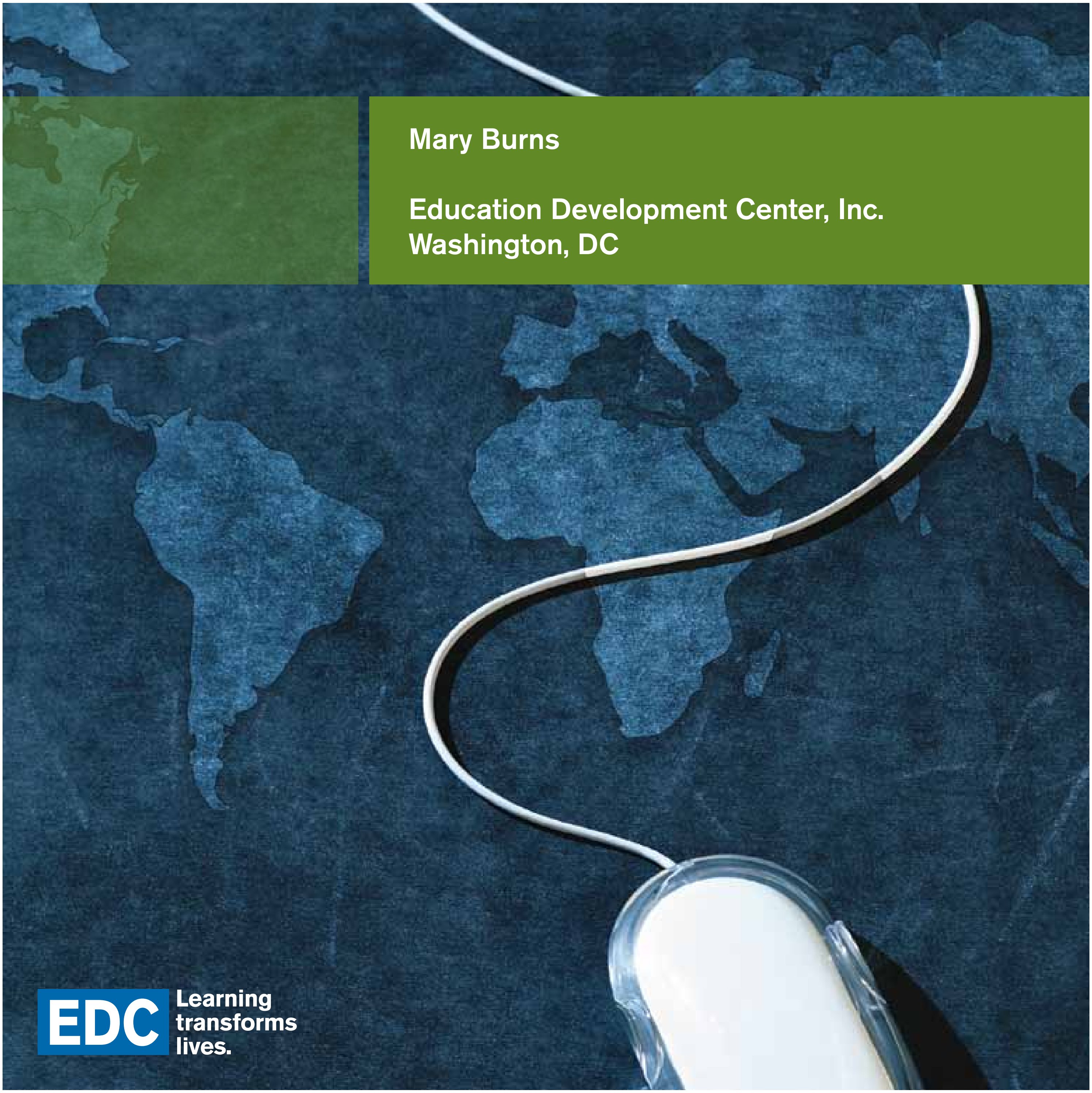
Distance Education for Teacher Training: Modes, Models, and Methods



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Washington, DC

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Acknowledgments

Thanks to the following Education Development Center, Inc. (EDC), colleagues for their review of and feedback on this guide:

Steve Anzalone, Director of Asian Center, International Development Division at EDC
Cornelia Brunner, Senior Research Scientist, Center for Children and Technology at EDC
Tom Haferd, Senior Research Associate, Learning and Teaching Division at EDC
Craig Hoyle, Senior Research Scientist, Learning and Teaching Division at EDC
Barbara Treacy, Director, EdTech Leaders Online, Learning and Teaching Division at EDC

Particular thanks to Andrea Osborne-Smith, International Technical Advisor, International Development Division at EDC for her careful edits to this guide.

Also, my thanks to the Creative Services team at EDC for their expertise in designing and copyediting this guide.

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Foreword

It is 1939 and Margaret Fitzsimons, a 17-year-old farm girl in County Cavan, Ireland, practices the glyphs and strokes of Pitman shorthand by candlelight. Though she dreams of working in an office, Margaret's school offers only cooking and sewing classes. Margaret has managed to enroll in a course in Pitman shorthand through a London-based correspondence school. After several months of self-study, Margaret will sit the exam that tests her mastery of Pitman shorthand, and her results will be sent to London for marking. Hundreds of miles away in Ireland, Margaret will wait for the results that will determine whether she attains or falls short of her professional dream.

Figure 1: Correspondence School Diploma

The above scene is as time-bound as it is timeless. Decades later, in the remotest parts of Ireland, a formerly impoverished nation, studying alone by candlelight—even in the most rural and remote parts of the island—is a quaint memory of times past. Today, learners on Ireland's westernmost islands tap into high-speed Internet portals, such as ScoilNet,[1] which offers learning opportunities for teachers and students via rich media, video and text. The story is similar across much of the globe where distance learning options have proliferated from print-based correspondence courses to learning via satellite, video, television, radio and the Internet. Because of advances in communications technologies, learners like Margaret no longer need to study in isolation or learn exclusively from a book or wait months for exam results. Instead, they can interact with a variety of media, collaborate with peers as needed, and receive almost instantaneous assessment results.

But the above scene is also timeless. In many parts of sub-Saharan Africa and South Asia, where hundreds of millions of people lack electricity, distance learners like Margaret still sit by candlelight or by fire studying mathematics or pedagogical techniques from a book. Content may come via the post or the Internet, but these distance learners study and struggle alone. Like Margaret, they sit their exams and wait—perhaps months—for results that determine whether their dream of professional self-improvement has been realized or deferred.

1 See http://www.scoilnet.ie/

Thanks to changes in technology, communications, and our knowledge of teaching and learning, the field of distance education has changed dramatically since 1939. Yet the core of distance learning has remained constant through the years. Distance learning has always been about offering learning opportunities to communities that have historically been excluded from formal learning systems—women, religious and cultural minorities, residents of post-conflict areas, or inhabitants of remote geographic regions. It has always been about leveraging combinations of available technologies—the printing press, the post, trucks, ships, radio, telephone, computers or fiber-optic cables—to overcome the challenge of geography, demographics, resources, and terrain to provide knowledge and opportunities to those who most need them. It has always been about bringing to bear innovation—either technical or methodological—to offer new methods and modes of learning, so that nontraditional students can learn in ways that may be more useful than those offered in a traditional "brick and mortar" or "clay and wattle" school setting. It has always been about expanding limited learning opportunities and offering the convenience of learning to those who cannot—because of their age or occupation—take advantage of traditional schooling. And at its very essence, distance education has always been about helping individuals fulfill their professional dreams and aspirations—whether to be an office worker or a para-teacher or a certified teacher.

Margaret passed her examination in Pitman shorthand (see figure 1) and went on to work in an office—first in the Cavan County Court House and then, upon emigration to the United States, as a secretary in the Massachusetts State House. It is our hope that this guide will provide new knowledge, ideas, and insights to those who fund, design, oversee, and teach distance learning programs for learners like Margaret Fitzsimons Burns.

About This Guide

This publication is a guide to the type of technology modes, education models, and instructional methods used for teacher pre-service and in-service distance learning across the globe. The information here is based on three primary sources. The first is Education Development Center (EDC)'s long history in the area of distance-based education internationally—particularly in the area of interactive radio instruction (IRI) and interactive audio instruction (IAI)—and within the United States, especially in the area of online learning. The second is an extensive review of the literature on distance learning, technology, and professional development and interviews with distance learning planners and providers in the United States, Africa, and Asia. The third is the author's involvement in distance learning for teachers and teacher trainers in the United States, Latin America, Asia, and Africa.

The Organization of Economic Cooperation and Development (OECD) defines professional development as "a body of systematic activities to prepare teachers for their job, including initial training, induction courses, in-service training, and continuous professional formation within school settings."

Figure 2: What Is Professional Development? (OECD, 2008: 19)

> The Organization of Economic Cooperation and Development (OECD) defines professional development as "a body of systematic activities to prepare teachers for their job, including initial training, induction courses, in-service training, and continuous professional formation within school settings."

This guide places particular emphasis on the modes, models, and methods of distance learning used in many developing country contexts. Unlike most studies on distance education, it focuses less on the technical and administrative aspects of distance learning and much more on how various distance education technologies—both current and future—can support the actual teaching and learning process within distance education.

Distance education, or distance learning, has long been a major form of professional development for pre-service and in-service teachers in developing and developed countries (see figure 2 for the working definition of professional development used throughout this guide). It is so well documented that the reader may wonder why we would embark upon another document about distance education for teacher professional development. But this guide differs in five major ways from most of the existing literature on distance education.

First, it examines all *modes* of distance education, from print-based learning to as yet untapped but potentially rich modes such as gaming and mobile learning. In the process it draws on examples from the United States, Asia, Africa, Latin America, the Caribbean, Europe, and Australia. As such, this guide is designed to provide a thorough grounding in various instructional technologies that are, or promise to become, part of any distance education system. It also provides global *models* within these modes of distance education. Such models in turn offer "actionable" information for donors, education policymakers, planners, and instructors in examining the foundations for successful distance education models for teacher training.

Next, while many distance education reports focus on the architecture, infrastructure, funding, and policy associated with effective distance education programs for teacher pre-service and in-service instruction, this guide concentrates on the most salient design issues as they impact the quality of *teaching and learning* in distance education courses. The often overlooked bottom line in distance education is not the policy framework or type of technology—it is the *quality* of teaching and learning. Thus, the focus here is on instructional *methods* from across the globe that directly shape the quality of learning opportunities in distance education courses, as well as on documented best practices that result in high-quality distance learning for pre- and in-service teachers.

Third, the rapid proliferation of technologies can be confounding, even for those working in the technology field. Virtual worlds, digital games, digital *learning* games, immersive environments—what are they? How are they distinct from one another? How do they or might they support teacher learning? This guide examines in depth both established and emerging technologies, not only to help readers understand the characteristics of various technologies as they relate to distance learning for teachers but also to ground them in their benefits and drawbacks as modes of instruction. We advance the argument that the same benefits that make many of these technologies potentially powerful tools for *student* learning also make them potentially useful tools for *teacher* learning—*even if they have never been used this way in the past*. This is a theme to which we will return throughout this guide.

Fourth, the education and technology fields, like many professions, are flooded with terms that are ill defined, but so commonly used that they become jargon and serve as a source of difference versus consensus. For that reason, this guide takes particular pains to define as many terms as possible clearly, most notably in the numerous textboxes and glossary. It is our belief that by proposing a common or shared technical language around overly used terms ("interactive," "learner-centered," etc.), we can begin to develop some consensus around terminologies and taxonomies, which in turn may result in more standardized and uniformly understood behaviors, uses, and best practices.

Finally, and not inconsequentially, this guide is free. There are a number of excellent distance education studies, books, and guides. But they are costly and may, in a time of constrained budgets and revenues, lie beyond the financial reach of many in our intended audience: state education directors in India struggling to train enough teachers to meet India's Right to Learn mandates; U.S. policymakers attempting to meet the "highly qualified teacher" requirements of "No Child Left Behind"; distance education providers in Indonesia undertaking the development of programs to help 1.75 million primary school teachers attain their S1 degree; and ministries of education across Africa endeavoring to recruit and train enough teachers to meet Education for All and Millennium Development Goal targets.

This guide is organized in two main sections. Section I provides our working definition of distance education and anatomizes its many modes and models, dissecting their strengths and weaknesses in terms of instructional quality and effectiveness. Section II focuses on methods, collating best practices and lessons learned about teaching and learning from successful global distance education models. The guide also contains a glossary of terms, a reference section for further Web-based information on distance learning programs and approaches, and an extensive bibliography of the sources cited within the guide. Where available, we provide website addresses for every program discussed here. We also provide the URLs of websites that offer *free* content, but not those of commercial websites, which can typically be accessed online by searching for them by name.

Caveats

As with any document of this size and scope whose focus is the ever-changing topic of technology, a number of caveats must be stated up-front. First, the increasing convergence of technologies (applications and devices) and the protean nature of the Internet often render attempts at differentiation and categorization within distance education "families" difficult. For example, should digital learning games be classified as Internet-based, multimedia-based or mobile forms of distance learning? Or are such classifications even relevant? Within this guide, decisions to place one or another technology under the rubric of a certain distance education mode were driven principally by the technology's core functions. Nonetheless, such classifications may appear subjective or misplaced, and the reader may find him/herself in disagreement with many of these taxonomical decisions. Such objections highlight the fluid and dynamic nature of technology.

Next, this guide contains numerous examples of past and existing distance education programs and projects. While these reflect actual distance learning projects for teacher training, they may not necessarily be exemplary. Since rigorous evaluation results in the world of distance education are often absent or hard to come by, we make no claims with regard to the quality of programs and initiatives outlined here. Where research findings about programs exist, we summarize them; however, we do not vouch for the quality or integrity of that research.

Figure 3: What Do We Mean by "Knowledge and Skills"?

Every distance education program aims in some way or another to improve teachers' knowledge and skills. But what exactly do we mean by "knowledge" and "skills"?

Knowledge is a broad and diffuse term. Often, when we speak of teachers' *knowledge*, we are referring to multiple domains—their content knowledge, that is, deep knowledge of the subject they teach (Shulman, 1986) and their knowledge about learning styles or assessment or instruction. This category is often referred to as "propositional knowledge."

Skills also fall under the domain of *knowledge*. Skills include *processes, procedures,* and *strategies* that help teachers *perform* certain tasks. For instance, knowing how to teach hard content in a way that is understandable to learners is a skill. Solving a problem is a skill. Organizing learners in heterogeneous collaborative teams is a skill. Knowing how to facilitate a meaningful discussion among students is a skill. Skills may be considered "procedural knowledge."

It is essential for any effective teacher to possess both *propositional* and *procedural* knowledge. But learning the skills of effective teaching requires continuing guidance and modeling, numerous opportunities for practice, and structured feedback and reflection as part of a continuous improvement cycle.

Third, the life span of both international development projects and World Wide Web sites can be ephemeral. Projects can end abruptly, leaving website cadavers as the only evidence of their existence. We therefore apologize, but assume no responsibility, for projects discussed here that are no longer operative or websites that are no longer functional.

Finally, developing distance learning systems is a means to an end: upgrading the knowledge and skills of teachers. Improving teachers' knowledge and skills is a means to another end: improving student achievement. Though we begin this guide with a discussion of modes (technologies) involved in distance education for teacher training, technology alone cannot improve teacher learning—and teacher learning alone cannot result in improved student achievement. Distance education must be one part of an overall systemic improvement process.

Distance education is ultimately about improving the quality of teaching so that we can improve student learning. But in this regard, distance learning is not enough. The school system in which new teachers begin their career, and to which in-service teachers return from professional development, must support high-quality teaching and learning. Studies of high-achieving educational systems, as demonstrated in the Programme for International Student Assessment, note the following five conditions necessary for a system to move from supporting low-quality to high-quality instruction:

» A committed belief within the highest level of a system that *all* children can learn
» Clear and ambitious learning goals linked to instruction
» Capacity around good instructional practice at every level of the system
» Incentives, accountability, and knowledge management around change

» Commitment on behalf of the educational system to make itself a learning organization in which everyone—from the highest-level administrators to students—is provided with opportunities for continuing learning (Fullan, 2010)

No distance learning system can exceed the quality of the people within the system. It is our hope that this document offers sufficient guidance on improving the quality for teachers and learners within any distance learning system.

Section I:
Distance Education: Modes and Models

Distance Education: Modes and Models

Distance education is a planned learning experience or method of instruction characterized by quasi-permanent separation of the instructor and learner(s). Within a distance education system, information and communication are exchanged through print or electronic communications media (Keegan, 1980) (see figure 4 for a fuller definition of distance education).

Figure 4: Distance Education Defined (UNESCO)

UNESCO defines distance education as "an educational process and system in which all or a significant proportion of the teaching is carried out by someone or something removed in space and time from the learner."

Distance education requires

- Structured planning
- Well-designed courses
- Special instructional techniques
- Methods of communication by electronic and other technologies

Distance education is also a broad approach characterized by a high degree of variation. Such variation includes the types of media or technology used (print, radio, computer); the nature of the learning (workshop, seminar, degree program, supplement to traditional classroom, levels of support); institutional settings; topics addressed; and levels of interactivity support (face-to-face, online, blended, none) (Fillip, 2001).

In the context of teacher education, distance learning has more than one aim and audience. It has been used as a *pre-service* teacher preparation method with teacher-candidates, mostly with extensive face-to-face preparation (often as part of a formal dual-mode institution, such as the University of the West Indies). In developing and developed countries, it has been deployed as an *in-service* vehicle to fulfill a mandate to upgrade the knowledge, skills, and qualifications of an existing teaching force. Finally—and predominantly within developed countries—distance education, mainly in the form of Web-based education, serves as a vehicle for *continuing education*, offering enrichment, enhancement, and additional certifications for teachers who have attained at least a minimum level of certification for their content and grade level. Where necessary, we distinguish among these three aims of distance learning in our discussion of distance education models.

Unlike other forms of training, instruction, and professional development, distance education is inexorably linked to its mode of delivery (Commonwealth of Learning, 2008). Because of the rapid evolution of delivery modes, distance education experts (Commonwealth of Learning, 2008; Taylor, 1995) often speak of "generations" of distance education models, such as print, multimedia, and Web-based delivery systems. Unfortunately, this term suffers from two weaknesses. First, "generation" implies a linearity and heredity that do not necessarily exist between types of distance education technologies. For example, print and IRI have been used simultaneously, not merely sequentially, as teacher training media. Nor did print "beget" IRI.

Next, the proliferation of new electronic delivery methods, particularly the Internet, and the convergence of different types of media and platforms blur the neat distinctions between generations. For example, a Web-based distance education system may employ print, audio, video, multimedia, and broadcast elements. Distance education approaches, even largely print-based ones, often use other secondary technologies, such as radio and audio, that are at least as powerful, if not more so, for teacher learning than the primary model.

As such, figure 5 broadly reorganizes these traditional classifications of distance education types based on their predominant technology delivery medium and discusses some of the main modes of each. The examples provided below are intended to be illustrative rather than exhaustive.

Figure 5: Types ("Generations") of Distance Education and Major Examples of Each

Types of Distance Education	Examples
Correspondence model	Print
Audio-based models	▪ Broadcast: IRI ▪ Narrowcast: IAI (via audio tape or CDs) ▪ Two-way radio ▪ Audio conferencing and telephone ▪ Broadcast radio
Televisual models	▪ Broadcast television (educational and instructional) ▪ Videoconferencing ▪ Video
Computer-based multimedia models	▪ Interactive video (disc and tape) ▪ CD-ROMs ▪ Digital videodiscs (DVDs/VCDs) ▪ Interactive multimedia
Web-based models	▪ Computer-mediated communication ▪ Internet-based access to World Wide Web resources ▪ Online courses (e-learning) ▪ Online conferences (webcasts and webinars) ▪ Virtual classes/schools (cyber schools) and universities
Mobile models	▪ Hand-held devices ▪ Portable media players (podcasting) ▪ Cell phones and smart phones ▪ Tablets ▪ E-readers

Figure 5 shows a number of cross-sectional trends throughout all distance education modes of delivery. First, the various programs associated with each distance education mode have different entry requirements, scope, duration, organization, and foci and may or may not be time- and location-specific. For instance, some are classroom-based; others occur before entry into schools; some take place after school hours or during school breaks. Even distance education "families" (such as online learning) differ from one another in terms of their linearity, types of interactions, temporality (fixed-time versus self-paced), models of learning (cohort-based versus solo learning), structure (open versus closed enrollment), and purpose (Dillemans, Lowyck, Van der Perre, Claeys, & Elen, 1998).

Next, many of the above forms of distance education have multiple audiences. Print and Web-based distance modes are directed primarily at teachers. Two-way audio, virtual classrooms, television, digital learning games, immersive environments, and IRI primarily target students. Yet extensive research-based and anecdotal evidence shows that these technologies can serve as "dual audience direct instruction" (Burns, 2007b) modes that provide content and instructional benefits to teachers and students at the same time.

Third, as mentioned earlier, while many distance education teacher training programs have tended toward one mode of distance learning (e.g., print or audio), convergence and blending of multiple distance education modes are increasing. For instance, many programs have integrated emerging technologies into student and teacher learning, using a combination of radio and television together with online course materials, online communication, subject-specific websites, or digital repositories and virtual classrooms. The advent of online tools blending these modes requires that teacher education programs learn how to mix and match distance education modalities and target and maximize print, audio, video, and online media to reach different types of learners and address different instructional purposes.

Fourth, different technologies are being employed to help different aspects of a teacher's development. For example, in the Caribbean, many pre-service teacher-candidates who cannot physically relocate to one of the three University of West Indies campuses in Jamaica, Trinidad, and Barbados instead participate in online and video-based instruction through the University of West Indies Distance Education Centre (UWIDEC). Continuing in-service professional development continues through individual teacher self-study via computer-aided instruction (as in Dominica), IRI (in Jamaica for math and science teachers), computer-mediated communication, and online professional development with a host of external university professional development providers (Gaible, 2009).

Finally, the types of professional development outlined in figure 5 often involve a hybrid approach, with face-to-face sessions complementing distance education and vice versa. Similarly, many of the above models allow teacher-candidates and teachers either to work together with their peers as part of a formal, structured learning opportunity or to work alone as a form of self-study. In the United States and Europe, pre- and in-service teachers receive formation and upgrading through interacting with a combination of models outlined in figure 5—for example, peer-based online professional development, self-study through interaction with Web-based resources, participation in webinars and viewing of webcasts, and interaction with print in school-based study groups.

The remainder of this section examines each of the distance education models outlined in figure 5.

Chapter 1: Print-based Distance Education

Overview

Print-based correspondence courses are the oldest existing form of distance education. In some parts of the globe, most notably Africa and South Asia, print remains the most common form of distance education for upgrading the skills of unqualified or under-qualified teachers. (Indeed, globally, text[2] in one format or another is still the main distance learning medium.) Print-based distance education courses have proved the least expensive, and sometimes the only, feasible model of teacher training in countries with difficult terrain; poor infrastructure; highly dispersed or difficult-to-reach populations; and little budget, infrastructure, and human capacity for more multimodal means of distance learning.

Examples of Print-based Distance Learning for Upgrading Teachers' Qualifications

A major focus of print-based distance education has been the upgrading of in-service teachers' basic content and pedagogical skills. Africa provides numerous models of such efforts. Since 2004, Ghana's Untrained Teachers' Diploma in Basic Education (UTDBE) program has mailed textbooks and study guides to unqualified teachers in its remote northern regions as part of its efforts to prepare these teachers for a diploma in basic education. Using the study guide/syllabus, teachers read their textbooks, complete worksheets and quizzes, and mail them to their tutors at the nearest teacher training college. Each summer, teachers meet with their regional colleagues and with tutors for a month-long summer session that focuses on instruction. Once they have completed this course of study, they sit for a national teaching exam following which, if successful, they receive an actual teaching diploma.

Though it is the sole medium and model for teacher upgrading in Ghana, print-based instruction is often supplemented by other media and formats in other teacher training contexts. For example, Tanzania's National Correspondence Institute, which trained 45,000 teachers from 1965 to 1981 (Chale, cited in Perraton, 1993), combined the use of printed study guides with radio broadcasts, audio-based lessons, school-based placements, and a final six-week residential program to help secondary school leavers become certified teachers. In some examples print is used as the secondary medium in a more technology-based form of distance education. In Guinea, the United States Agency for International Development (USAID)–

Figure 1.1: Collaboration (Friend & Cooke, 1992)

Collaboration

Collaboration literally means "working together." But collaboration is not a naturally occurring event. Certain conditions are necessary for collaboration. Collaboration must be voluntary and should include the following:

- Mutual goals
- Parity
- Shared responsibility for decision-making and outcomes
- Shared participation and sharing of resources

2 *Text* in this section of the guide refers to written information irrespective of format; therefore, text can be print-based, digitally based, or electronically based (as in television). *Print* is the process used to reproduce text onto paper. In this section of the guide, print refers exclusively to the paper-based format in which text appears: books, newspapers, magazines, or any other printed publication.

funded and EDC-designed radio broadcast, *Pas à Pas (Step by Step)*, became a major tool for teacher professional development from 1998 to 2006, supplemented by print-based study guides and materials.

Finally, in some cases print is the primary source of instruction, but support is provided through other media. India's Indira Gandhi National Open University (IGNOU)[3] offers a two-year diploma course in primary education that uses mainly print materials but also offers academic support through radio, telephone conversations, face-to-face trainings, and television.

Increasingly, computer technology is used as a distribution medium for text-based instruction, either through the Internet or via distribution of text on CD-ROMs. Many of Asia's open universities use technology (CD-ROM and Internet) as distribution channels for text-based instruction (Latchem & Jung, 2010) or as print distribution mechanisms. In Namibia, where Internet connectivity is better than in most sub-Saharan African nations, but where low bandwidth still prevails, the Basic Education Teachers Diploma program used e-mail to distribute text-based materials and sent CD-ROMs of resources to in-service teachers via postal mail. Teachers often returned their essays or tests via e-mail.

Perraton (1993) reports that overall print-based correspondence courses show consistently documented effectiveness compared with courses taught in conventional settings. Other research demonstrates the variability of results of print-based distance learning. For example, Nielsen & Tatto (1993: 111), after studying in-service distance education in Sri Lanka, reported that exit-level in-service teachers who matriculated through a print-based program scored higher on measures of teacher effectiveness (mathematics, language, subject mastery, and professional attitudes) than their entry-level colleagues in the same print-based program. However, when compared with exit-level candidates from colleges of education in teacher training colleges, they scored lower in these same areas—with the exception of language.

Figure 1.2: Open Universities

Open universities are distance education universities that combine various forms of distance technologies with some face-to-face instruction to provide learning opportunities to nontraditional students (students over 21, working professionals, etc.) They are open to all learners, hence the designation "open university." Perhaps the most respected such institution internationally is the United Kingdom's Open University, which was founded in 1969 as the University of the Air.

Using the U.K. model, open universities were established in earnest in Asia in the 1980s in order to educate Asia's young population, many of whom were graduating from secondary school with skills that did not equip them for the world of work. Because of their large size, these open universities have been termed "mega-universities" and are often the main source of tertiary education in their countries. India's IGNOU and Shanghai Television University are the largest universities in the world.

3 See http://www.ignou.ac.in/

Print-based distance education courses also suffer from high attrition rates (Perraton, 1993; Robinson & Latchem, 1997; Potashnik & Capper, 1998; Nielsen & Tatto, 1993), largely because print-based courses invoke the model of the teacher-learner as a solo practitioner. Like Margaret, whose distance education experience was described in the Foreword of this guide, learners, for the most part study at their own pace with little or no supervision or collaboration with colleagues. When collegiality or supervision occur, they typically do so through annual summer residential sessions that take place away from school, where teacher-learners need the most support when implementing new ideas or practices. There are exceptions to this solo-learner model; for example, Sri Lanka's distance education program furnished human supports such as study circles and group tutors, and Indonesia's print-based distance education programs provided ongoing media support such as radio and television (Nielsen & Tatto, 1993).

Research on both of these programs demonstrates that in the case of print-based (indeed all) distance education programs, both media and human supports are important in lessening learner isolation and reducing the attrition rate of learners. However, of all potential supports, human support is the most important. This finding is consistent with the literature on teacher change, success, and persistence in all forms of professional development, whether face-to-face or distance-based (Hord, Rutherford, Huling-Austin, & Hall, 2006). The issue of support is a constant theme in all forms of teacher education and will be discussed at greater length in "Chapter 17: Supporting Distance Learners."

Considerations: Print as a Distance Learning Tool

Since text is still the dominant form of information in a distance environment, print-based instruction will continue to play a critical role in distance learning initiatives. Print offers compelling strengths as a distance education medium. Both its production and distribution costs are low relative to other forms of distance education. It is easy to reproduce, portable, ideal for self-study, and a familiar medium to teachers.

However, there are many challenges associated with print/text-based instruction that weaken its efficacy as the sole source of teacher instruction. Many teachers or teacher-candidates may neither like to read nor be particularly strong readers. Print can be an unattractive learning option in nonreading and/or more orally based cultures. Print materials are often poorly written, and text is particularly difficult for learners with disabilities such as dyslexia and useless for those who are blind or suffer from impaired vision.

The World Wide Web has helped to transform reading and books into a more collaborative and social experience. Websites such as Shelfari[4] are forums for readers to share, discuss and review books they are reading. Numerous other sites, such as Google Books,[5] allow users to read thousands of free digitized texts and create their own virtual library and bookshelves. But even if teachers read text on a computer screen, increasing evidence suggests that doing so results in less sustained reader attention and absorption and

4 See http://www.shelfari.com/

5 See http://books.google.com/

retention of information compared with paper-based reading.[6] Reading text on a standard computer screen is hard on the eyes and difficult in bright sunlight or natural light, a consideration in many parts of the poorest regions of the world. Further, text is not the best medium for helping teachers learn application of skills, processes, or procedures.

Print-based distance learning also suffers from production, copying, and transportation issues. The variable quality of paper, printer toner, and copying machines can make print hard and unattractive to read—seemingly minor points that nevertheless negatively affect legibility, reader interest, and the effectiveness of print as a learning tool. Damage rates from water, heat, and mold are high. Distance education providers often run out of paper and copier toner, postal services are unreliable in many parts of the globe, and it is not uncommon for teachers to report that their textbooks or exams were lost in the mail.[7] Print-based instruction suffers from a quantity-absorption tension. Because teachers' knowledge of a certain topic may be low, authors may create very long texts for teachers to read—but the length of the text may in turn intimidate and deter teachers from actually reading it.[8]

Finally, print/text-based instruction increasingly suffers from perception problems. Many policymakers see print-based distance learning as outmoded and frequently agitate for more technology-based forms of distance learning, even when such options are not feasible, and even though the technology may in fact serve only as an expensive delivery system for print-based learning.

Most likely, text will continue to shift from a print or paper medium to a digital medium, such as a CD-ROM, online learning, e-reader (such as the Kindle and Nook), or tablet computer (such as the iPad). These technology platforms can address some of the production and distribution issues associated with print-based documents. E-readers and tablets will be discussed at greater length in "Chapter 7: Mobile Technologies for Distance Learning."

Summary of Print-based Correspondence Model

Figure 1.3 summarizes the role of print-based distance learning and its strengths and limitations as a distance education mode.

6 In the July 2009 *Atlantic* article "Is Google Making Us Stupid?" Nicholas Carr cites a five-year British study that examines the impact of Web-based reading on attention and comprehension. This contention has been substantiated by additional subsequent research. However, these findings do not extend to reading on tablets or e-readers, which will be discussed in "Chapter 7: Mobile Technologies for Distance Learning."

7 Based on the author's experience with distance learning programs in Africa and interviews with UTDBE candidates in 2006 and 2008.

8 Based on the author's interviews with Ghanaian teachers in 2006 and 2008.

Figure 1.3: Overview of Print-based Correspondence Courses in Distance Education

Roles in Teacher Professional Development	Strengths	Limitations
▪ They provide self-paced professional development for teachers. ▪ They provide teachers with access to learning resources for use with students. ▪ They are often supplemented by face-to-face institutes/ workshops or by some form of audio instruction. ▪ They are frequently used as a supplement to some other form of media-based distance education (radio or television). ▪ They are commonly used in very low-resource environments (e.g., Ghana's UTDBE and Namibia's e-mail-based distance learning program for upgrading teacher skills). ▪ Increasingly, text-based content is delivered via e-mail, fax, the Internet, and CD-ROM. ▪ Web-based connectivity potentially means greater access to, variety, and dissemination of text-based resources. ▪ Development of e-readers and digital tablets holds greater promise for improved production, reproduction, storage, and access.	▪ They work anytime, anyplace and do not depend on Internet connectivity, electricity, or access to hardware and software. ▪ They can reach large populations of teachers. ▪ They are a versatile and portable form of learning—easily developed, shipped, and distributed; and teachers can carry materials to school or home for study. ▪ They take advantage of the prevalence of word-processing software, typewriters, copiers, and fax machines. ▪ They don't involve sophisticated programming or instructional design. ▪ Print-based reading has consistently been shown to result in greater comprehension and retention than reading from a computer. ▪ New technologies can augment print-based information. For instance, the use of QR codes on print documents can allow teachers with camera-enabled and QR-code-reader phones to access multimedia, video, and additional information.	▪ The focus on text disadvantages struggling readers, those who may have reading disabilities, or those who may simply learn best using another modality. ▪ Success is contingent upon a high degree of literacy and enjoyment of reading. ▪ They often lack high-quality or interactive content. ▪ Because print materials are so content-focused, they are often accompanied by written exams, which lack predictive validity. ▪ Textbooks can't model behavioral and attitudinal elements of effective teaching, nor can they model interactive instruction. ▪ Text and associated tests may be poorly constructed and contain errors, which may be hard to correct because of the print-based format. ▪ Because the focus is often on enhancing teachers' basic skills, focus of content is often on lower-order skills. ▪ Print tends to focus learning on concrete facts and concepts as opposed to abstractions, skills, and behaviors.

Roles in Teacher Professional Development	Strengths	Limitations
▪ Screen readers and speech-to-text programs can help visually impaired teacher-learners learn from computer-based text. ▪ Many print documents or services (e.g., magazines or journals) offer corresponding applications ("apps,") which readers can download onto a tablet or smart phone to augment printed content.		

Chapter 2: Audio-based Distance Education

Overview

Audio-based instruction for teacher education includes radio broadcasts; Interactive Radio Instruction (IRI); one- and two-way audio instruction; and, increasingly, podcasts.[9] This chapter examines the most prevalent forms of audio- (or aurally) based distance education. Like print-based education, *radio broadcasts* have been directed mainly at teachers. Content is created for teachers, and formal teacher learning occurs outside the classroom. In contrast, the primary audience for IRI and two-way radio has been students, with teachers as a secondary audience (if at all). Content is designed for students, and the primary locus of learning is the classroom. However, research on IRI in particular has demonstrated that teachers as well as students benefit greatly from classroom-based audio instruction.

More than print-based instruction, audio instruction has proved to be a successful means of conveying information to teachers, particularly in areas of conflict, areas marked by difficult terrain, and remote and isolated locations. Because it is a broadcast technology, new listeners can be brought on board at very low unit costs.[10] Furthermore, radios and audiocassette and CD players are easy-to-use, widely available technologies, even in the poorest corners of the globe.

This chapter examines two-way radio, broadcast radio, IRI, and interactive audio instruction (IAI) as modes of distance learning for teachers. Podcasting, though an audio-based technology available via the Internet and portable media players (MP3 players, iPods, etc.), will be examined in "Chapter 7: Mobile Technologies for Distance Learning."

Two-Way Audio

Two-way audio provides instruction, content, and resources to students and teachers in isolated and hard-to-reach locations with little communications infrastructure. Unlike one-way audio instruction, two-way audio allows back-and-forth communication between the teacher and students.

One of the earliest examples of audio-based distance education comes from Australia. In the 1950s, Australia's Schools of the Air (SOA) began using two-way audio high-frequency radio transceivers to send and receive lessons and messages to and from students in the Northern Territories and Western Australia. Students interact with teachers at a studio (broadcast) site and with other students around Australia at regularly scheduled times during the day (Australian Government, n.d.). In some cases, students work alone using their high-frequency radio and printed material; sometimes they work with a tutor face-to-face; and in other cases, SOA provides access to curricula and instruction in remote primary and secondary schools where teachers may not be certified to teach a particular content area, or where curriculum and materials may be lacking.

9 Though an audio format, podcasting for teacher education will be discussed in "Chapter 7: Mobile Technologies for Distance Learning."

10 The World Bank estimates that IRI's annual recurrent costs per pupil average between $1 and $2US.

In recent years, SOA has supplemented two-way radio instruction with additional technology such as video cameras, Internet access, and interactive whiteboards (IWBs), enabling teachers at the studio sites to give lessons via satellite to learners who have Internet access. Students can watch and respond in real time via web cameras attached to their computer or via synchronous collaboration tools, thus providing greater interactivity between students and teachers, among students in varying remote locations, and between students and the learning material. As well as providing two-way audio and video, students can e-mail teachers and each other, interact with the IWB, and answer pop-up questions. They can also hear their classmates and participate in live group discussions (Australian Government, n.d.). Even with the expansion of other technologies, audio-based instruction has continued in Australia's Learning and Teaching in Schools program, an Internet- and satellite-based project for schools in the Northern Territories, and in its Virtual Schooling Pilot in Queensland (Wenmoth, in Naidoo & Ramzy, 2004).

Many types of distance-based professional development programs lack a strong research base demonstrating their impact on teacher knowledge and practice. This deficiency appears to hold true for SOA too. Investigation of the two-way radio model demonstrates learning benefits for *students*; however, our research on SOA did not yield any studies showing improved benefits for participating teachers in remote schools. Nevertheless, there is mention of improved benefits for tutors, parents, and the community. Given the impact of other types of classroom-based dual-audience distance approaches on teachers' content and pedagogical skills—such as IRI, instructional television, and virtual classrooms (to be discussed later in this guide)—it is logical to infer that similar benefits accrue to teachers from a well-implemented two-way audio program. At this point, however, such an assertion is based on extrapolation, not evidence.

Broadcast Radio

Radio—both broadcast and interactive—has been a commonly used model for distance-based teacher instruction, primarily in terms of upgrading existing teachers' content knowledge skills. As a teacher training tool, radio is especially effective in countries where it is already a common technology; where radio listening is a primary source of entertainment and information and television is often unavailable, at least outside the capital city; where existing radio infrastructure is present; where Internet connectivity, computers, and computer-literate teachers are in short supply; and where radio can substitute for the absence of a well-developed and widely distributed corps of teacher trainers and professional development opportunities.

Throughout the globe, a number of entities have developed broadcast radio programming specifically for teachers. From 1998 to 2006, the USAID-funded and EDC-developed *Pas à Pas* radio series in Guinea developed 15- and 30-minute weekly radio segments to help teachers understand content-related concepts in math and science, as well as varied instructional approaches and communication strategies for students. Unfortunately, listenership was low, as broadcasts occurred during the main market day.

Fastele! Fastele! is a 15-minute radio program initiated by Zambia's Ministry of Education in 1999 to enhance teachers' skills and support their continuing professional development. Every broadcast consists of three parts: (1) a radio drama based on an educational topic; (2) informative interviews based on the topic of the drama; and (3) the sharing of teaching tips. *Fastele! Fastele!* is broadcast twice each week and targets teachers who are already certified. The episodes are also available on CD-ROMs in teachers' resource centers.

In 1975, Indonesia, an archipelago of some 17,500 islands, initiated DIKLAT SRP, an in-service radio broadcast program, to help primary school teachers in 21 provinces understand how to use Indonesia's new curriculum. The program was administered by Indonesia's Center for Information and Communication Technology for Education (PUSTEKKOM) and used a curriculum developed by Indonesia's Open University.[11] In 1990, teachers participating in DIKLAT SRP were required to complete six learning packages over three years. Packages focused on content (e.g., Indonesian language, science, mathematics, and social studies), curriculum and instruction, and additional topics such as basic education and educational psychology. Teachers were given a paper-based test at the end of each package. Those who passed the test with a score of 56 received a Certificate of Accomplishment worth two credits and counting toward teachers' promotion and receipt of their Diploma II.

One hundred and sixty radio programs were broadcast twice daily (a morning edition repeated in the evening) six days per week, except holidays. Teachers, organized in learning groups under the coordination of the school principal, first read their printed materials. They then listened to that day's 20-minute radio broadcast on a government-issued radio/tape player provided to each school. Broadcasts were followed by a 10-minute discussion facilitated by the school principal, who was trained in the face-to-face Primary School Teachers' Development Project.

DIKLAT SRP provided no school-based follow-up, though it did offer twice-yearly monitoring by PUSTEKKOM through its regional offices. Listenership and fidelity data, that is, the percentage of teachers who actually followed the prescribed sequence of reading-listening-discussing, are not available. In 1990 the government upgraded teachers' minimum qualifications to Diploma II and upgraded DIKLAT SRP into Diploma 2 by Air. Content coverage of the program increased; printed supplementary material was expanded, and participants had to register as Diploma II students. Evaluation of DIKLAT SRP teachers indicated no "significant" difference between the skills of teachers who went through face-to-face professional development and those receiving professional development via radio (Sadiman, 1999).

One form of radio broadcast—soap operas or novellas—has been employed successfully in other sectors, such as public health and agriculture, to reduce high-risk behavior or promote positive behaviors. The "edutainment" value associated with radio novellas, their proven persuasive ability to influence behavior, and their capacity to diffuse information in a social and engaging way, would suggest that radio novellas are worth exploring in some capacity as one of a number of formal teacher learning tools.

Figure 2.1: "Just-in-Time" Professional Development

The just-in-time inventory strategy is used in business to improve the business's return on investment. It involves ordering materials as close as possible to the actual time of need.

Just-in-time professional development applies this strategy to education by providing instruction or professional development in a particular strategy as close as possible to the teacher's actual implementation of the strategy. Doing so creates "low latency"—little time lag between learning and implementation.

11 See http://www.ut.ac.id/.

Interactive Radio Instruction (IRI)

More promising and better researched than broadcast radio is the impact of IRI on teacher practice. IRI is an instructional approach that uses *one-way radio* to reach *two audiences* (students and their in-class teachers). In this dual-audience, direct-instruction approach, the teacher is not "live" (as in SOA) but prerecorded. Once the in-class teachers turn on the radio, the radio "teacher" delivers content and orally directs the in-class teachers to apply a variety of interactive instructional approaches within their classrooms. Both the content and activities of the radio program are based on the national curriculum and use a series of structured learning episodes in which students are prompted to sing songs, participate in individual and group work, answer questions, and perform certain learning tasks. Regular IRI broadcasts offer curriculum developers the opportunity to scaffold instruction across a series of episodes and to model activities—such as short experiments using locally available materials—that can be completed by teachers and students between broadcasts. The approach is interactive, because the radio "teacher" speaks to students and students respond to radio prompts and interact with materials and with one another at the radio's prompting (Gaible & Burns, 2007).

IRI has been successfully used since the 1970s in many areas of Africa, the Caribbean (such as Haiti and the Dominican Republic), Latin America, and Asia, where human and financial resources are few. IRI has proved to be an inexpensive, portable, one-to-many technology that requires minimal training to use and is aligned with traditional oral means of imparting information.

One of the best-known and longest-running examples of IRI was South Africa's Open Learning Systems Educational Trust (OLSET)'s *English in Action*. Like all IRI, the program was aimed at a dual audience: students and teachers. From 1993 until its closure in December 2009, 52,000 teachers and nearly two million primary school students in nine South African provinces improved their English-language speaking and writing through radio-scaffolded active learning, games, and group work (Potter & Naidoo, 2009; OLSET, 2010). While the program began as a form of teacher in-service education, it was extended to include pre-service teachers, in spite of mixed evaluation results.

As a model of pre- and in-service distance education, IRI exhibits many best practices in professional development that provide demonstrable teaching and learning benefits (Bosch, 1999; Evans & Pier, 2008; Gaible & Burns, 2007):

» **Highly scaffolded just-in-time professional development.** Radio provides structured, in-class, job-embedded teacher professional development. Teachers and students react verbally and physically to prompts, commands, questions, and exercises posed by radio characters. Though the approach is often highly behaviorist, over time teachers, through ongoing replay of broadcasts, learn how to perform a set of instructional activities well (see figure 2.1 for an explanation of just-in-time professional development).

» **Uses formative assessment.** IRI owes much of its success to the practice of continual formative evaluation. IRI programs are evaluated throughout the life cycle of the IRI project to gauge student interest, participation levels, and skills development. Evaluation occurs in part through the process of audience research during piloting phases and through periodic interviews, observations, and guides after the program is launched. Where problems are found, they are corrected. Evaluation of IRI makes the programs responsive to student and teacher needs (Dock & Helwig, 1999; Bosch, 1997).

» **Proven impact on teachers' instructional practices.** Because of its scope, IRI can provide structured support to primary teachers throughout a country, even those in the most isolated regions. It can help teachers implement active, intellectually engaging instructional practices generally associated with competency-based instruction, while at the same time ensuring that students learn more effectively (Evans & Pier, 2008). When supplemented by music, text, games, and resources, IRI guides teacher and student through a series of differentiated learning activities and can encourage teachers to adopt more engaging, student-centered teaching strategies to teach specific outcomes and subject areas (Evans & Pier, 2008).

» **Proven impact on teachers' content knowledge and content-based pedagogical knowledge.** IRI's impact on teacher learning has been extensively documented. Radio instruction, both for students and adults, has proved effective in offering basic content knowledge to adults as well as children (Perraton, 1993), particularly when combined with print and supported group study. Indeed, most studies of IRI show greater benefits for IRI learners than for conventional classroom learners (Potashnik & Capper, 1998). As a result of IRI, the number of teachers in Madagascar's *Appui Technique aux Éducateurs et Communautés* project (2006–2007) using targeted active learning behaviors rose from 58 percent to 96 percent (Evans & Pier, 2008).

» **Changes in teacher attitudes and dispositions.** Anecdotal evidence of IRI's impact on teachers' attitudes is strong, with teachers in many programs stating that IRI has increased their motivation, enabled them to overcome embarrassment at their lack of subject mastery, changed their approaches to teaching and learning, and made them more gender-sensitive in their classrooms (Hartenberger & Bosch, 1996; Bosch, 1999; Burns, 2007b).

Figure 2.2: Behaviorism Versus Constructivism

Behaviorism is a philosophy of learning that emphasizes the importance of behavior, as opposed to consciousness and experience, in learning. Under its original definition by the American psychologist John Watson, the emphasis was exclusively on reflexes and conditioning. In a behaviorist paradigm, learners are environmentally conditioned: the teacher creates a learning environment that elicits certain behavior and controls learning by predicting and directing learning outcomes. The learner assumes an active role in learning, practicing the new behavior and receiving feedback that reinforces the behavior.

In contrast, ***constructivism*** is a philosophy of learning that emphasizes learning through experiences and consciousness. Within a constructivist paradigm, learning is a quest for understanding and meaning. The learner actively constructs knowledge by interacting with a variety of experiences, resources, and individuals. The role of the teacher is significantly different than in a behaviorist paradigm. In a constructivist paradigm, the teacher designs learning experiences that promote inquiry, exploration, and problem solving. The teacher is a facilitator, who guides and supports learners as they construct knowledge.

These philosophies of learning shape instructional design and in turn the ways in which teachers teach and students learn.

Interactive Audio Instruction (IAI)

A number of other audio-based technologies can be used to extend the reach of broadcast and interactive radio, both of which are highly vulnerable to broadcast interruptions, to teachers and students in remote areas. For example, lessons and instruction can be recorded on audiocassette or CD-ROM and provided to schools—a practice sometimes known as "narrowcasting" (Cumming & Olaloku, cited in Perraton, 1993). This approach occurred extensively in Guinea's 1998–2006 Fundamental Quality and Equity Levels project when government funding for IRI broadcasts ceased. Teachers audiotaped radio broadcasts and created and shared vast libraries of the popular IRI program *Sous le Fromager*. Using audiocassettes and CD-ROMs, teachers were able to schedule lessons conveniently; replay lessons; and use the *stop, pause,* and *rewind* features of audiocassette recorders and CD players to re-examine a particular piece of information. This recording and use of IRI onto other types of audio formats is known as IAI.

In 2007, USAID's Decentralized Basic Education 2 (DBE 2) program introduced IAI in 113 Indonesian kindergartens in seven provinces to enrich the quality of preschool learning. The DBE 2 IAI kindergarten initiative is a pilot program that consists of an audio and print-based materials package for participating schools as well as a series of teacher training activities. Using a series of 106 interactive, innovative lessons recorded on audio CD, the IAI program both guides and supports the daily instruction of an entire year of the Indonesian kindergarten curriculum through a series of in-class audio programs. The program aims to enhance the quality of kindergarten teaching and learning and improve school readiness in the following ways:

Figure 2.3: DBE 2's kindergarten program in Indonesia

The DBE 2 kindergarten materials package includes everything a teacher needs in order to use the IAI program in her classroom:

- CD player and batteries
- Teacher's guide
- Four posters
- Student worksheets
- Number and letter cards
- Scissors and crayons

» Providing high-quality content that follows the national kindergarten curriculum
» Simultaneously training teachers and teaching students
» Facilitating an active learning–based approach with every lesson

There are three types of audio programs, though they all follow the same structure: an introductory program, core programs, and review programs. Teachers are expected to complete three audio programs a week with their students.

Figure 2.3 outlines the materials used in the kindergarten IAI instruction. The printed teacher's guide is designed to help teachers prepare for each audio lesson and contains information detailing the basic competency each audio lesson addresses; indicators to help teachers assess student achievement and self-progress; instructions and suggestions on what to do before, during, and after the audio program; and lyrics for all songs included in the program. To familiarize teachers with IAI, DBE 2 also provided a series of two 2.5-day teacher training workshops.

EDC has conducted extensive evaluation of its Indonesia IAI kindergarten program. Pre- and post-test administration occurred in the 2007–2008 academic year, with the post-test conducted following instructional delivery of the first of two IAI series. Learners were assessed in the areas of language, cognitive development, and physical and psychomotor development (Ho & Thukral, 2009). Figure 2.4 displays the results of these comparisons, as well as additional general information about the program. Though figure 2.4 focuses on kindergarten students, what it really demonstrates is that the IAI positively affected *teachers'* literacy instruction for their young learners.

Figure 2.4: Overview of EDC's Indonesia Kindergarten IRI Program

Number of teachers participating in IAI (2007–2009)	399
Number of students participating in IAI (2007–2009)	6,071
Length of program	106 audio programs (each 35–40 minutes in length)
Program structure	The 106 programs are organized into four units: ▪ Unit 1: Myself ▪ Unit 2: My Family and My Community ▪ Unit 3: My School ▪ Unit 4: Animals and Plants All audio programs contain the following components: ▪ **Presentation/introduction segment.** The teacher and children are welcomed to the program and the basic competency and materials needed are explained. ▪ **Circle song.** Repeated in all audio programs, the circle song is used to organize the children in a circle and motivate them for the IAI lesson. ▪ **Activities.** Each audio program has at least three activity segments: songs, games, a story, and physical activities responding to learning objectives. ▪ **Evaluation.** Each program includes an evaluation segment, which instructs teachers to ask children what they liked most about the lesson. ▪ **Closing.** Following a brief summary of the lesson, activities that can be done after the program are suggested.

Evaluation results for students (Ho & Thukral, 2009)	IAI students meeting or exceeding school readiness requirements in ▪ **Language and Cognitive Development:** 21 percentage points versus 13 percentage points (control kindergartners) ▪ **Physical and Psychomotor Development:** 5 percentage points versus 2 percentage points (control kindergartners) ▪ **Percentage of IRI kindergartners assessed as "above average" in language:** 7 percentage points higher than control kindergartners.
Primary distance learning modes	CD-ROM, print teacher's guides

Other Forms of Audio-based Distance Education

There are additional forms of audio-based distance education used for initial teacher formation and upgrading of skills. Digital radio, or digital audio broadcasting, can supplement regular broadcast radio, since it has the potential to increase access to radio signals, generally has lower airtime costs, and can expand the services that regular radio provides. Digital radio signals may carry any binary-encoded data, which means that digital radios can also transmit multimedia information to computers (Gaible & Burns, 2007: 44).

As with all modes of distance learning, the Internet is revolutionizing audio-based learning. Internet services such as DAR.fm[12] allow users to listen to and record any AM/FM program in the United States—a service that will undoubtedly expand to other countries. Web 2.0 tools such as Broadcastr[13] allow users to upload recorded stories and organize them by geographic location. These stories can then be accessed via Internet radio and smart phone and Android tablet applications. "Radio browsing" has been used in Bhutan and Sri Lanka as part of community radio projects. Funded by UNESCO and administered by the Bhutan Broadcasting Service and Kothmale Community Radio, radio browsing combines the broadcast capacity of radio with the information retrieval capacity of the Internet to provide tailored assistance or instruction on local issues according to local requests for assistance (PricewaterhouseCoopers, 2010). It is typically used in rural communities where Internet access is unavailable. Listeners to a particular radio program ask radio broadcasters[14] to find out specific information, which is then broadcast on the radio program. The Virtual University of Pakistan uses *Virtual University Radio (VUP)—Sound of Knowledge*, a Web-based radio program that delivers educational and informational content to Pakistani teachers and citizens in general (PricewaterhouseCoopers, 2010).

12 See http://dar.fm/

13 See http://beta.broadcastr.com/

14 It is not clear by what means they ask.

Phones and Audio Conferencing

Formally and informally, teachers have for decades used phones to share information with peers and for professional development (especially through teacher "help lines"). Phone-based professional development has often been combined with radio broadcasts (Zambia) and television broadcasts (Indonesia), in which teachers call in to ask particular questions about use of a science kit or new instructional strategies.

Phone-based audio conferencing allows multiple parties of teachers to connect using either an audio-conferencing bridge system or external conferencing providers. Audio conferencing has significant benefits: it is synchronous, allowing teachers to communicate in real time; and it is simpler to use than other distance education media such as videoconferencing. Phones are a familiar medium requiring no or limited training. Audio conferencing has a long history in both instruction and teacher professional development. The American city of Baltimore, for example, uses audio conferencing as part of its Home and Hospital program, in which teachers instruct groups of students prevented from attending school by illness or other circumstances. Australia's University of New South Wales has used audio conferencing since 1991 as the primary means of communication between teachers and students in 20 learning centers across the country.

Like most modes of distance education, audio conferencing has increased in popularity because of the Internet. Free Web-based audio-conferencing programs allow users to communicate orally at no cost from computer to computer using a headset, from computer to phone via free Internet telephony applications such as Skype,[15] or from phone to phone using free audio conferencing such as ConferenceUp.[16] Other free phone-conferencing tools such as Google Voice,[17] Group Me,[18] and Rondee[19] combine text- and voice-based services. Wiggio[20] is a free group management service that allows conference calling and helps users plan projects, send mass text messages, and take polls within groups. It also enables users to streamline voice and e-mail communication; set up virtual meetings; and combine screen share, a shared whiteboard, file trading, and videoconferencing options with a conference call—features that make it a potentially powerful teacher learning tool.

The power of this type of real-time communication is invaluable for teachers who benefit emotionally and intellectually from talking in real time to a colleague, an instructor, or a group of peers. The University of

15 See http://www.skype.com

16 See http://conferenceup.com/. *Conference Up* allows conference calling by telephone, but calls are routed through the Internet.

17 See https://www.google.com/voice

18 See http://groupme.com/

19 See http://www.rondee.com/

20 See http://wiggio.com/

the West Indies, one of the major providers of pre-service education to 13 island states in the Caribbean,[21] uses audio conferencing to link its various campuses and learning centers as part of its Bachelor of Education programs, though it is severely reducing this focus on synchronous communication in favor of more asynchronous communication.

The Internet and mobile technologies are transforming all forms of audio-based learning. Podcasts have become an increasingly common and useful tool in the audio-based teacher professional development repertoire because of their versatility and portability. Teachers can listen to them on MP3 players, such as the iPod; smart phones, such as the iPhone or Blackberry; personal digital devices, such as the iPod Touch; and via the Internet. Numerous support services are being developed to support audio-based learning. For example, Google Listen[22] allows users to do voice searches for audio files and to subscribe, download, and stream these files onto Android-enabled cell phones to create personalized "audio magazines." Podcasting will be discussed in greater length in "Chapter 7: Mobile Technologies for Distance learning."

Considerations: Audio as a Distance Learning Tool

Audio-based distance learning has been a fixture in the global distance education landscape since the 1970s, when IRI was developed by Stanford University. Radio and audio are simple technologies with which many teachers across the globe are familiar. Schools don't need to purchase computers or Internet connectivity, and teachers do not need to learn complex technology in order to participate in audio-based professional development. Audio-based, oral learning is a culturally familiar medium that doesn't require the reading and writing skills needed to undertake print-based instruction or the technology skills demanded by online learning—requirements that often prompt teacher attrition in distance education programs.

Audio offers both strengths and weaknesses as a distance learning mode for teacher education. Teachers learn when they can communicate and collaborate frequently in real time; hence any distance education initiative should build in opportunities to allow learners to discuss and reflect with one another through phone or audio conferencing. (Teacher reflection and technology accommodations for this will be discussed throughout this guide.) Recorded audio files of professional development sessions, particularly content, can be archived on CD-ROMs or audiocassettes, allowing teachers to access these materials for self-study or additional refreshers.

Audio-based instruction—particularly in the two radio broadcast programs profiled in this chapter (Diklat SRP and *Pas à Pas*)—has suffered from weaknesses that have diminished its effectiveness as a mode of distance-based professional development. These weaknesses reveal important lessons that must be built into audio-based distance education in particular and into any type of distance-based professional development in general.

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21 UWIDEC operates out of three campuses: Barbados, Jamaica, and Trinidad. In addition to face-to-face and distance instruction in education for pre- and in-service teachers on these three islands, UWIDEC offers distance-based education to pre-service teacher-candidates in 13 other island nations or dependencies: Anguilla, Antigua and Barbuda, the Bahamas, Belize, British Virgin Islands, Cayman Islands, Dominica, Grenada, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent, and the Turks and Caicos Islands. See http://dec.uwi.edu/projects/blend.php

22 See http://listen.googlelabs.com/

- **Interactivity is critical for engagement and learning.** As will be discussed shortly, *interactive* radio or audio has proved to be a more effective teacher training tool than noninteractive *broadcast* radio. Broadcast radio is essentially a single-channel, passive medium, making it easy for participants to "tune out." Limited interactivity in turn limits learning outcomes. For example, Dakir & Simanjuntak (1999, cited in Sadiman, 1999) compared the performance of teachers in face-to-face professional development with those receiving professional development via broadcast radio and found no "significant" difference in the skills of these two groups. Studies of the impact of broadcast radio in Africa show similar results. In contrast, the multichannel involvement, participation, and engagement—learner with content, learner with facilitator, learner to learner, and learner with technology—that are characteristic of IRI provide tangible and measurable results showing that teachers in IRI-/IAI-based training often perform as well as their peers in face-to-face trainings (Bosch, 1997) and in some cases better.
- **Monitoring and evaluation are key to assuring quality and measuring outcomes.** Radio broadcasting for in-service teacher professional development has often been termed "spray and pray." Because many radio broadcasts for teacher learning have limited or no monitoring, school-based follow-up, or formative evaluation, such programs spur more questions than answers. For example, what percentage of teachers listens to the broadcasts at all or with any regularity? What percentage implements with fidelity what has been taught via broadcasts? When monitoring and coaching are provided, completion rates for radio-based distance learning increase. When these are not provided, completion rates decline (Perraton, 1993).
- **The distance learning medium must be appropriate to goals for teacher learning.** Research on broadcast radio as a mode of teacher training appears to indicate that radio may have constrained teacher learning as much as it may have helped it. In Indonesia, for example, Gafur (1994, cited in Sadiman, 1999) states that teachers reported concerns about the quality and length of DIKLAT SRP programming, suggesting that episodes were too short and topics not sufficiently developed. Much of the content of the Diploma II curriculum (56 of 80 credits) could not be broadcast via either DIKLAT SRP or Diploma 2 by Air because radio was not a suitable medium for delivering more complex types of activities. In 2006 interviews with the author, a number of Guinean teachers stated that they couldn't concentrate on the information presented in the radio broadcast program *Pas à Pas* because it was "boring," and the French sometimes too formal and academic to follow.

In terms of research-based outcomes, the most valuable members of the audio distance education "family" are IRI and IAI. IRI's main attractions are its reach, its cost, its school-based character, and its just-in-time nature. Where radio infrastructure is available,[23] the range of radio is formidable, reaching large numbers of teachers in geographically remote and isolated areas. The broad reach of radio means that more teachers can be trained, thus reducing the overall instructional unit cost per teacher. Because of its broadcast nature, new teachers can be added to existing programs with low marginal costs. Because teachers can listen to radio broadcasts or audio programs during the school day, schools do not need to worry about paying for substitute teachers, paying teachers' travel to workshops, or losing class time for students.

23 Many parts of the world where IRI has been a fixture on the teacher professional development landscape (South Asia, Latin America, and sub-Saharan Africa) have well-developed radio and audio production capacity.

These advantages are enhanced when IRI and IAI are used as specific distance education delivery systems. First, IRI and IAI, unlike broadcast radio, are engaging and interactive, speaking directly to students and teachers. One critical advantage is that the teacher can receive just-in-time, classroom-based professional development.

Next, unlike other modes of professional development, IRI and IAI compensate for the learning curves required of a novice teacher with little degradation in the quality of instruction. For example, a teacher may learn how to use a science kit in a face-to-face or online session and must often then "muddle through" the first few times he or she attempts to apply what she's learned in class. But because they are so highly scaffolded, IRI and IAI programs can direct the teacher through use of the new kit in a way that mitigates degradation of instructional quality. Third, related to this last point, IRI and IAI can serve as an in-class support for multiple types of professional development. Finally, IRI (especially) and IAI are backed by a body of rich, deep, and longitudinal research proving their effectiveness as a medium for both student and teacher learning.

Summary of Audio-based Distance Education

Figure 2.5 summarizes the role of audio-based distance learning and its strengths and limitations as a distance education mode.

Figure 2.5: Summary of Audio-based Distance Education (adapted from Gaible & Burns, 2007: 46)

Roles in Teacher Professional Development	Strengths	Limitations
▪ It substitutes for or complements the in-class teacher as an instructor. ▪ It provides a highly scaffolded form of professional development for teachers with weak literacy, content, and pedagogical skills. ▪ It offers instruction in basic skills: math, health, language of instruction (English, French, etc.). ▪ It promotes teacher development, primarily via demonstration, guided and hands-on classroom management, and building subject knowledge.	▪ It can lead to improvements in students' and teachers' basic skills. ▪ It may be implemented with or without textbooks and other resources. ▪ It can reach large student and teacher populations. ▪ Lack of literacy skills is not a barrier. ▪ It addresses equity and access issues (gender, ethnic, rural). ▪ It can combine hands-on development of teacher skills with student learning. ▪ Audio learning may support visualization and concept building by learners. ▪ It enables instructional continuity across grades and subjects. ▪ Radio is a known quantity in all countries, and radio production skills are widespread. ▪ It is durable and survives extreme environments and long-term use with minimal care. ▪ It requires only moderate classroom infrastructure and low technical support.	▪ Value of content may degrade over time—long-running programs must evolve with schools and education systems. ▪ Broadcast airwaves are subject to political and economic events and fixed broadcast schedules. ▪ It has a tendency to reinforce rote learning models—interactivity may be limited, and attention to needs of individual learners is limited. ▪ IAI/IRI may promote a linear, one-size-fits-all approach. ▪ It risks student and teacher dissatisfaction, including boredom, especially when lessons are broadcast daily. ▪ Hardware replacement programs are necessary: radios and batteries may be stolen or damaged.

Roles in Teacher Professional Development	Strengths	Limitations
	▪ It aligns well with learning styles of oral cultures. ▪ IAI and podcasting largely facilitate portable and "anytime, anyplace learning." ▪ Audio conferencing provides real-time shared learning and as-needed contact and instruction from an instructor and a group of peers.	

Chapter 3: Televisually-based Distance Education

Overview

Seeing is believing; seeing is understanding; and seeing is learning. Teachers benefit when they see other teachers work in new ways, when they see another teacher use one computer with 40 students to promote collaboration, or when they see an innovation successfully implemented with the same types of learners and the same local context that they themselves face. Seeing other teachers in action offers credibility. It furnishes models of desired practice, provides implementation guidance, sparks ideas, and increases teachers' understanding of difficult-to-explain procedures or processes. To paraphrase a famous American baseball player, teachers "can observe a lot by watching."

This chapter focuses on televisual models of distance education for teachers. "Televisual" includes such visual broadcast media as television, video, and videoconferencing.

As a tool for teacher education, televisually based distance education is often used to show teachers real teacher-student interactions in the classroom, thus enabling them to observe the management of learning activities. In this respect the uses of radio and television for teacher professional development can be contrasted: whereas radio often is used to *guide* teachers through scripted activities, television *shows* teachers images of teachers and students in action (Gaible & Burns, 2007: 50).

Television

Though expensive, television has tremendous reach and enjoys the advantage of being a familiar and engaging visual medium. As such, television has for decades been well established as a distance education mode providing high-quality content and instructional techniques for pre-service, in-service, and continuing teacher education. Teachers have participated in television-based professional development in their homes; in their classrooms; or, in areas where television is not widely available, in viewing centers. Indeed, the largest distance education program in the world, Shanghai Television University, is television-based.[24]

Television's strengths include the power to engage viewers, to present conceptual information visually, and to show real people doing real things in environments both local and international. Television can support professional development by giving teachers opportunities to observe other teachers as they implement new instructional practices. By enabling teachers to anticipate what will happen, television reduces the risk inherent in experimentation (Gaible & Burns, 2007: 50).

As with radio, there is a large body of collective and cumulative evidence demonstrating that televisual formats of education (both television and video) can play an important role in facilitating learning. Studies (Saltrick, Honey, & Pasnik, 2004; Kothari & Takeda, 2000) suggest that educational television can assist with the following outcomes:

24 Shanghai Television University has approximately 200,000 students. For more information, see: http://www.shtvu.org.cn/index/index.htm (Mandarin).

- Reinforcing reading and lecture material
- Developing a common knowledge base
- Enhancing learner comprehension of a particular topic or procedure
- Helping learners visualize processes and procedures that might otherwise be difficult to understand via text or radio
- Increasing learner motivation and enthusiasm
- Promoting teacher effectiveness in areas targeted by television or video learning segments
- Augmenting reading skills, especially when used to reinforce the connection between the spoken and written word.

Figure 3.1: Instructional Television in China (Wang, 2000)

With its focus on economic development in the 1980s, China first turned to education as a mechanism to promote economic development. The 1986 Law on Compulsory Education guaranteed nine years of basic education for all children. This immediately increased the demand for more qualified teachers.

China has used television in a nationwide effort to develop the millions of teachers needed and upgrade their basic skills. Using a microwave network, China offers over 200 courses toward teacher diploma and subject-area certification. Because of its satellite technology, China has established the largest educational television network in the world: Central Educational Television provides a diploma in education to academically unqualified teachers, upgrades the professional skills of teachers, and conducts in-service management training for school principals. From 1988 to1998, 710,000 primary school and 550,000 secondary school teachers received diplomas in education through instructional television.

China has made its educational television broadcasts available on DVD. DVDs not only enable teachers to play back several hours of high-quality television, thanks to video compression techniques, but also allow them to stop, rewind, and view selected frames. Since an hour of video can hold 100,000 stills, this system offers enormous storage potential, allows for anytime-anyplace viewing, and can be shared among schools.

Television has been a common teacher training tool in countries that have well-developed broadcasting or satellite infrastructure (e.g., Cuba and the United Kingdom); cover a large geographical expanse (Canada, Australia, China, Mexico, Brazil, and the United States); and have large or dense populations that make television a cost-effective distance education model for teacher training (India and the United Kingdom). Globally, Canada, China, Mexico, and Brazil have been leaders in using television for teacher pre-service and in-service instruction. Canada also has a number of national and provincial teacher training broadcast programs.

In 1987 China, in order to upgrade the skills of the two-thirds of its teaching force who had not received appropriate pre-service teacher training, established the China Television Teachers' College to offer in-service teacher training through educational television. Within 10 years the number of unqualified primary school teachers had declined from 39 percent to 14 percent, and the number of unqualified secondary school teachers from 73 to 36 percent (Zhao, 1995, cited in Wang, 2000). China presently has approximately 100 instructional television channels operating at both the national and regional levels (see figure 3.1 for more information about China's instructional television program).

Much of what is known about *instructional* television[25]—using television as an in-class education tool for students and teachers—comes from Latin America. For instance, Mexico's *Telesecundaría*[26] program is designed specifically to provide year-round curricula to rural junior secondary schools. Through in-class broadcasts, *Telesecundaría* enables college graduates with no training as teachers to guide students toward successful completion of the curriculum by supplementing educational programming with in-class discussion, lessons, and assessments. Instruction is delivered through text, the television, and teachers. The teacher uses materials and a script provided by *Telesecundaría* and often learns concepts simultaneously with his/her students through the broadcasts.

Each *Telesecundaría* lesson consists of a 15-minute televised program, followed by a 35-minute teacher-student dialogue, and a 10-minute break before the next segment begins. The televised program introduces a concept, and the students study relevant material in a specially designed *Telesecundaría* textbook. Students then engage in activities designed to apply the lesson to a practical situation, and the lesson closes with some form of assessment. The *Telesecundaría* model has been so successful that it has expanded to Costa Rica, Guatemala, Panama, Honduras, and El Salvador (Fillip, 2001; Calderoni, 1998; Santibañez, Vernez, & Razquin, 2005). In comparisons with their non-*Telesecundaría* counterparts in México, *Telesecundaría* students were "substantially more likely" than other groups to pass a state-administered ninth-grade examination and scored better in reading, math, and chemistry than students who studied these subjects via IRI and satellite courses respectively (Calderoni, 1998: 6). It is important to note, though, that *Telesecundaría* students perform poorly compared to students in brick-and-mortar schools in México (*Economist,* 2011b: 46).

México's Instituto Tecnológico de Estudios Superiores de Monterrey[27] (aka the Tecnológico de Monterrey or the "Tec"), a private, nonprofit university system, uses a variety of television formats for teacher education. Through its Virtual University,[28] the Tec offers postgraduate, continuing education, and training programs for teachers and teacher-educators in primary and middle schools via analog and digital television and Internet-based television, as well as through videoconferencing and Web-based learning.

The Programa de Actualización de Maestros en Educación program, funded by the Fundación Cisneros, Intel, and other private organizations, uses television, print, and the Internet to upgrade teachers' skills. At a predetermined date and time, teachers tune into a live broadcast on the day's topic from the Tec. As they watch the program, they can e-mail questions to the lecturer, who may respond live at that moment or

25 Though the terms "instructional" and "educational" television are often conflated, we distinguish here between the two terms. Instructional television is defined as broadcasts that simulate an instructional experience, with an instructor or narrator demonstrating procedures or explaining concepts. Educational television is used to refer to non-commercial television content that broadcasts programming for the purposes of educating or enriching viewers' understanding of a particular topic.

26 See http://telesecundaria.dgme.sep.gob.mx/

27 See http://www.itesm.mx/

28 See http://www.ruv.itesm.mx/

via e-mail at a later stage. Two thousand teachers from seven countries (Argentina, Colombia, Costa Rica, Ecuador, México, Panamá, and Venezuela) participate in this initiative through their DirecTV connection. Fundación Cisneros distributes television sets and DirecTV to all participating institutions. After the two-hour program, teachers can communicate via the website[29] in forums and discussion boards. Programs are aired for eight months, after which teachers must present a final project in which they demonstrate how they plan to improve their teaching. As part of this program, teachers also learn how to use a computer, e-mail, and the Internet in order to integrate these technologies into their classrooms and so that they can access the educational resources offered through the program's portal.

Cl@se is Fundación Cisneros' exclusive DirecTV channel, through which educational programming is broadcast directly into Mexican classrooms. Programs are aligned with the Mexican national curriculum and provide activities and ideas for teachers to continue exploring the topic after the program has been viewed. The program provides in-class support for in-service teachers, an especially crucial element for the many untrained and volunteer teachers in México's rural schools.

In Brazil, both private and public television channels carry educational programming that addresses vocational training and ways to improve classroom instruction. *Salto para o futuro*, broadcast by the government to address teacher professional development, is viewed by approximately 200,000 Brazilian primary and secondary teachers. The program's goal is to guide teachers in instructional change, but results are mixed. TV Futura's *A-Plus* is a daily nonformal private-channel television series used for continuing in-service professional development for teachers. Teacher follow-up is provided through local community mobilization networks, which offer extension activities around teaching practice.

On the other side of the globe, Indonesia's Channel 2 of TV Edukasi[30] (or TVE2), initiated in August 2008, is Indonesia's teacher education channel. Programs focus primarily on content and methodology and are broadcast to pre- and in-service teachers across Indonesia six days per week, eight hours a day to help teachers obtain an advanced degree and acquire advanced competencies. The Universitas Terbuka (UT) provides content and awards teachers credit. Typical teacher-based professional development using TV Edukasi involves watching programs, either in school or in one of UT's 37 learning centers, and reading print-based materials. Teachers then create a portfolio based on what they have learned. A local university tutor assesses this portfolio and sends the grade to UT, which confers credit on the teacher.

Egypt uses interactive instructional television to provide short-course in-service training for teachers at its 39 distance training centers across all governorates. Teachers can watch television programs and ask broadcasters questions via center coordinators. This technique of having teachers phone in questions that are then answered live on air is a format replicated in a number of countries that use television-based teacher training and is often referred to by the program designers as "interactive" television—though the degree of interactivity may be severely proscribed. As with TVE2, programs are considered interactive because teachers can respond in real time to the program by sending a short message service (SMS), e-mail or phoning the studio if the program is broadcast live (see figure 3.2 for a definition of interactivity).

29 See http://www.ame.cisneros.org

30 See http://tve.depdiknas.go.id/

In the United States, the Public Broadcasting Service (PBS) has been at the forefront of instructional television. Programs such as *French in Action*—a 52-episode French-language immersion program co-produced by Yale University and the PBS station WGBH—began in 1987. *French in Action* used a planned immersion approach to language learning in which students were exposed to authentic French language through a continuing storyline embedded with targeted grammar points, vocabulary, and culture. The actors' spoken language proceeded at a normal pace, but the script was designed to create a logically sequenced approach to teaching the French language. Because it was so highly structured, *French in Action* served as a curriculum supplement for students, an instructional aid for teachers, and an in-class professional development resource for beginning teachers (such as the author of this guide). Though there has been no research on teacher learning using this instructional television mode, *French in Action* is marketed as an aid for both student and teacher learning.

Figure 3.2: Interactivity

Though frequently used, the term "interactivity" is often not defined. Broadly, interactivity includes the following features:

- Learner interaction with an object or person in a way that allows learners to improve their knowledge and skills in a particular domain
- Multiple communication between learners around an object of study, a tool, or an experience
- Learner control and program adaptation based on learner input (Sims, 2003)
- Reciprocal process of information exchange and sharing ideas between students and teachers
- Multiple forms of synergistic participation and communication that aid the development of meaningful learning

Nations such as Australia and the United States are perhaps better known for *educational* television offerings—a term that denotes general educational enrichment. The Australian Broadcasting Corporation produces and broadcasts a range of educational programs for the general public that include curriculum-based television and radio programming.[31]

In the United States public broadcasting programs such as *Sesame Street, Cyberchase,* and *Between the Lions* educate young learners in and out of preschool, kindergarten, and primary school classes. Each program is broadcast live and archived on videodiscs that come with a teacher's guide. *Sesame Street*, in particular, is a staple in many early childhood classrooms around the globe. The impact of these programs on children's learning has been extensively documented. For example, students who view *Cyberchase* are better able to solve more mathematically sophisticated problems than students who do not watch the program (Stansbury, 2008). Though such programs can plausibly be considered dual-audience direct-instructional programming, that is, teaching teachers as they teach students, research on the impact of these programs on teacher practice is difficult to find. There is some self-reported evidence by teachers from the Indian state of Karnataka that India's educational television program, *EduSat*, helps teachers feel more comfortable teaching certain types of content (Phalachandra, 2007). Teachers do report that educational television programming such as *Sesame Street,* in addition to multimedia and other video, provides them with ideas and strategies to be applied in their classrooms (Saltrick, Honey, & Pasnik, 2007; Center for Children and Technology, 2008) but such information on the impact of educational (versus instructional) television on teachers is typically anecdotal and has not been well researched.

31 See http://www.abc.net.au/learn/

Finally, in terms of television within the United States, cable television programming and, to a lesser, more local degree, community access television also broadcast general educational programming.

Though expensive, television still offers the broadest array of high-quality digital and analog content. Many nations, including the United States, have investigated the creation of a national, on-demand, online digital media service that would allow teachers to access public television's extensive archives of educational content free of charge. These resources could be repurposed for use in student education, teacher education, and adult learning (Stansbury, 2008).

Internet Protocol Television (IPTV)

Television as we know it is rapidly changing. The experience of watching television is fast becoming less time- and place-based, more personalized, and more platform-varied. In many countries, like the United States, the rate of television ownership is dropping as the "television experience" shifts inexorably to the World Wide Web via on-demand Internet streaming. Though this change is occurring everywhere, it is most pronounced in Asia, particularly in Korea, Japan, and Taiwan. In 2009 Indonesia began to distribute TV Edukasi via the Internet in a program called TV Online, through which television programming is offered 24 hours a day and can travel over minimum bandwidth speed of 256 Kbps.

As televisions connect to the Internet directly or through set-top boxes, Blu-ray players, and game consoles, there promises to be an explosion of offerings and formats that, though geared toward consumers in the short term, will undoubtedly impact television as a distance learning mode in the medium and long term. In 2010, both Apple and Google launched Apple TV and Google TV[32] respectively. Google TV is a software platform that allows users to download Internet videos as well as cable television programs and consolidate them all in the same place.[33] Google TV includes Google's search engine, so that viewers don't need to watch programs as they are broadcast, but rather can search for video content on their television or on the Web and then view it on their television, computer, or other mobile device at their convenience. Time-shifting technologies such as digital video recorders (DVRs) allow users to view television programs at a time of their choosing. In addition, place-shifting technologies such as Slingbox, which stream content from home televisions to a tablet, laptop, or phone in another location, allow users to view programs far from home.

In 2010 Britain's BSkyB introduced its Anytime+ service, which uses broadband to deliver on-demand programming. BSkyB also allows viewers to share the content of their DVRs. The British Broadcasting Corporation[34] (BBC) and other British broadcasters set up home box sets that unlock the online program stores (*Economist,* 2010). As this technology expands beyond U.S. and British borders, distance education providers may potentially search the Internet for appropriate topics for teacher education and call up this content to be viewed by teachers as part of a professional development offering.

32 Google TV has struggled since its inception but has since acquired hardware from other companies (such as Motorola), which may help to improve its television set-top box offerings.

33 To do this, Google TV requires an extra piece of hardware.

34 See http://www.bbc.co.uk/

In addition to expanding the amount of television content and allowing it to be stored and viewed in different ways, the Internet promises to make television more of a shared social experience, as opposed to a solitary one. Pay TV and cable television firms are building guides for mobile devices such as the iPhone and iPad that can be used to program DVRs. Samsung television sets currently contain iPhone-type applications that allow users to go straight to subscription film-streaming services and view television programs on their (Samsung) phones. Other providers are weaving social networking sites (e.g., Facebook and Google+) into television guides so that viewers can recommend shows to one another (*Economist,* 2010).

As an example, Boxee[35] is a media browser that users can purchase or design via a free software download. It allows viewers to save and stream programming that they can view on a smart phone, computer, or television and around which they can communicate, recommend programs, and watch programs with colleagues who live in different locations. Again, the implications of this type of convergence for professional development are potentially exciting: Teachers could order subscription professional development television programming via their cell phones, view content on cell phones or on a television, share the program with colleagues, and engage in online, real-time, facilitated post-program discussions via a computer or through their cell phones.

In a variation on television viewing, technology companies in South Africa are blending the platform of television with the services of the Internet. Vodafone's Webbox is a QWERTY[36] keyboard that plugs into a television through a standard RCA connector and runs an Opera[37] mini-browser over mobile networks. The Webbox allows users to access such online services as SMS and e-mail messaging, Internet searches, FM radio, and photo and music galleries. Viewers can access the Internet via a pay-as-you-go SIM card. Webbox even works effectively on older cathode-ray-tube televisions. Once users finish accessing the Internet, they unplug the Webbox, and the set functions again as a standard television.

For several years South Korea has been capitalizing on the convergence of the Internet and television to offer in-service professional development and continuing education to its teachers via Internet Protocol Television (IPTV)—cable-based, high-quality internet television. IPTV fuses broadcasting and telecommunications by providing multimedia content—such as various data, texts, graphics, video, and audio—as well as two-way communication. IPTV guarantees service quality by using ultra-high-speed Internet for Web TV and standard-definition content for high-resolution television screens. These characteristics of IPTV—its multi-channel content, customization of education services by level, high-definition video, and individualized reciprocity in various forms—make it a potentially powerful teacher education tool (KERIS, 2009: 12). Using IPTV, teachers can create "playlists" of professional development and education-related programming for viewing at their own convenience (KERIS, 2009: 12).

35 See http://www.boxee.tv/. XBMC, at http://xbmc.org/, is a more complex though customizable version of Boxee.

36 QWERTY refers to the first six letters (keys) in the top row, from left to right, of the most common type of computer keyboard layout in use.

37 See http://www.opera.com/

The Korean Education Research & Information Service (KERIS) and the Ministry of Education, Science and Technology are exploring uses of IPTV 2.0—customizable playlists on mobile devices with adaptable and three-dimensional media content—for use in both teacher and student education.

Figure 3.3: Video Case Studies

Video case studies involve a facilitated group of teachers who analyze certain components of a video of another teacher's practice. Video case studies are an attractive professional development option, since they allow teachers to see one another's classes. As digital recorders fall in price, computers become more common, and video editing software becomes easier to use, educational organizations may begin to build their own libraries of video case studies for teacher training purposes.

Video

Whether it is used to support students or teachers, recorded video offers numerous advantages over television as a mode of distance learning for teachers. Using videos, teacher training entities can re-use and control viewing and transmission schedules and control the rate of presentation through freeze-frame, pause, rewind, and other options, thereby enabling viewing to be interspersed with discussion or specific sequences to be repeated. Once confined to hard discs that could be mailed from one location to another, video technology now enjoys prominence on the World Wide Web. Sites such as TeacherTube,[38] School Tube,[39] Edutopia[40] and Annenberg Learner[41] contain numerous classroom and activity-based videos that, with the proper professional development and expert facilitation, could serve as in- and pre-service teacher education tools.

As a distance learning tool, video segments of classroom activities are commonly used to enable teachers to watch expert colleagues and also observe their own experiments with new instructional methods. Video case studies allow teachers to study a classroom or an instructional strategy, such as co-teaching, in depth, providing actual models of how a process should and should not work. A large percentage of instructors and students also believe that video adds to the quality of a course, improves understanding of content, and increases learner motivation (PBS & Grunwald Associates, 2010).

A number of supplementary tools and protocols support video as a teacher training tool. We briefly discuss two tools and one protocol here. First, Video Traces is a system that makes it easy to capture a piece of rich digital imagery, such as video or a digital photo, and to annotate that imagery both verbally and visually (using a pointer to record gestures). This functionality enables teachers and teacher educators to create "traces"—imagery plus its annotation that can be viewed by the creator, exchanged with others, and further annotated for a variety of teaching and learning purposes.[42] However, Video Traces appears to be still in its formative stages.

38 See http://www.teachertube.com

39 See http://www.schooltube.com

40 See http://www.edutopia.org/

41 See http://learner.org

42 For more about Video Traces, see the Program for Educational Transformation Through Technology at the University of Washington. Retrieved from http://depts.washington.edu/pettt/projects/videotraces.html

Next, on the World Wide Web, where video is increasingly stored and viewed, VoiceThread,[43] a free, collaborative multimedia space, allows teachers to post still and moving images and view and comment on video in real time or asynchronously, using a microphone to record comments, type comments, or phone in comments. EDC's DBE 2 project in Indonesia, funded by USAID, used VoiceThread extensively as part of a program to help Indonesian educators to become school-based coaches. Coaches uploaded video of their classroom work with teachers and met with four-person learning teams who provided synchronous feedback and guidance on this work.

Figure 3.4: Evidential Reasoning and Decision-Making (Receso et. al., 2009)

Step 1: Identify a Focus. Teachers choose a focus. This can range from micro-level concerns such as how to individualize instruction for a struggling student to macro-level issues such as how to manage the classroom with 40 students and one computer. In a pre-observation conference with teachers, a teacher support person helps teachers identify a focus for the classroom observation.

Step 2: Collect Evidence. Teachers then identify and collect evidence that is directly or indirectly associated with their focus (e.g., lesson plans, video recordings, student work, etc.)

Step 3: Look Through a "Lens." Teachers then select a lens through which to collect, filter, analyze, and interpret evidence. A lens is a protocol to amplify fine-grained attributes of practice while eliminating unrelated "noise." A support person (e.g., a coach) can guide the interpretation of evidence through the use of lenses, which provide a specific perspective to highlight and analyze specific aspects of teaching.

Step 4: Enact a Course of Action. Following the lens-aided analysis, teachers synthesize what they have discovered about their particular behavior (step 1) into a course of action. They then enact that plan and repeat this process in an ongoing manner to improve specific aspects of their practice. The support person helps the teachers do this.

Finally, Evidential Reasoning and Decision-Making (ERDM) is a four-step, video-based method of collecting, analyzing, interpreting, and acting on classroom practice (Recesso, Hannafin, Wang, Deaton, Shepherd, & Rich, 2009) to enable teachers systematically to capture, identify, analyze, and adapt their practice. See figure 3.4 for a full explanation of ERDM.

There are numerous examples of using video to instruct teachers in improving their pedagogical practices. The University of Michigan's Elementary Mathematics Laboratory places two video cameras in the classrooms of master mathematics teachers. While the master teacher works with struggling math learners to uncover their mathematic reasoning, a group of novice mathematics teachers observes the live video in another location.

In sub-Saharan Africa and South Asia, video has been used effectively to aid teachers grappling with new teaching modes. In 1996, schools in Lesotho demonstrated techniques to help teachers integrate disabled

43 See http://voicethread.com/

students into regular classes in a video series produced by Save the Children. The series of 13 videotapes, each about 15 minutes long, guided teachers through identifying physical and cognitive disabilities; helping children overcome them; and ensuring that the classroom remains a safe, equitable, and welcoming environment (Gaible & Burns, 2007: 56–57).

Video has been successfully employed in rural Nepal to improve teachers' instructional skills (Pouezevera & Khan, cited in UNESCO, 2007). USAID's Basic Education Support 2 program in Namibia tasked circuit inspectors with videotaping teachers' classrooms to enable observation and assessment. *Stratégies Intégrées pour une Education Equitable et de Qualité* (SIEEQ) in the Democratic Republic of Congo used video as part of a program of intensive follow-up support for teachers. When a SIEEQ team traveled to a project school, they brought a digital video camcorder and a laptop. They filmed teachers working with students, uploaded the video to the laptop, and then shared it with the teachers as in-class professional development.

In the above examples teachers viewed videos of teaching practice to improve their own instructional skills, but video need not involve teaching episodes to be an effective professional development tool. From December 2004 to June 2005, the Discovery Channel's Global Education Partnership Learning Center project provided 371 teachers and 18,000 students in hundreds of Namibian schools with a satellite dish to allow teachers to download prerecorded science, history, and geography videos and show them to students in a learning center equipped with a television and DVD player. Each video was accompanied by a printed teacher's study guide that walked the teacher through the video. The guide included scripts and pointers for introducing the lesson, told the teacher where to pause the video, offered suggested questions for teachers to ask students, helped the teacher with summarizing techniques, and suggested follow-up activities. Though evaluation data on this program is unavailable, teachers reported[44] that they found this form of structured, dual-audience, direct instruction quite helpful, claiming that the videos helped them learn content better and that the guide helped them teach it more effectively.

Like audio and print, video has blended well with the World Wide Web. The Web has made video more flexible, while video has added value to the Web itself. Because of this convergence, video can now be used for more personalized instruction, while also reaching a potentially mass audience. For instance, at New York University[45] and Carnegie Mellon University,[46] many lecturers videotape their class lectures and post them online for students to access. This system not only allows students to view videos at their own convenience but also, more critically, frees the lecturers up to use class time to offer more personalized, one-on-one instruction—a process sometimes referred to as "flipped teaching"—or to offer greater computer-based support (Parry, 2010).

Video can also be packaged on websites as professional development toolkits for teachers, teacher-educators, and principals. Three good examples of this are Success at the Core,[47] a Web service dedicated to

44 June 2005 author interviews with teachers in Caprivi, Namibia.

45 See http://www.nyu.edu/

46 See http://www.cmu.edu/

47 See http://www.successatthecore.com/

building school-based leadership teams and quality instruction. Professional development occurs almost entirely via multiple free videos—some of which function as mini-case studies and others as step-by-step guides—as well as accompanying print protocols and reflective activities. A second example is the TIMSS Video Study[48] site, which provides videos of math and science classes from around the globe, as well as numerous documents about teaching mathematics and science.

Finally, Teachscape.com is a commercial Web-based teacher development system that offers teachers access to annotated video cases and subject courses. Each lesson has multiple video clips of exemplary teaching in a specific subject and topic—such as weight and density in science—and includes sample lesson plans, learning activities, student work, and guides for assessing student work. Teachscape is designed to provide teachers with observations of exemplary teachers in action. It uses video clips selected to illustrate specific points.

Video used to be difficult to find but is increasingly easy to access and develop. Video of classroom practices can be acquired from many universities and private companies, often via Internet download. Such videos are designed to achieve specific objectives in specific contexts, however, and may not be appropriate for use in all contexts. Examples of teaching videos can be freely accessed, downloaded, and stored on DVDs using any number of free tools via YouTube,[49] Teacher Tube, My Learning Tube,[50] and School Tube,[51] in addition to in-country repositories of video. Through the prevalence of increased Internet bandwidth, inexpensive but fairly robust pocket video recorders, and online services to compress and stream video, users can create their own streaming video for use on computers, phones, and tablets. For example, a face-to-face professional development session or lecture at a teacher training college can be recorded live and streamed live (via a free Internet video service such as UStream).[52] Similarly, users can record video using a pocket video recorder or video-enabled cell phone and use the increasingly easy video editing tools that come with pocket recorders or with a PC (MovieMaker) or Mac (iMovie) to create their own teaching videos. These videos can be made more interactive by inserting a slide/still of discussion questions or group activity assignments, which can then be projected on a wall using a mini-projector such as the Pico or Acer's micro-projector.

Videoconferencing

Videoconferencing (or video-teleconferencing) is a set of interactive technologies that allow individuals in two or more locations to interact via full-motion, two-way video, and audio transmissions simultaneously. Videoconferencing can take place through high-end dedicated systems (consoles and remote control video cameras) such as Polycom's Converged Management Application and Cisco's Telepresence[53] system, which

48 TIMSS is the Trends in International Mathematics and Science Study. See http://timssvideo.com/

49 See http://www.youtube.com

50 See http://www.mylearningtube.com

51 See http://www.schooltube.com

52 See http://www.ustream.tv

53 At this point in time, Telepresence systems cost about $100,000.

use multiple video cameras and high-definition screens, or via low-end Internet-based desktop systems, such as TeamViewer[54] or Skype, in which participants communicate via a built-in or external computer Web camera.

Videoconferencing is a powerful distance education option, since it approximates face-to-face interactions at a distance. The Canadian province of Alberta uses videoconferencing extensively as a mode of distance learning for teachers. In professional development projects like the U.S.-based Teachers' Telecollaborative Network (2001–2002), teachers in one location collaborated in group-based activities with teachers in another. Teachers were able to see their colleagues and instructors remotely, discuss topics with them at length, participate in learning experiences that might otherwise have been inaccessible, and view live examples of the types of instruction they should and should not be doing.

Since teachers can hear and see one another and observe important nonverbal cues (like gesturing) and tonal cues, there is evidence that videoconferencing can mitigate many of the misunderstandings that emerge in online learning. But teaching a remote audience via videoconferencing is still not the same as teaching a "live" audience. There are often lags in audio; picture and audio quality may be poor; it may be difficult to see all remote learners (or for remote learners to see the instructor); video can drop, leaving remote learners stranded; it may be hard for the videoconference teacher and remote teacher to coordinate activities and timing; certain activities work poorly or not at all across distance; and videoconferencing, like television, often doesn't capitalize on the benefits of the medium, instead defaulting to "talking head" instruction. Finally, if the videoconferencing instructor is working with both a live physical audience and a remote audience, he or she may focus on the live audience to the exclusion of the remote audience—or vice versa.

These issues notwithstanding, videoconferencing is a powerful distance education medium that can serve multiple purposes. In Indonesia, videoconferencing is used for *group meetings* as part of the blended, residential teacher-upgrading program, HYLITE. As part of the USAID-funded, EDC-administered DBE 2 program, coaches in an online learning program used the free remote access software TeamViewer to *co-teach* a one-computer activity with teachers in remote schools. Washington State University's cyber mentoring program, a collaborative venture between the university and K–12[55] schools, uses high-end videoconferencing so that pre-service teachers can *tutor students* in course content, literacy, and communication skills. This system allows for interaction between school sites, even at great distances, and facilitates the creation of partnerships between remote sites while still maintaining many of the facets of face-to-face communication crucial for quality educational experiences (Johnson, Maring, Doty, & Fickle, 2006). In the rural U.S. states of Oklahoma and Iowa, many pre-service teachers use a Polycom system to do *formal observations* of experienced teachers in their classrooms. And in many distance education programs, teachers participate in *university lectures* and seminars via videoconferencing.

The biggest issues facing videoconferencing are technical and financial. Videoconferencing demands very high two-way transmission of full-motion video and high-quality audio. When one or both of these fails

54 See http://www.teamviewer.com/

55 K–12 is a U.S. term that refers to kindergarten until grade 12 (the end of secondary school).

or is interrupted, or when the network is congested, teaching and learning are compromised. Poor audio quality, unclear images, and lags and interruptions in communication from one site to another undercut the whole rationale for videoconferencing: "being there" with fellow distant learners. High bandwidth is expensive, and more effective types of transmission such as microwave Wireless Wide Area Network (WWAN), along with the best videoconferencing systems, may be unavailable or beyond the budgets of many distance education institutions.

However, the future for videoconferencing as a much more widespread distance education tool is quite promising. Free desktop video applications like TinyChat[56] and Google Chat[57] make videoconferencing much more accessible to teachers. The use of bandwidth conservation and re-allocation mechanisms such as Quality of Service (QoS) allow institutions to set desired levels of service for different types of traffic on a network, thereby potentially allocating a higher QoS to videoconferencing and eliminating many of the transmission problems that occur using this method.

Finally, in a variation on simple videoconferencing, the use of "virtual bug in the ear" (VBIE) technologies, a Bluetooth-enabled earphone, can provide teachers with real-time coaching at a distance. A remote coach observes the teacher via a high-definition Web camera and provides the teacher with live coaching assistance via Skype. The information is communicated directly to the teacher's earpiece, so only the teacher hears—students don't. The teacher can thus make the improvements in practice or in a lesson suggested by the coach immediately. Further, using a video-based call-recording system such as Pamela or CallGraph, these VBIE sessions can be saved as electronic video files, and the teacher and coach can view them together after the class (Rock, Gregg, Gable, & Zigmond, 2009).

Considerations: Television and Video as Distance Learning Tools

Television and video possess numerous strengths as a medium for teacher education. Like radio, television is a mass communication medium with extensive reach; it is a technology with which teachers are familiar, thus requiring little training; and programs can be recorded and rebroadcast to teachers at their convenience. If produced well, television and video can be an engaging medium for learning content, procedures, processes, modeling techniques, and strategies that are difficult to present in either print or via radio.

A real strength of television and video is that they combine words and moving images. Moving images serve as powerful shorthand for communication and are an engaging and familiar cultural and professional communication medium. Images are concise—several pages of text can be encapsulated by a brief video segment, and conceptual, abstract information can be made concrete. A video can unfold in a nonlinear fashion, whereas nonlinear text sometimes proves disorienting to the reader. Because video is a dual-channel (aural and visual) learning approach, as opposed to a single-channel approach such as print and radio, the involvement of both aural and visual memory may result in greater long-term retention of information (Mayer, 2001). The use of video, particularly as part of an online or Web-based course,

56 See http://www.tinychat.com

57 See http://www.google.com/chat

lessens the reliance on print-based learning, thus enhancing the accessibility of whatever distance learning medium is used. Most important, television and video can blend multiple media—still images, moving images, and sound—to offer teachers a more multimodal learning experience than either print or audio.

Thus, televisually based technologies—television and particularly video—hold tremendous potential as media for and components of any distance learning program. The decreasing cost and increasing ease of video-editing tools means that video examples can be captured and edited locally and used for teacher self-study, case studies, and group study—all of which can then become the basis of discussion and analysis. Videos can be archived and viewed in multiple formats—via the Web, video compact discs (VCDs), television, smart phones, or tablets. New video cameras offer 360-degree image-capturing capabilities that can be transmitted over the Internet to provide a panoramic classroom view. Videoconferencing can bring isolated teachers into synchronous conversations with a larger community, which can be enormously beneficial, particularly if a well-trained facilitator ensures productive and focused discussion around the video examples.

However, as teacher education tools, television (in particular) and video suffer from a number of inherent and exogenous weaknesses. Television has extremely high initial production and recurrent costs and demands an extensive distribution network and highly skilled personnel. Broadcasts can be interrupted for a number of reasons: electrical, technical, programming, or political. Broadcast schedules may not be convenient for teachers, though this problem can be eliminated by using recording devices such as videocassette recorders (VCRs) and DVRs. Much instructional television and video fails to capitalize on the medium, instead falling back on traditional talking heads. It is often difficult to create engaging instructional television or video programming; and locally produced video, in particular, is often too long, of poor quality, or lacking narration. Finally, in the case of in-class television broadcasts that are more broadly educational, rather than directly instructional (that is, directly involving the teacher) in nature, television may be used to "babysit" students as teachers leave to smoke or visit with friends (as the author observed with EduSat programming in India).

As distance learning tools, the weaknesses of television and video can be redressed by using the following techniques:

» Using many of the same techniques as used in IRI (pausing, questioning the audience, reinforcement, and guiding and scaffolding the teacher)
» Monitoring teachers' viewing of in-class educational programming and participation in instructional programming through classroom observations, teacher logs, or teacher-created artifacts or activities that directly link to television or video programming
» Using additional communication technologies such as e-mail, two-way audio, telephones, and cell phones (either voice or SMS) to create interactivity between viewers and presenters, viewers and content, or among groups of viewers in different locations
» Where robust Internet connectivity allows, housing video on the Web where it can be "remixed" and where viewers can comment and ask questions (similar to the communities that form in YouTube, Vimeo,[58] School Tube, and Teacher Tube)

58 See http://www.vimeo.com

» Developing instructional video (narrated short video segments, interspersed with places for facilitated group discussions, individual reflection, large-group processing, and assignments)

Summary of Televisually-based Distance Education

Figure 3.5 summarizes the role of televisually based distance learning and its strengths and limitations as a distance education mode.

Figure 3.5: Summary of Televisually-based Distance Education Model (Adapted from Gaible & Burns, 2007: 53)

Roles in Teacher Professional Development	Strengths	Limitations
▪ The medium delivers content and concepts to learners across the curriculum. ▪ It develops teachers' skills and knowledge. ▪ It provides views of real classroom practices and learning activities. ▪ It provides teachers with learning resources that show distant places, graphical representations of concepts, historical events, etc. ▪ It visually demonstrates difficult-to-understand concepts such as instructional or assessment strategies, communication strategies, and content-based procedures. ▪ It demonstrates new modes of teaching and learning through views of real classroom activities. ▪ Videotaping classes shows teachers their own interactions, habits, and progress toward effective teaching. ▪ Video-enabled cell phones and portable video recorders allow distance education instructors and teachers to record, display, and study video examples of actual classrooms.	▪ The medium is both powerful (moving images, audio, etc.) and familiar. ▪ It can be used to "bring" viewers to the site of events and phenomena. ▪ Observing demonstrations of classroom management and other teaching practices helps teachers implement new techniques effectively. ▪ It can reach large populations of students and teachers. ▪ It addresses equity and access issues—although access requires electrical power. ▪ It supports instructional continuity across grades and subjects. ▪ All computers are equipped with video-editing software, so video can be produced inexpensively and without a lot of production expertise. ▪ Teachers benefit from seeing other teachers—and themselves—in action. ▪ Video recordings can be used and re-used according to teachers' schedules. ▪ Playback controls (rewind, freeze-frame, etc.) enable close analysis of specific events.	▪ Visual medium could, but typically does not, guide teacher through scripted, hands-on classroom activities. Unlike radio, television and video promote "watch and learn," not "do and learn." ▪ For television and commercial video production, high development costs may limit testing, review, and revision before programming is launched. ▪ Value of content may degrade over time—costs of revisions and new programming are high. ▪ Television broadcasts may be subject to external political and economic disruptions. ▪ Television production requires sophisticated skills and facilities. ▪ Access to electrical power and, in the case of Web-based video, high bandwidth are both required. ▪ Internet television demands robust, high-speed Internet connectivity. ▪ Individually or locally produced video may be of such inferior quality that it turns off potential learners.

Roles in Teacher Professional Development	Strengths	Limitations
	▪ Video production tools can be used locally—in schools, by ministries, etc. ▪ Fixed broadcasting schedules can be made more flexible through DVRs (like TiVo) and VCRs. ▪ Development of new gaming consoles (like the Wii) and apps for smart phones and tablets extend television's reach and functionality.	▪ Video produced by foreign institutions may be ineffective—teachers may not identify with or reject experiences shown outside recognizable contexts. ▪ Over time, the technical quality of video fades and content may look, sound, feel, and be outdated. ▪ Increasing evidence shows that declining attention spans mean that teachers "tune out" 30- or 15-minute broadcasts.

Chapter 4: Multimedia-based Distance Learning

Overview

Multimedia is media that combines a number of content formats: text, audio, full-motion video, still images, animations, or applets. Multimedia in this chapter includes CD-ROMs, DVDs/VCDs, group teaching and learning software (GTLS), computer-aided instruction, intelligent tutoring systems, and digital learning games (both on- and offline).

While multimedia has long been used extensively to support student learning, it has historically been used less for teacher learning, though that disparity is now changing. In particular, at this point in time, digital learning games have been completely overlooked as a teacher learning tool. Yet multimedia offers at least two potential benefits as a distance and open learning model[59] that could be part of any distance education program. First, the combination of text, audio, video, color, animation, and various other ways of learning afforded by multimedia may effectively address teachers' individual learning styles and their "frames of knowing" (Gardner, 1983).

Next, as research on cognitive theory illustrates (Mayer, 2001), multimedia may help all individuals—both students and teachers—learn more effectively and meaningfully through the "dual coding" of information in which the learner processes text and images simultaneously. This dual coding has been shown to aid learners' working memory. In studying the use of rich media as a teaching and learning tool, Mayer identified seven principles that characterize its potential to enhance learning.[60] These principles are outlined in figure 4.1.

Figure 4.1: Mayer's Cognitive Principles on Multimedia (Mayer, 2001)

Cognitive principle	Learners learn better when . . .
Multimedia principle	▪ There are words and pictures rather than just words alone.
Spatial contiguity principle	▪ Corresponding words and pictures are presented near rather than far from each other on the page or screen.
Temporal contiguity principle	▪ Corresponding words and pictures are presented simultaneously rather than successively.
Coherence principle	▪ Extraneous words, pictures, and sounds are excluded rather than included.

59 Because the computer acts as a teacher and multimedia is typically used as a self-paced, self-instructional tool, we refer to this model as open learning that may or may not form part of a distance education program.

60 Mayer's research demonstrates the learning impacts of multimedia applications if they follow the cognitive principles outlined in figure 4.1.

Cognitive principle	Learners learn better when . . .
Modality principle	▪ There is animation and narration rather than animation and on-screen text.
Redundancy principle	▪ There is animation and narration versus animation, narration, and on-screen text.
Individual difference principles	▪ Design effects are stronger for low-knowledge learners than for high-knowledge learners and for high spatial learners rather than for low spatial learners.

The remainder of this chapter examines various forms of multimedia as actual and promising modes of distance education for teachers.

CD-ROMs, DVDs, and VCDs

Since their inception CD-ROMs and DVDs have been used as tools for pre-service and in-service teacher training, both for self-study purposes and as part of formal professional development. CD-ROMs, DVDs, and VCDs[61] here refer to storage discs that contain multimedia applications, such as games, simulations (e.g., SimCity), self-study programs, remixes of audio/video/text, and noncommercial and commercial stand-alone computer programs (e.g., Reader Rabbit).

An ever-increasing amount of text, graphic, and full-motion video data can be recorded and distributed on CD-ROMs, DVDs, or VCDs. As digital video compression improves, CD-ROMs and DVDs have replaced videotape and laser discs and can substitute for Web-based streaming video, which requires high bandwidth. In developing countries where broadband access may be limited, DVDs have become a popular medium for distributing full-motion video programming, films, and telecourses. Additionally, DVDs can offer high-quality still images and animation, with better resolution than is found on the World Wide Web.

There are numerous examples of CD-ROM and DVD-based materials developed to support distance learning for teacher education. The United Kingdom's Open University has used Web-, CD-ROM-, and DVD-based materials for teacher self-study at its regional centers. Through a grant from the Intel Corporation, the College of Education at Arizona State University[62] redesigned and transferred to CD-ROM a graduate media design course and all supporting materials for education students and Intel trainers to learn at their own pace and in any setting (McIsaac & Gunawardena, 1996). The EDC-implemented, USAID-funded Pre-STEP program in Pakistan is, in part, a DVD-based self-study course in which instructors at Pakistan's teacher training colleges read about and view videos and animations of learner-centered pedagogies and questioning techniques. As of March 2009, PUSTEKKOM had distributed 40,000 DVD players to schools across Indonesia for the purpose of teacher in-service professional development.

61 VCDs are a common storage format in Asia. Like DVDs, they play in a DVD player, but they hold much less data than a DVD. They fall between CD-ROMs and DVDs in terms of storage capacity.

62 See http://education.asu.edu/

Namibia's National Institute for Educational Development[63] has placed all of its Web-based content on CD-ROMs and distributed them to schools where teachers have computers as part of in-service self-study to help them integrate information and communications technologies (ICTs) into instruction. Uganda's 2003–2005 Connect-ED pre-service teacher training program designed six CD-ROM-based professional development courses for teachers enrolled in primary teacher colleges. Each course was self-paced and featured 15 units of study, downloadable reading materials, a glossary, and quizzes; interactive materials in some units offered visual demonstrations of key concepts.

As noted in chapter 3, the SIEEQ project in the Democratic Republic of Congo (2004 to 2007) used video to support teacher development in workshops and to provide follow-up support for teachers once they returned to their schools. Initial work with Congolese teachers in their own classrooms was videotaped and edited by project personnel to create DVDs for use in professional development workshops. The 720 teachers targeted by the project observed specific pedagogies by their peers and colleagues and compared those pedagogical techniques with their own practices (Gaible & Burns, 2007: 56).

Like radio and television, educational content available on CD-ROMs and DVDs, particularly when organized in a structured learning sequence, can serve as a form of dual-audience direct instruction for students and teachers. For example, as part of China's National Distance Learning Program for All Rural Schools (2003–2007), the Chinese government distributed CD players and CD-ROMs with curriculum materials and educational content to 110,000 village classes and 380,000 rural primary schools. These materials, designed to be used with students, also served as instructional and subject-knowledge aids for teachers (Miao, cited in UNESCO, 2007). In the Philippines' Text2Teach pilot project,[64] designed to deliver Department of Education–certified multimedia content to science classrooms, 46 percent of teachers reported that DVD materials helped them teach their lesson "well," and 95 percent stated that the content made it easy for them to implement science content (Rodriguez, cited in UNESCO, 2007).

In India the Azim Premji Foundation,[65] along with the state government of Karnataka, has used curriculum-based CDs as part of a program to train 15,000 teachers in math and science (PricewaterhouseCoopers, 2010). In West Bengal, India, InTuition, an online learning program, also provides CD-ROM-based multimedia lessons in physics, chemistry, mathematics, and biology for students in grades 9 to12. The InTuition model could certainly be replicated with teachers.

Research on the impact of multimedia-based teacher training programs is hard to find. In China, the Jiangsu Radio and Television University, in partnership with China's Central Radio and Television University, uses multimedia as a main component of its in-service teacher training program, which aims to upgrade teachers' qualifications and pedagogical competencies in English-language instruction. Though not focused on impacts on teacher knowledge and skills, findings (Zhang & Hung, 2007) did reveal that

63 See http://www.nied.edu.na/

64 In this classroom-based project directed at grades 5 and 6 science teachers in 82 schools in the southern Philippines, teachers were provided with cell phones and text-messaged orders for certain video clips and lesson plans. Materials were transmitted directly to schools via satellite and burned onto CD-ROMs or DVDs for distribution and storage in schools. Text2Teach has since become BridgeIt, which will be examined in "Chapter 7: Mobile Technologies for Distance Learning."

65 See http://www.azimpremjifoundation.org

the multimedia program helped to lower the teacher attrition rate from the radio and television–based university, increased learner (i.e., teacher) satisfaction, and improved learner outcomes.

The way in which multimedia is stored and viewed is rapidly evolving. Multimedia used to be accessed and used via commercial CD-ROMs, VCDs, and DVDs that were installed in computers. Now, multimedia is increasingly accessed and used via Internet "cloud-based" applications on desktops, laptops, or mobile devices.[66] South Korea's National Open University[67] (KNOU) incorporates desktop, offline multimedia applications as one of its major forms for self-study and makes all of its instructional multimedia available on mobile phones.

Group Teaching and Learning Software (GTLS)

One of the more unusual uses of multimedia as a tool for teacher professional development involves GTLS. GTLS is a dual-audience multimedia program presently used by EDC with teachers in 4,167 schools in five Indian states.[68] GTLS involves not simply multimedia, but rather a dual-audience direct-instruction approach that borrows from and transfers IRI approaches to the design of computer multimedia. It helps students learn content by interacting with the teacher and the computer, and its highly structured system provides content-based and instructional professional development to teachers. As with IRI, GTLS content is accompanied by entertaining characters with voice-over narration, colorful animations and screen text, topical sing-along songs, lesson plans for IRI-style follow-up of computer activities, and competitive quizzes (Royer, 2007: 2–3).

In the GTLS approach, teachers are provided with one computer into which they install a CD-ROM of directed modular activities that help the teacher direct student learning in math or science. The content is designed to address areas that teachers find difficult to teach and that, consequently, students find difficult to learn. For instance, the physics CD-ROM focuses on light, forces and motion, and electricity and magnetism. Each CD-ROM module contains vocabulary builders, applets, team-based activities, and off-computer activities designed to increase student understanding of the subject matter.[69]

Pre- and post-evaluations between a control and experimental group of teachers and students indicated a number of positive outcomes associated with the use of GTLS. For instance, students who used the GTLS learned more than their counterparts enrolled in control classrooms. Teachers using GTLS recorded enhanced learning gains on test items drawn from the instructional syllabus, from content targeted by the software, and from items that measured transfer to new material. The impact on the software was particularly strong on these transfer items. Measures of teacher quality and classroom environment characteristics improved from pre-test to post-test, suggesting that the positive shift in classroom characteristics could have mediated positive changes in test performance. Though more research is needed on the impact of GTLS as a teacher and student learning tool, there is strong evidence in the evaluation

66 More on this in "Chapter 6: Emerging Web-based Models for Distance Learning."

67 See http://www.knou.ac.kr/engknou2/

68 These states are Karnataka, Delhi, Jharkhand, Bihar, and Chhattisgarh.

69 Thanks to Nevin Katz of EDC for this information.

data that GTLS use improved student learning of the material targeted by the tests and raised classroom climate indices that have been shown to be related to enhanced student learning (Royer, 2007: 13–14).

Computer-Aided Instruction (CAI)

CAI is instruction by a computer "tutor." Typically used as remediation and enrichment for students, CAI—sometimes called computer-based instruction (CBI) or computer-aided learning (CAL)—is a growing, though still largely untapped, mode of teacher professional development. Most of the literature on CAI focuses on its use to improve content-specific skills (math, science, reading) for *students,* but CAI shows promise as a tool to improve basic and intermediate skills for *teachers* in key content areas. For example, research on adult learning (Lauzon & Moore, 1989, cited in McIsaacs & Gunawandera, 1996) reports that CAI meets the diverse needs and characteristics of adult learners by providing opportunities for self-paced learning that can be both individual and group-based. Other research (Cheng, Lehman, & Armstrong, 1991 cited in McIsaacs & Gunawandera, 1996) regards CAI as an "effective tele-training" tool to enhance learners' content skills.

In areas that are geographically remote, mountainous, sparsely populated, or lacking qualified instructors, computer-based training—either via distance learning or via local stand-alone CAI applications—is an attractive professional development option. Indeed, the tutoring component of CAI is essentially its most attractive feature as a distance learning tool—and its most criticized.

CAI can be used to upgrade teacher qualifications, provide access to content and dynamic lesson plans, take online examinations, and allow teachers and students to communicate across geographic boundaries with their peers in other locations. CAI is often a staple technology in Asia's open universities. For example, both Bangladesh's Open University and the Allama Iqbal Open University of Pakistan[70] use CAI as part of pre- and in-service teacher instruction. Since 1998, Indonesia's UT has developed CAI programs containing interactive texts and images to provide teacher learners with more detailed analysis and explanation of print concepts, as well as to offer some form of interactive learning accompanied by instant, computer-generated feedback. CD-ROMs and DVDs of multimedia materials are mailed to pre- and in-service teachers across Indonesia. The majority of CAI programs produced by UT and its partners are geared toward secondary school teachers.

Relief International/Schools Online[71] and the Bangladesh Rural Advancement Committee[72] both utilize CAI for teacher training in Bangladesh. And throughout the globe, many teachers—informally and formally—use CAI to upgrade their skills because, like their students, they find it makes interaction with content more stimulating, engaging, and enjoyable.

There appear to be few in the way of reliable evaluations measuring the impact of CAI on teacher learning. However, evaluation studies carried out during the 1970s and 1980s found that computer tutoring has

70 See http://www.aiou.edu.pk/

71 See http://ri.org/

72 See http://www.brac.net/

positive effects on *student* learning. A major meta-analytic review (Kulik, 1994, 2003) reported that the average effect of computer tutorials was an increase in student test scores from the 50th to the 64th percentile. These 58 studies included many evaluations of computer tutorials in mathematics and reading, but very few evaluations of computer tutorials in science. In fact, too few studies were available in science or social studies to warrant separate conclusions about the effectiveness of CAI in these subjects (Kulik, 2003: viii).

One example of CAI that has demonstrated learning benefits to students is SimCALC's MathWorlds.[73] MathWorlds is a math-based simulation program that can be downloaded free onto Texas Instrument graphing calculators or onto computer desktops. Research (Roschelle, Tatar, Schectman, Hegedus, Hopkins, Knudsen, & Stroter, 2007) indicates that students who used MathWorlds had a better understanding of rate and proportionality than similar students who used the standard curriculum. SimCALC's MathWorlds also demonstrated a statistically significant effect on students' math scores, particularly on knowledge of complex math concepts.

Intelligent Tutoring Systems (ITS)

An intelligent tutoring system (ITS) is a variation of CAI. It is a computerized learning environment that incorporates computational models in cognitive science, computational linguistics, artificial intelligence (AI), and mathematics that track and cater to learners' subject knowledge, skills, strategies, and motivations in an adaptive manner (Graesser, Conley, & Olney, in press: 1). There are multiple types of ITS—cognitive tutors and example-tracing tutors are just two examples.

Essentially, an ITS interprets learner problem-solving behavior using a cognitive model that captures the skills that the learner is expected to master. The ITS then applies an algorithm called "model tracing" to monitor a learner involved in a problem. It compares the learner's actions against the expectations and misconceptions that are appropriate according to a cognitive model, and modifies instruction accordingly.

Some research (Graesser et al., in press) has shown ITS to be more successful with learners than human tutors. For example, Cognitive Tutors,[74] a mathematics-based ITS developed by the University of Pittsburgh and Carnegie Mellon University, has shown learning

Figure 4.2: Virtual Worlds (Bell, 2008; Warburton, 2009:418)

A "virtual world" is a synchronous, persistent network of people, represented as avatars, who interact in relation to a particular task or topic via networked computers (Bell, 2008). Virtual worlds possess a number of characteristics (Warburton, 2009: 418):

- Persistence of the in-world environment
- Shared space, allowing multiple users to participate simultaneously
- Virtual embodiment in the form of an avatar
- Real-time interactions between users and objects in a 3-D environment
- Similarities to the real world such as topography, movement, and physics that provide the illusion of "being there"

73 See http://www.kaputcenter.umassd.edu/products/software/

74 See http://www.learnlab.org/

gains in experimental and classroom settings (Corbett, 2001, cited in Graesser, Conley, & Olney). Many ITS programs have outperformed human tutors in doing fine-grained (as opposed to approximate) learner assessment, fine-tuning and adapting to individual learners, identifying students' problem-solving strategies ("model tracing"), and ordering learning topics from simple to complex.

ITSs have one major drawback, which is why they tend to be absent from e-learning or CAI. Because they rely on AI programming, they are exceedingly complex and expensive to create.

Where ITSs are used, they are overwhelmingly geared toward student learners. But the same benefits—their ability to work across a range of problems, perform fine-grained assessments, recognize multiple learner-solution strategies, handle large quantities of data, provide instant feedback to learners, reframe content, and adapt instruction to students' cognitive performance—also make ITSs potentially promising learning tools for *teachers,* particularly in situations where they need to improve their subject knowledge.

Digital Learning Games

Digital learning games, in contrast to the larger genre of general computer games, have an explicit educational focus. They are virtual worlds,[75] designed experiences (Squire, 2006) in which learners play some role as they solve problems by learning to think like scientists, historians, journalists, or any other group that employs systematic methods of inquiry and problem framing in order to investigate an issue. Unlike the modes of distance learning discussed so far, digital learning games are highly platform-independent. They can be CD-ROM- or DVD-based. They can be Internet-based, such as Skoolaborate,[76] EcoMUVE,[77] or Urgent Evoke.[78] They can be played on mobile devices such as portable gaming systems (e.g., the Wii, Xbox or PlayStation), televisions, computers, iPads, and smart phones. Input can be touch-, joystick-, keyboard-, or motion-based. Cumulatively, digital games can be both off- and online, collaborative (multi-user/multiplayer), or solitary learning tools. Adding to their expansive nature, digital learning games are varied in their content, structure, dimensions, and focus, so much so that figure 4.3 attempts to classify them into genres.

75 This definition is under dispute by certain technology specialists. Klopfer et al. (2009: 14) state that defining digital games as virtual worlds is "erroneous."

76 See http://www.skoolaborate.com/

77 See http://www.ecomuve.org/

78 See http://www.urgentevoke.com

Figure 4.3: Genres of Digital Learning Games (Adapted from Lucas & Sherry, 2004: 512; New Media Consortium, 2011: 21)

Genre	Description of This Type of Game
Action/adventure	▪ Players participate in an adventure
Alternative reality	▪ Players find clues and solve puzzles that blur the boundaries between the game and real life (e.g., World Without Oil; Superstruct).
Athletics/sports	▪ Games are based on athletic or sporting events (Wii Fit).
Content-based	▪ Players learn general content or specific content topics.
Fantasy/role playing	▪ Players assume a character role (e.g., World of Warcraft).
Problem-solving	▪ Players solve a real-world problem.
Quiz/trivia	▪ Games test players' knowledge.
Re-enactment	▪ Players become characters living in a certain historical period, dealing with issues of that period.
Simulation	▪ Games mimic or simulate real environments and issues associated with that environment (e.g., SimCity).
Strategy	▪ Games employ strategies and planning skills (e.g., Age of Empire)

Through narrative and game mechanics, digital learning games enable players to approach problems by engaging in activities and scenarios that share common values and practices. These practices are learned by thinking like certain groups and conceptualizing issues by employing culturally or professionally mediated "lenses." Thus, understanding and literacy in games are developed as players learn the discourse practices that games embody.[79] Further, digital learning games have three specific educational uses: they may be designed as curricular interventions used in formal classroom settings; they may be used in informal contexts but with a specific curricular focus; or they may be designed as vehicles for assessing student knowledge (Clark, Nelson, Sengupta, & D'Angelo 2009: 28).

Clark et al. (2009: 28) classify *all* games as belonging to one of three categories: (1) games of short duration, which can be played in a few minutes online or on hand-held devices; (2) games of fixed duration with a set start and stop time; and (3) games of ongoing participation, in which players become members of an ongoing community. The latter usually occur online. One example of participation games writ large is Massively Multiplayer Online Role-Playing Games (MMORPGs), such as World of Warcraft, which millions

79 E-mail communication, C. Brunner, December 8, 2008

of players may play simultaneously. Another example of participatory games is Massively Multiplayer Online Games (sometimes called MMO or MMOG), such as Whyville.[80] These are multiplayer video games capable of supporting hundreds or thousands of players simultaneously, but they are not necessarily role-based.

There is a good deal of long-term research on the benefits of digital learning games for students. Digital games (not just digital learning games) have been linked to acquisition of computer literacy (Greenfield et al., 1994; Greenfield & Cocking, 1996; Griffiths, 1991, cited in Lucas & Sherry, 2004), improvement of cognitive and attention skills (Green & Bavelier, 2003; Subrahmanyam & Greenfield, 1994, cited in Lucas & Sherry, 2004), and development of positive attitudes toward technology (Canada & Brusca, 1991, cited in Lucas & Sherry, 2004).

Figure 4.4: 21st-Century Skills (Partnership for 21st-Century Learning, 2004)

21st-century skills include the following:

- Information and communication skills
- Thinking and problem-solving skills
- Communication and self-directed learning skills
- Ability to use technology to access, manage, integrate, and evaluate information; construct new knowledge; and communicate with others effectively
- Ability to learn academic content through real-world examples

Recent theories and empirical research on learning with games have focused on games as tools with which to develop conceptual thinking by interacting with and manipulating complex systems (Gee, 2003; Squire, 2006; Squire & Barab, 2004) and as alternate, virtual environments in which learners outfit themselves with virtual identities or avatars in order to practice ways of knowing within a situated, authentic context (Gee, 2003; Gee & Shaffer, 2010a; Shaffer, 2005; Shaffer & Resnick, 1999; Shaffer, Squire, Halverson, & Gee, 2005). Gee & Shaffer (2010a: 12–15) summarize the benefit of games as learning tools:

» **Games are built around problem solving.** Players must use facts, artifacts, and evidence to make decisions.
» **Games inherently require and assess 21st-century skills.** Games require players to collaborate, modify the game, map out complex variables, and find solutions to challenging "boss" levels.[81] All of these skills can be classified as 21st-century skills (see figure 4.4).
» **Games collect information about players on many dimensions.** For example, how players deal with problems across time, how a player's decisions are related to overall success, etc.
» **Games track information across time.** Games are developmental in nature and are thus designed in terms of levels. For players to go from one level to another, they must have mastered a certain set of skills.

80 See http://www.whyville.net/

81 Gee and Shaffer state: " 'Boss battles' at the end of a level in a game are often used to assess whether the player has mastered the skills of the level just finished, and whether he or she is prepared for learning the more demanding challenge of the next level." (p. 13)

- **Games integrate learning and assessment.** Learning and formative and summative assessments are "inseparable" in games. Players are given feedback on what worked and what didn't and are informed about their progress.
- **Games can be collaborative and social.** In multi-user games, learners play "against" or "with" other players simultaneously and often must collaborate as part of the game itself.
- **By design, games can be higher-order learning tools.** Games embody adaptable challenge, clear criteria, personalized feedback, and a broad range of challenging topics as intrinsically motivating ideas (Prensky, 2001, cited in Gee & Shaffer, 2010a). Furthermore, games can serve as "entry points" into conceptually complex content in ways that lead learners to investigate a concept further through immersion in the process (Klopfer, Osterweil, & Salen, 2009).
- **Games provide information that players can use to improve their knowledge and skills.** Games often provide "actionable" information to players so that they can make decisions about what to do to improve and succeed. Thus, players know where they have succeeded and where they have failed and can take corrective action in order to succeed.

While research on games as tools for student learning has been conducted for at least several decades (Cordova & Lepper, 1996; Malone, 1981; Turkle, 1984, 1995), there is little research on using games as learning tools for *teachers*. However, as this guide reiterates, many (if not most or all) forms of technology that are geared toward student learning can also be used for teacher learning. Indeed, given the popularity of games and demographics of gamers, many teachers, particularly young ones, are undoubtedly gamers, making this is a very familiar medium for them. Digital learning games may be particularly helpful when teachers lack strong content knowledge and thinking, reasoning, and problem-solving skills—or need models and ideas for making learning more creative and interactive.

A number of high-quality commercial off-the-shelf games with specific educational content can deepen both student and teacher content and procedural knowledge (Civilization, Making History and Ourselves, etc.). Further, educational nonprofit organizations, such as the Center for Children and Technology at EDC, have designed educational games on behalf of the U.S. Department of Education and the U.S. Library of Congress to enhance teaching and learning in science, literacy, and history. While these games are designed explicitly for students, they also have cross-over potential as didactic tools for teachers and help to cultivate important behaviors—persistence, problem solving, and risk taking (Gee & Shaffer, 2010a)—that are as important for teachers as they are for students. Finally, digital learning games can also provide teachers with ideas for nondigital gaming scenarios, content framing, and instructional approaches that they can use in class. It is important to note that games should be one component, not the sole menu item, of a professional development program. They should also be facilitated by a skilled instructor who can help teachers persist with the game, particularly when it seems disorienting, when it becomes difficult, and when navigation issues become problematic. Skilled facilitators can also help teachers reflect on their own learning via digital learning games and discuss ways to transfer propositional knowledge, procedural skills, and ideas for creating engaging experiences to their classrooms to enhance student learning.

Other Forms of Multimedia

Widgets

Widgets are gaining increasing attention as a stand-alone multimedia tool for teacher education. Widgets reside somewhere between applications ("apps") and full-blown computer programs. A widget is a small, Web-delivered, module of content (a mini-application) that can be easily added to a webpage, social networking profile, or blog—or in some cases run as a stand-alone application on a computer. The simple interface of widgets allows users to add content and functionality easily to an LMS, blog, wiki, or website. The micro-blogging application Twitter has a number of widgets that increase its functionality.

Though nascent as a teacher training tool, widgets are sure to become more fully functional and expansive applications in the not-too-distant future. South Korea's EDUNET learning portal is widget-based so that learners can create customized "playlists" of content and media. We can soon expect to see teachers using widgets as either stand-alone tools for self-study on, say, linear equations or as collaborative, networked applications for group study. Websites such as WidgetBox[82] and Kick Apps[83] offer educationally based widgets that can be used in blogs and wikis and allow users to create their own simple widgets.

Considerations: Multimedia as a Distance Learning Tool

In contrast to multimedia as a *student* learning tool, multimedia applications have been much less used as *teacher* learning tools. Yet where used, multimedia can offer learning benefits to teachers in two ways:

- They act as direct teacher professional development tools through which teachers can enhance their content skills—particularly their ability to apply, analyze, synthesize, and evaluate content-related knowledge.
- They offer a *dual-audience, direct-instructional approach,* such as radio or television programming. Though directed toward student learning, multimedia can also allow teachers to learn content alongside their students.

Multimedia applications, if designed well, offer numerous teacher education benefits. Rich media can engage teachers on several cognitive levels and can address multiple learning styles. Multimedia applications, such as stand-alone programs and CAI, can potentially enhance and deepen teachers' content knowledge. Simulations can allow learners to participate in learning experiences that might otherwise be physically or logistically impossible and/or prohibitively expensive. A good ITS may substitute for a human tutor, assess teachers' learning, and adapt content to teachers' cognitive level. Widgets can help teachers refine content skills or engage in game-based educational play. And digital learning games can instill motivation to learn; thinking and problem-solving skills; enhanced content-based knowledge, skills and behaviors; self-regulation; and an awareness of the importance of collaboration in learning (Lieberman, 2006)—all qualities that we would hope to see not just in our students, but in our teachers.

82 See http://www.widgetbox.com/tag/education

83 See http://www.kickapps.com/

However, the broad category of multimedia is not without its drawbacks. Multimedia applications vary greatly in their design, which in turn results in qualitatively different learning experiences and levels of learning. One multimedia application may be open and exploratory in its design, while the application functions as a tool for inquiry and higher-order thinking. Another may be focused on information regurgitation, in which learning is rote and passive and the multimedia application itself merely a delivery system for fact-based, low-level thinking. This latter accusation has been leveled particularly at the "tutoring" characteristic of CAI. Though now improving, CAI is still maligned for its more didactic and binary qualities, which promote lower-order rather than higher-order thinking and do little or nothing to scaffold the metacognitive processes necessary to correct misunderstandings and arrive at a correct response.

Multimedia suffers from other drawbacks. Most multimedia applications are not available in local languages. Digital learning games may not be culturally appropriate. Teachers may have a very difficult time using software that demands problem solving, hypothesis generation, pattern seeking and extemporaneous thinking when they have never been asked to do so previously. Numerous games are marketed as learning tools that, though engaging and stimulating, offer little or nothing in the way of deep content learning. Multimedia may be seen by administrators and policymakers as frivolous games or toys and therefore not worthy to be a teacher education tool. The opposite may also be true: multimedia (for example, CAI or ITS) may be seen as a financially attractive option for teacher professional development that can eliminate the need for human facilitators and the costs and logistics associated with any larger program of professional development. While the AI that programs ITS has evolved considerably, it still cannot perform the many critical actions that human-mediated forms of distance learning can do, such as sensing emotions, comforting a troubled learner, and offering deep encouragement. Finally, though some research shows the benefits of multimedia for student (i.e., nonteacher) learning, there is also contradictory research that shows no benefits.[84]

Summary of Computer-based Multimedia Distance Learning

Figure 4.5 summarizes the role of computer-based multimedia as a distance learning tool for teacher education and lists its strengths and limitations as a mode of distance education.

84 Mayer (2001) has been referenced previously in this chapter. In contrast, Clark & Feldon (2005) refute many of Mayer's conclusions and find that commonly ascribed benefits of multimedia learning for students (e.g., their superiority over "old media," motivation, etc.) are in fact exaggerated or negligible.

Figure 4.5: Summary of Computer-based Multimedia a Distance Learning Tool

Roles in Teacher Professional Development	Strengths	Limitations
▪ Multiple media and platforms combine text, audio, video, animation, and interactivity. ▪ Teachers interact with content that is provided in a number of different formats: text, audio, animation, video, etc. ▪ It can be used for self-paced self-study or group-based collaboration or competition. ▪ It's typically used to expand teachers' content knowledge and understanding of processes associated with certain events. ▪ It can be used to help teachers think like subject-area specialists (like historians or mathematicians) to help develop content-based thinking. ▪ Dual-audience, direct-instruction approach can serve as an in-class scaffold for teachers and instructional tool for students. ▪ Professional development in applications such as *Flash* and *Director* can help teachers develop their own modest multimedia applications, resources or tools. ▪ Complement or supplement text-based instruction (See Figure 4.1: Cognitive Principles on Multimedia).	▪ It is flexible and powerful—can be used to discover new ideas, understand causality, access resources, and communicate. ▪ It may give teachers ideas about more interactive pedagogies and addressing their students' varied learning styles ▪ It provides support for collaboration—individuals, pairs, and groups of teachers or students can collaborate, especially around more complex CD-ROM applications and games. ▪ Some research demonstrates that multimedia enhances student literacy and numeracy. ▪ Games and multimedia applications can assess deep understanding, inquiry, or problem solving in the classroom. Teachers can use this information to make beneficial changes in instruction. ▪ Games, ITS, simulations and multimedia applets can help to address teachers' gaps in content knowledge.	▪ Complex software may require both time and ongoing technology training to be effective. ▪ Teacher-candidates/teachers who have not had practice in developing higher-order thinking skills as part of their teacher formation may be lost and unable to participate in multimedia learning without extensive professional development and ongoing support. ▪ Hardware, software, robust video cards, and high-speed Internet access must be available in teacher training institutions and schools. ▪ After some time, especially with more simple games and applications, users become bored as they exhaust all of its potential. ▪ "Gaming the games:" Evidence that learners figure out the software with poorly designed or more simple games, CAI or ITS, mechanics—versus truly mastering the domain of knowledge—in order to arrive at the a correct response.

Roles in Teacher Professional Development	Strengths	Limitations
▪ With programs like *Flash*, text-based content can be made more visually appealing and understandable.	▪ Depending on the design, may model higher-order thinking skills (problem solving and analysis) as well as 21st century skills (collaboration, learning and innovation skills and media and information skills). ▪ Versatile: can be Web-based, displayed on mobile devices or portable gaming systems, or as stand-alone applications. ▪ May be used to teach content to students in areas where teachers' knowledge about that particular content topic is weak.	▪ The best software, applications and games are commercially produced and may be expensive, not culturally appropriate and involve use of English. ▪ Discrimination is a must—there is a lot of really poor educational software on the market. ▪ Games, CD-ROMs, etc. may not be aligned with teacher training standards or curriculum standards.

Chapter 5: Established Web-based Models for Distance Learning

Overview

One of the fastest-evolving modes of distance education is Web-based or online learning (also referred to as *virtual learning* or *e-learning*). This mode is expanding in nations such as the United States, South Korea, Singapore, Japan, Canada, Australia, New Zealand, and much of Europe—countries where high-speed broadband access is prevalent, school or home Internet access rates are high, and technology skills are broadly disseminated. It is also expanding more and more even in countries where the above prerequisites are largely absent. Indeed, in many parts of the globe, online learning *equals* distance education.

The potential of online learning rests on its ability to do the following:

» Deliver *multichannel instruction* encompassing print, audio, visual, and video-based content
» Provide multiple formats for text-based, audio, and video-enabled *real-time communication and collaboration* with peers across the globe
» Offer *"anytime, anyplace" learning*, provided learners have access to the Internet

Capitalizing on the World Wide Web to enhance their outreach and customer base, many teacher training colleges and universities have refashioned themselves from "single-mode" to "dual-mode" institutions by developing online teacher education programs that deliver content, instruction, and interaction with a community of peers.

Because of the protean nature of the World Wide Web, the boundaries between categories of Web-based models of distance education are more fluid and offer a range of professional development opportunities that are extensive, wide ranging, and often overwhelming. A teacher in Belize may participate in an online course through the University of Belize's online teacher training program and afterwards sign up for a listserver or e-list discussion about teaching children with special needs via the University of Buffalo's Assistive Technology Training Online Project.[85] But her Web-based learning may not end there: she may participate in monthly webinars offered by a teacher education program in Australia; participate in free online learning through Sophia's[86] "learning packets;" find and download free assistive technologies from Scotland's Regional Support Center Northeast;[87] join a special education teacher network within Facebook; buff up her content knowledge through interaction with online Java math applets and simulations; participate in self-paced online tutorials at the University of Toronto's Adaptive Technology Resource Center;[88] browse other special education activities in any number of national education portals; co-develop a math activity with a teacher in Panamá via a wiki; download videos of special education classrooms via the free video player, Miro;[89] receive tweets from her personal learning network; and send and receive

85 See http://atto.buffalo.edu/

86 See http://www.sophia.org

87 See http://www.rsc-ne-scotland.ac.uk/eduapps/

88 See http://atrc.utoronto.ca/index.php?option=com_content&task=view&id=23&Itemid=48

89 See http://www.getmiro.com/

live updates about inclusion strategies on her cell phone via Push.ly[90] from the United Kingdom's Joint Information Systems Committee.[91] With reliable and robust Internet access, teachers can interact with a host of global resources and peers in a multitude of formats and in ways that are simply not possible with any other technology or any other form of distance learning.

As the above paragraph demonstrates, Web-based approaches to teacher learning encompass a number of practices. They include not only computer-mediated communication (such as e-mail, e-lists, and bulletin board systems) and self-paced or cohort-based online courses but also online tutorials, online communities, e-mentoring, webinars, webcasts, and telecollaboration and teleresearch projects—as well as virtual schools that foster content-based creation and collaboration with virtual professional learning communities. We will explore all of these elements at varying length in this chapter. As we do so, it is important to be mindful that many of these forms of e-learning, despite their attractiveness, are still evolving. As such they have yet to establish a track record, and they lack the research base of other forms of distance education, such as IRI, and face-to-face teacher professional development.

Because the Internet has colonized and consolidated so many other forms of distance education, serving as a single conduit for "established" modes of distance education (e.g., print, audio, multimedia, and video), as well as previously unimagined modes (e.g., immersive environments and social media), information on Web-based teacher professional development is organized into two chapters in this guide. This chapter focuses on current, or established, models of Web-based professional development: online courses, computer-mediated communication, virtual (cyber) schools, portals, webinars and webcasts, and online coaching and mentoring.

Chapter 6 explores some of the newer developments in Web-based technologies, such as immersive environments and Web 2.0 applications, many of which are beginning to gain recognition as teacher professional development tools.

What Is Online Learning?

As figure 5.1 demonstrates, online or Web-based professional development does not follow one template but rather encompasses a continuum of practices, centered primarily on the amount of content and interaction with the facilitator that is offered both on- and offline.

90 See http://push.ly/

91 See http://www.jisc.ac.uk/

Figure 5.1: Classification of online learning (Sloan Consortium, 2008)

Proportion of content delivered online	Type of course	Description
0%	Traditional	▪ Course uses no online technology. ▪ Content is delivered in written, oral, or audiovisual format.
1–29%	Web-facilitated	▪ Course uses Web-based technology to facilitate what is essentially a face-to-face course. ▪ Course might use LMS to post syllabus and assignments.
30–79%	Blended/hybrid	▪ Course blends online and face-to-face settings. ▪ Substantial proportion of the content is delivered online. ▪ Course typically uses online discussions and has some face-to-face meetings.
80+%	Online	▪ Course delivers the vast bulk of content online. ▪ Course typically has no face-to-face meetings.

Using the classification system of the Sloan Consortium (2008), an online course offers the vast majority (above 80 percent) of its content and interactions via the Internet. "Blended" or "hybrid" courses offer between 30 and 79 percent of their content and interactions online, though a substantial component of learning occurs in face-to-face settings. Examples of online and blended teacher training programs are explored below momentarily. Finally, "Web-facilitated" courses have some online learning component, but the majority of their interactions are face-to-face. An example of a Web-facilitated teacher education program might be any number of the teacher education offerings of many Asian open universities (for example, IGNOU), where some content is placed online but most learning is place- and time-bound with an instructor and students. Indonesia's HYLITE program, a hybrid distance learning/summer residential program that focuses on upgrading teachers' qualifications, is another example of a Web-facilitated program. It places some content online and uses e-mail, Web conferencing, and bulletin boards, but the vast majority of instruction occurs in face-to-face settings.

Why Online Learning?

There are multiple motivations for using online learning. The first is as a *replacement* for face-to-face instruction, particularly in cases where the latter is too costly or is logistically impossible to carry out successfully. The key measure here is *equivalence:* If learner outcomes are the same whether a course is taken online or face-to-face, then online instruction is considered "successful" (Means, Toyama, Murphy, Bakia, & Jones, 2009: 3). In this regard, online learning has proved to be a cost-effective intervention when too few learners are situated in a particular geographic locale to warrant an on-site instructor.

A second motivation for online learning is as an *enhancement* of the face-to-face learning experience (i.e., online learning activities that are part of a face-to-face professional learning experience). As an enhancement activity, Web-based learning should produce outcomes that are not simply equivalent, but measurably *superior to* those resulting from face-to-face instruction alone (Means et al. 2009). If this improvement occurs, online learning as an enhancement application may be worth the additional time and resources. If not, it may be a waste of time and money, since its addition does not improve learning outcomes.

These are the two major motivations that drive policymakers and institutions to develop online learning possibilities; however, several other motivations should drive adoption of online learning, one of which is *accessibility*. "Accessibility" here has several meanings. The Internet provides access to experiences, resources, and interpersonal professional interactions that would be impossible in a non-networked environment. Online learning should also be considered successful if it provides opportunities for learning that would *otherwise be unavailable*. Further, the Internet's appropriation and blending of other forms of distance technologies means that online learning is potentially the most diverse and multimodal form of teacher distance education, and as such has the ability to target more learning styles and preferences successfully than any other mode of distance education.

As Capper (2003) notes, online learning offers access in multiple ways:

- **Providing access to continuous learning.** Online courses can provide teachers with "anytime, anyplace" access to sustained and ongoing learning, for example, ongoing access to follow-up support to help teachers implement innovations in their classrooms. This access is particularly valuable for traditionally underserved groups and teachers in remote geographical areas, where face-to-face professional development would be impossible.
- **Broadening access to instructional practices.** Through Web-based video, webcasts, and webinars, teachers can observe different instructional styles in classrooms that are similar to and different from their own. Online professional development can provide the type of "flexible access to experts and archival resources" (Dede, Breit, Ketelhut, McCloskey, & Whitehouse, 2005: 1) that would otherwise be impossible without electronic communications.
- **Addressing teachers' content knowledge.** Teacher lesson plan sites, teacher wikis, numerous "ask an expert" sites (such as *Ask a Volcanologist*,[92] *Ask Dr. Math*[93]), telementoring projects, and the abundance of all resources and information available on the World Wide Web can help teachers broaden, deepen, and refine content knowledge.
- **Providing access to curriculum and content supports.** Internet educational portals, e-mail, e-lists, blogs, wikis, and educational websites can provide teachers with access to a broad array of ideas, teaching and learning resources, and tools (see figure 5.2 for the distinction between digital resources and cognitive tools.)

92 See http://www.soest.hawaii.edu/GG/ASK/volcanoes.html

93 See http://mathforum.org/dr/math/

Figure 5.2: Digital Resources Versus Cognitive Tools (Songer, 2007: 475–480)

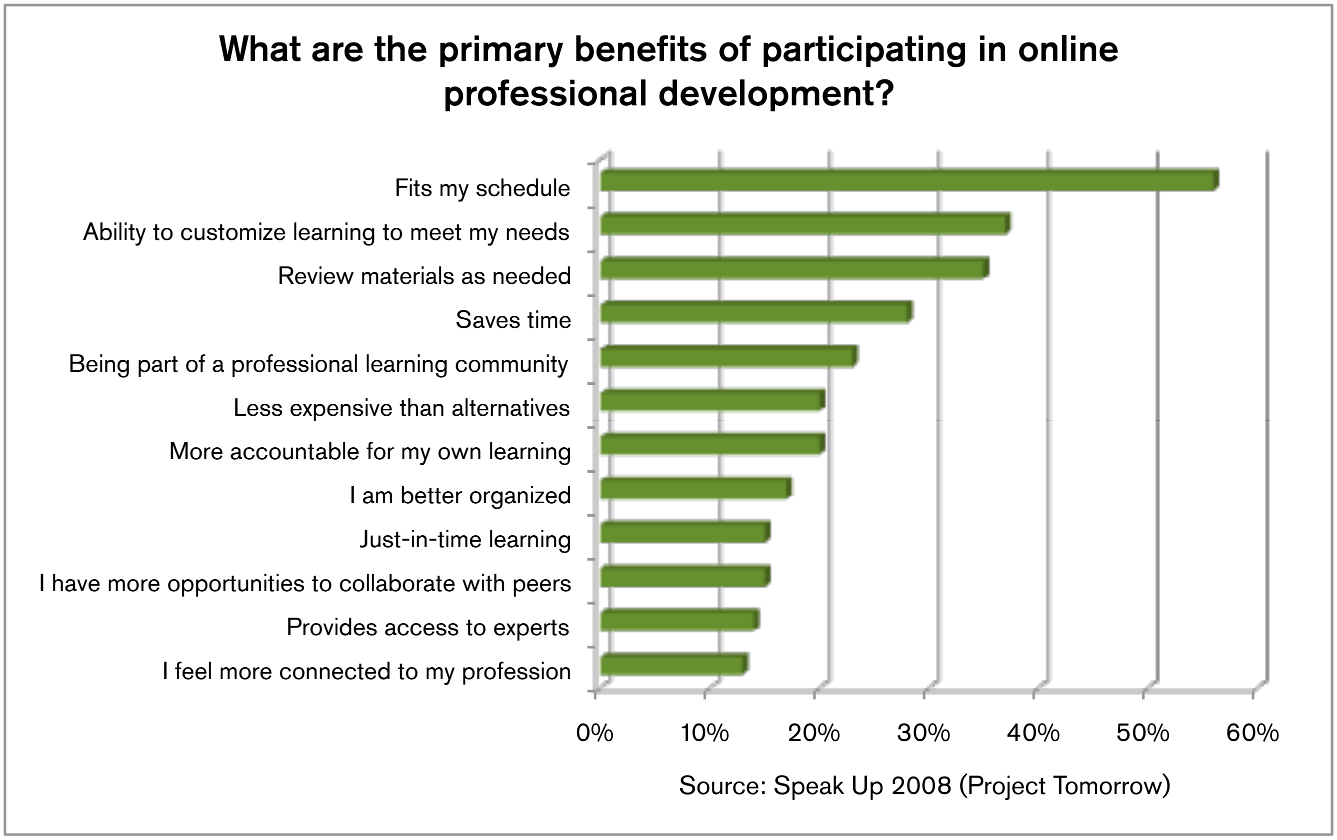
Traits	Digital Resources	Cognitive Tools
Definition	▪ Digital information sources (text, pictures, simulations, multimedia) contain facts, perspectives, or information on a topic of interest.	▪ Digital information sources or resources present focused information specifically tailored for specific learning outcomes.
Audience	▪ These are designed for a general audience to serve a range of possible roles.	▪ These are designed for a specific audience focused on a particular knowledge objective.
Learning activities	▪ These do not specify how the resource should be used for learning—they may be used for a range of purposes.	▪ These are designed to achieve a specific learning goal (for instance, gathering data, data analysis) that is articulated with learning standards.
Learning performance	▪ These do not specify the kinds of products learners produce as a result of working with the digital resource.	▪ Products produced by cognitive tools can be examined and evaluated and compared with original predictions about audience and learning goals.
Determinations	▪ Since audience, activities, and performances are not articulated, there are no clean comparisons of goals, activities, and products to determine relative learning success.	▪ Empirical evidence can be gathered on the degree to which intended learning objectives are demonstrated by actual outcomes, serving as empirical evidence about the effectiveness of the resource.

» **Promoting reflection and dialogue.** Through the use of e-mail, blogs, e-lists, bulletin boards, chats, wikis, user groups, online discussion groups, and Voice over Internet Protocol (VoIP), teachers can engage in "reflective, analytic learning activities and discussions around specific teaching attributes and practices." (Capper, 2003: 2) By using these tools to communicate with peers, teachers create an automatic archived body of knowledge that may be accessed by others. And by communicating and collaborating on an ongoing basis with a group of online colleagues, teachers can begin to develop online communities of learning and online communities of practice.

» **Serving as a tool to model good instructional practices.** The process of learning how to use the Internet and how to integrate Web-based content and experiences into a particular subject area can be combined with learner-centered instructional approaches so that the computer in general and the Internet in particular serve as tools to promote new ways of teaching and learning.

A fourth motivation for online learning lies in its *popularity,* an attribute that should not be discounted. Professional development, for a variety of reasons, is often a tough sell to teachers. Where online learning is offered, it is extremely popular, as seen by the increase in its supply and demand rates. Motivation is an important ingredient in willingness to engage in, and complete, formal learning opportunities. As figure 5.3 demonstrates, U.S. teachers, for instance, like the "anytime/anyplace/any pace" and customizable nature of online learning. In South Korea, where the vast majority of professional development is offered online, a survey of 380,000 teachers who took in-service online courses generally praised the "high quality" of online offerings (Latchem & Jung, 2010).

Figure 5.3: U.S. Teachers' Perception of Benefits of Online Professional Development (Project Tomorrow, 2008)



We now turn to examining modes and models of current e-learning/virtual learning/online learning for teacher education.

Online Courses

Online or Web-based professional development has emerged as an attractive and successful alternative to face-to-face professional development. Indeed, in countries such as South Korea and, increasingly, Singapore, online learning is *the* major form of teacher in-service and continuing education.

Online or Web-based teacher training has been used extensively throughout the globe, mainly in countries that have very good broadband access, high penetration of or access to personal computers, and a critical mass of computer-literate teacher instructors and teachers.

Many universities offer all teacher preparation and education courses online. Examples of these single-mode, online (virtual) universities include Western Governors' University,[94] the University of Phoenix,[95] and Britain's Open University[96]—the latter an early pioneer in distance education that has increasingly shifted its diverse portfolio of education courses to a Web-based format.

Online *courses* are distinct from other types of Web-based distance education in that they typically involve enrollment in a course; registration and payment of tuition and fees at the institution that offers the course; a structured pathway through learning resources and experiences; direction from an online instructor (or "facilitator"); course completion requirements (exams, lesson plans, projects); and periodic assessment. Some online courses are self-paced, some are group- or cohort-based, and some are individually-based. Some have instructors, while others do not.

Online or Web-based courses have become a staple for in-service upgrading of teacher skills or continuing professional development. Online courses can address specific curricula and groups of teachers. They can help teachers build understanding of general pedagogical concepts and techniques, like the courses Harvard University's WIDE World program[97] offers to teachers in Kuwait, Jordan, and Saudi Arabia. They can help to build online professional development capacity, like EdTech Leaders Online (ETLO),[98] which trains educators to facilitate online and virtual-school professional development and create their own online and virtual-school courses. They can help to certify or burnish teachers' content skills, like PBS TeacherLine.[99] In all of these examples, 100 percent of the course content, instruction, interaction, and assessment occurs via the World Wide Web—through LMSs such as Moodle,[100] via e-mail and chat, and through webinars and webcasts.

Research on online learning is still thin and inconclusive, often focusing on online learning versus face-to-face instruction (Dede et al., 2005a). This approach, however, is beginning to change. For instance, research (O'Dwyer, Masters, Dash, DeKramer, Humez, & Russell, 2010) on EDC's ETLO program revealed that teachers who participated in three online content courses (90 hours) over 15 months demonstrated higher scores on measures of instructional practices for writing and vocabulary than teachers in the control group. Grade 5 math teachers who participated in online learning had, on average, higher scores on measures of instructional practices for algebraic thinking, fractions, and measurement than teachers in the control group. Grade 8 math teachers in the treatment group demonstrated higher scores on measures of instructional practices for proportional reasoning and geometric measurement. More important, students assigned to teachers in the treatment group had higher knowledge scores on exams (O'Dwyer et al., 2010: 6).

94 See https://www.wgu.edu/

95 See http://www.phoenix.edu/

96 See http://www.open.ac.uk/

97 See http://wideworld.pz.harvard.edu/

98 See http://www.edtechleaders.org/

99 See http://www.pbs.org/teacherline/

100 See http://www.moodle.org

However, research on online and blended learning, which we discuss below, has a long way to go. As of yet, there has been little rigorous content or discourse analysis of online posts and discussions and analysis of back-end data from LMSs. The data gleaned from both types of analyses could be blended with other metrics, such as learner assessment data, to paint a more vivid picture of the strengths and weaknesses of online learning.

Blended Learning

Blended or hybrid learning involves a blend of face-to-face and online instruction—from 30 to79 percent of the latter (see figure 5.1). As online learning has increased in popularity, so too have blended learning programs and "dual-mode" institutions, as many formerly exclusively face-to-face programs for teacher pre- and in-service professional development offer an online component.

Dual-mode universities are those that allow teacher candidates to learn the craft of teaching online as well as in person. Examples of these universities include the Tecnólogico de Monterrey,[101] which provides bachelor's and master's education degrees in both on-campus settings and through its Virtual University. Similarly, the University of the West Indies[102] offers teaching degrees at each of its three campuses (Jamaica, Trinidad, and Barbados) and increasingly through its Distance Education Centre.

Figure 5.4: Models of Blended Learning (Horn & Staker, 2011)

Models of Blended Learning

There is not one model of blended learning but several. Horn & Staker (2011) identify six models of blended learning that institutions can employ:

1. Face-to-Face Driver Model: The face-to-face teacher delivers most of the curriculum and uses online materials to supplement. This model often occurs in a computer lab.
2. Rotation Model: Students rotate equally between face-to-face and online components of the course on a fixed schedule. They have the same teacher for each component. The online component occurs remotely.
3. Flex Model: The online component delivers most of the information, with an in-class teacher present to provide flexible support as needed. This model includes lots of individual and small-group, face-to-face tutoring.
4. Online Lab Model: The online teacher delivers the course in a brick-and-mortar classroom, but with paraprofessional or teacher aides supervising students.
5. Self-blend Model: Individual students take online courses à la carte. Online learning is remote, but traditional instruction is brick-and-mortar.
6. Online Platform Model: Instruction and materials are all online, with students taking the course remotely. Weekly check-ins with a face-to-face supervisor or teacher are required.

101 See http://www.itesm.edu

102 See http://www.uwi.edu

There are numerous examples of blended learning approaches for teacher professional development across the globe. One example of a blended learning in-service teacher education program is Enhancing Missouri's Instructional Networked Teaching Strategies (eMINTS),[103] a U.S.-originated teacher professional development program that helps teachers integrate technology to support learner-centered instruction. Originally a face-to-face program, eMINTS now offers professional development to teachers in the United States and Australia using a combination of face-to-face and Web-based instruction. In the Maldives, teachers participate in blended professional development at local teacher resource centers, where online and interactive content is presented to groups of teachers via an IWB (PricewaterhouseCoopers, 2010).

A third example is EDC's online coaching/one-computer pilot program that took place in Indonesia as a component of the USAID-funded DBE 2 project. The program had two goals. One was to help teachers integrate one computer in learner-centered ways with their 40 to 50 students. The second was to build systemwide teacher support capacity by creating a cadre of school-based coaches who can help teachers implement technology-based and instructionally based innovations in their classrooms.

The program was largely a response to the challenges that beset cascade/train-the-trainer approaches in assuring quality implementation of innovations in the classroom. In this blended approach, Indonesian educators (content area supervisors and general supervisors) received two weeks of face-to-face instruction in coaching techniques, for example, conducting classroom observations. They were then assigned in pairs to a school, where they spent four months helping teachers integrate four models of one-computer, learner-centered activities into their classrooms.

To help coaches in this endeavor, they participated in a 10-session, 21-week online learning course, Strategies and Techniques of School-based Coaching.[104] The coach learned a particular strategy and, together with his or her school-based coaching partner, applied this coaching technique with teachers. Examples include holding productive meetings, helping teachers design a lesson plan, co-teaching a one-computer classroom activity with teachers, and observing and providing feedback to teachers.

To determine which mode of distance learning best suited the development of coaching skills and teacher use of technology, EDC created three models of Web-based learning: a purely online version (100 percent of interaction and instruction online), a blended version (50 percent of interaction and instruction online), and a Web-facilitated version (25 percent of interaction and instruction online). Teachers in the Web-facilitated version did far better than their colleagues in either the hybrid or online program in measures of their knowledge of craft and expressed greater confidence in using technology. Similarly, teachers who participated in the blended approach (online learning and face-to-face, school-based coaching) reported higher levels of technology proficiency, better understanding of learner-centered methodologies, and greater confidence in integrating one computer into the classroom than did teachers who participated in the purely online approach (Ho & Burns, 2010).

103 See http://www.emints.org

104 See http://ptk-online.org

A recent U.S. Department of Education meta-analysis (Means et al., 2009) found that instruction combining both face-to-face and online learning elements produces greater impact than instruction that uses one or the other of these modes.[105] The study's authors note that the observed advantage for blended learning conditions is not necessarily rooted in the media used per se, but rather reflective of differences in content, pedagogy, and learning time. Other research (Zhao, Lei, Lai, & Tans, 2005) has also found that hybrid learning may actually provide a qualitatively superior form of professional development than either online or face-to-face learning alone.

The third category of Web-based learning is Web-facilitated learning, in which a small percentage of instruction (25 percent or less) occurs via Web-based means. This is still a major form of Web-based learning among many Asian open universities, often using computer-mediated communication. Since it has been briefly discussed earlier in this chapter, we now turn to other forms of established, Web-based professional development.

Computer-Mediated Communication

Computer-mediated communication (CMC) includes forums, discussion groups, e-lists, e-mail, bulletin boards, and groupware (e.g., First Class) tools that facilitate online, asynchronous, text-based communication. CMCs can be a component of or separate from online courses and other forms of Web-based learning. Because they need relatively little bandwidth, CMCs are commonly used in Web-based distance education programs for teachers in many Asian and African open universities and in other low-bandwidth environments. They are often used for sharing content and group work in cases where each group has its own discussion board within an LMS or bulletin board system for the purposes of exchanging ideas and communicating. Results and presentations can later be posted at a general resource center to which all students have access.

CMCs can be a useful tool to create a learning environment in which student-teachers not only communicate with the lecturer but also with one another. Teacher-learners can ask questions; add links; or post documents on a bulletin board, discussion forum, or e-list; and a lecturer can respond, thereby making his or her answer available to everyone. Topics and learning objectives can be discussed over longer periods, beyond the traditional one-hour class, enabling more in-depth discussions (Teng & Allen, 2005). However, discussion forums need strong facilitation and organization from the lecturer in order to push teachers to question their assumptions and values, critically reflect on their own practice, and question and critique the practices and beliefs of their online colleagues.

Additionally, CMC models such as e-lists, groupware, discussion forums, e-mail, and bulletin boards are still an integral part of e-learning. They are often used in place of LMSs, such as Blackboard and Moodle, because of cost or connectivity issues, or because teachers are unfamiliar with LMSs. For example, many

105 **From the report:** "Learning outcomes for students who engaged in online learning exceeded those of students receiving face-to-face instruction, with an average effect size of +0.24 favoring online conditions. The mean difference between online and face-to-face conditions across the 51 studies is statistically significant at the $p < .01$ level. Interpretations of this result, however, should take into consideration the fact that online and face-to-face conditions generally differed on multiple dimensions, including the amount of time that learners spent on task. The advantages observed for online learning conditions therefore may be the product of aspects of those treatment conditions other than the instructional delivery medium per se."

Asian open universities with online components, such as IGNOU or UT, and "television universities," such as Shanghai's, continue to use e-mail and bulletin board systems as main modes of communication and content sharing.

CMCs suffer from many of the afflictions of online communication. They have variable rates of use. Roughly one-third never use them, one-third use but don't contribute, and one-third contribute to online discussions. Their asynchronous nature means that learners don't receive immediate responses. Consequently, discussions and learning may lag, and participants may become discouraged and stop posting if too much time elapses between online posts. Effective bulletin boards, e-lists, and discussion forums demand more time from both online instructors and learners (Moon, Leach, & Stevens, 2005; Teng & Allen, 2005). And now, given the abundance of VoIP programs such as Skype, chat, video chat, and online conferencing applications—and a generation of young people who are not only fluent in their use but who have rejected asynchronous communication such as e-mail in favor of synchronous communication like instant messaging and texting—text-based communications tools may seem quaint and antiquated.

Figure 5.5: Coaching Versus Mentoring (Killion & Harrison, 2006)

Both coaching and mentoring are recognized as essential ingredients in human resource development. Although the two terms have often been used synonymously, they are in fact quite distinct.

Coaching is a method of directing, instructing, and training a person or group of people to achieve a particular goal or to develop a set of specific skills. Within education, coaches have a number of roles—including classroom supporters, resource providers, facilitators, catalysts for change, or instructional coaches. Unlike a mentor (see below), a coach may be a peer or have equal or less experience than the person he or she is coaching. Coaching involves a number of tasks, but a coach's main job is to empower the teacher in terms of a particular set of knowledge and skills. Coaches do not act as teachers' aides, evaluate teachers, work as substitute teachers, or do individual student assessments.

Mentoring, on the other hand, involves a developmental relationship between a more experienced professional and a less experienced partner and usually involves being available to give advice. Typically, mentors are established and seasoned professionals charged with the task of helping to train, advise, and share practical experience with a person who is new to an organization or field. They share their body of experience, impart knowledge, offer wisdom, and generally help novices (referred to as protégés or mentees) learn the ropes.

If a coach has more expertise and experience than a teacher, he or she can also act as a teacher mentor. While mentors and coaches often use the same techniques of modeling, inquiry, and reflection with their charges, mentoring is not the same as coaching. A coach need not have specific expertise and experience in the same field as the person receiving the coaching in order to provide quality coaching. In contrast, mentors should.

For more about coaching and mentoring in a teacher support role, see "Chapter 17: Supporting Distance Learners."

However, the greatest benefit of CMCs is that they promote a social context for group learning and facilitate the creation of a social learning environment that enhances learners' understanding beyond what they could achieve individually (Stacey, 1998). CMCs also mimic many of the forms and conventions of written communications—the e-mail as a letter and the electronic bulletin board as a physical bulletin board on which one can ask a question or make a request. They may employ and reflect the written conventions with which many teachers may be familiar. Further, Salmon (2000) states that structured and sustained involvement in, and commitment to, CMCs increases the sophistication of interactions and learning outcomes as learners move from accessing materials to online socialization, information exchange, knowledge construction, and ultimately development of materials.

Online Coaching and Mentoring

Coaching and mentoring are critical determinants of teacher retention and teacher quality (Fulton, Burns, & Goldenberg, 2005). The differences between the terms "coaching" and "mentoring" are outlined in figure 5.5. In a mentoring model, older or more experienced teachers guide and assist younger or novice teachers in all areas of teaching via Web-based communication such as e-mail, chat, VoIP, and forums. This can be either a one-on-one or a many-to-many, team-based approach. Mentoring is popular among experienced teachers because it acknowledges and builds upon their experiences, it is popular among novice teachers because it reduces the isolation of teaching, and it is embraced by school leaders because it reduces teacher attrition rates (Fulton et al., 2005). As mentioned earlier in this chapter, EDC's Strategies and Techniques for School-based Coaching offered online mentoring for learners while also helping Indonesian supervisors become school-based coaches. Online coaching and mentoring is an increasingly common form of Web-based professional development, particularly for novice teachers. The U.S. state of North Carolina includes in-service online coaching for teachers as part of its New Schools Project.[106]

Mentoring programs can be part of pre-service teacher training programs, such as the WINGS program at the University of Texas,[107] or part of in-service teacher education and support, as in the case of Teachers Learning in Networked Communities,[108] a mentoring program designed by the National Commission on Teaching and America's Future (NCTAF)[109] and funded in part by Microsoft.

Coaching and mentoring will be discussed at greater length as forms of teacher support in "Chapter 17: Supporting Distance Learners."

Virtual Schools

Virtual schools, also called cyber schools, are one of the fastest-growing subsets of Web-based learning for students and teachers. These schools are full-time online learning programs in which learners enroll and receive credit. As in brick-and-mortar schools, students must fulfill all course requirements, complete

106 See http://newschoolsproject.org/

107 See https://uteach.utexas.edu/go/wings/Mentor-Development/

108 See http://tlinc.wordpress.com/

109 See http://www.nctaf.org

assigned readings, participate in discussions, turn in assignments, and take tests—all online. Teachers design content, communicate with students, provide lectures, answer questions, check for understanding, grade projects, and assign grades—also all online. Virtual high schools have proliferated throughout the United States, with 38[110] states now offering some form of virtual high school and 45 providing significant supplemental or full-time online learning programs in which students take most or all of their courses online. One of the oldest and most successful of these in the United States is the Florida Virtual High School.[111] Open universities, virtual high schools, and virtual universities such as Western Governor's University,[112] the Hong Kong Open University[113] and México's Tecnológico de Monterrey's Virtual University are all "virtual" versions of physical universities.

The Tecnológico de Monterrey's Virtual University is one of the earliest and most successful virtual universities for teacher training. It uses both satellite and online learning to deliver training to 25,000 teachers in México and 10 Latin American countries. The 260-hour teaching certificate program consists of 13 courses covering educational technology, education psychology, development of critical and creative thinking, problem solving, curriculum design and planning, classroom assessment, and so on. Courses involve students in online group projects and provide substantial opportunities for online communication with peers and education faculty. This virtual university has also developed online training programs for school principals.

Figure 5.6: Asynchronous Versus Synchronous Instruction

Asynchronous instruction occurs when the student is not receiving instruction as the teacher delivers it. It usually occurs through a course management system, e-mail, or discussion group.

Synchronous instruction, on the other hand, occurs as the teacher is delivering it. Because it happens in real time, it more closely resembles the learning experiences students have in a brick-and-mortar classroom. This type of instruction usually takes place via chat or VoIP and can also occur via social networking sites.

There is an important distinction to be drawn between the open universities of Asia and Africa, which might be considered virtual schools, and the term "virtual school" as used in American and European contexts. While virtual schools are in all contexts full-time, open-enrollment, degree-granting online institutions, in countries such as the United States, Europe, and México they often offer synchronous and cohort-based instruction. Because learners may follow a semester or term schedule, and because they interact and work closely with a group of online classmates, programs at these virtual schools are typically not self-paced (Watson, Murin, Vashaw, Gemin, & Rapp, 2010).

There are numerous types of virtual schools. An *off-site virtual learning* model means that students access online educational material, content, and courses from a location of their choice (home, Internet café, etc.). This system works well for learners who are self-directed and can learn without supervision. *On-site* virtual schools operate as "schools within a school." Students attend a physical structure but take their academic

110 As of 2010.

111 See http://www.flvs.net/

112 See http://www.wgu.edu/

113 See http://www.ouhk.edu.hk/

coursework online, for example in a computer lab. *Third-place virtual schools* are based at a separate nonuniversity facility, such as a community center. These sites typically have a proctor or teacher to help monitor students in their online work (Hassell & Terrell, 2004: 5). This model best serves students who need structure and who may struggle with certain aspects of online learning.

In contrast to virtual schools, *virtual classes* may be part of either an online or brick-and-mortar institution. These typically follow the open-university model, since they are often individualized courses offering greater interaction with an online instructor and less or no interaction with online classmates. As such, instruction is synchronous and self-paced (Watson et al., 2010). Virtual classes may be either full-time or supplementary programs directed toward a degree or taken for continuing education credit or even enrichment. The Cyber Teacher Training Center in South Korea offers self-directed, self-paced, Web-based courses for primary and secondary school teachers. Online tutorials are also offered, with some courses requiring occasional face-to-face meetings (Jung, 2002).

However, a second variation of virtual classes uses a dual-audience, direct-instruction approach that focuses on educating teachers and students simultaneously. In the United States, the Louisiana Algebra I Online project, a part of the Louisiana Virtual School, uses technology to provide online Algebra I courses to students in rural Louisiana who lack qualified Algebra I teachers.[114] Students interact primarily with an online teacher and are monitored in class by a teacher who may or may not be certified in mathematics. Students communicate with their online teacher via e-mail and the LMS Blackboard and use the Internet, digital tablets, and graphing calculators. As they are doing so, an in-class, uncertified algebra teacher monitors their work. In addition to instructing students, the online teacher coordinates lessons with and provides guidance to the in-class teacher, so that he or she can provide help to students as needed. In state-level exams, online Algebra I students have performed as well or better than their peers in face-to-face Algebra I classes. However, interviews with teachers[115] and other research also suggest that the online Algebra I classes have improved both content knowledge and instruction for teachers and have helped to support uncertified teachers' efforts toward mathematics certification (Kleiman & Carey, 2005). Though this program is geared toward students, it is also an example of just-in-time in-class professional development and support for teachers.

Louisiana's Algebra I program is validated by fairly rigorous research. The same cannot be said at this point for virtual schools in general, though several long-term, rigorous research and evaluation programs of virtual schools in the United States, commissioned by the U.S. Department of Education, are presently under way.

Online Tutoring and "Schools of One"

Another, more individually focused model of online learning is virtual or online tutoring. In a virtual tutoring arrangement, individual learners interact with an individual tutor in a one-to-one relationship. Online tutoring is particularly common in Asia to give students an edge in exams, help them compete

114 Illustrating the blurring of distinctions among modes of distance education delivery, the Louisiana Virtual Algebra I program may be equally defined as an online lab model blended learning approach (See figure 5.4).

115 The author participated in the interviewing process.

for places in international universities, or compensate for the deficiencies of the existing education system. With the exception of South Korea, whose tutoring programs are government-funded and free to all students, many tutoring programs involve payment of tuition to commercial entities such as Kaplan. In West Bengal, India, InTuition provides online teachers from 6:00 a.m.to 10:00 a.m. to tutor class 9–12 students in all subjects. Teachers interact with students via chat and Web cameras. InTuition is presently developing online labs for physics, chemistry, and biology that will be broadcast online (PricewaterhouseCoopers, 2010).

A recent form of online learning, initially piloted in New York City and confined for the time being to students, is the School of One model, a public-private partnership between New York City public schools and the Gates Foundation. The program breaks down the classroom into individualized computer workstations in which students learn by interacting with personalized lesson plans (online and offline materials and content) and personalized instructional plans, which are generated through algorithms that create a "play list" of learning material adapted to student performance. Though evaluation results are mixed, the approach has gathered an enormous amount of attention in the United States as a means of differentiating and individualizing instruction, especially for at-risk learners.

In keeping with the "school of one" theme, a number of learning platforms, for example, Time to Know, provide interactive core curricula targeted toward students in particular grades (standards/classes) and content areas. These individualized learning platforms also provide collaborative tools designed to support group activities and discussions, various summative and formative assessment capabilities, interactive lesson planning with content previews, and a range of real-time classroom management utilities. It is not a huge stretch of the imagination to envision these individual models adapted and applied to teacher pre-service and in-service education.

Figure 5.7: Individualized, Personalized, and Differentiated Instruction (U.S. Department of Education 2010)

One of the major rationales for online learning is that it can offer individualized, personalized and differentiated instruction to learners. The U.S. National Educational Technology Plan distinguishes between these three terms:

Individualization refers to instruction that is paced to the learning needs of different learners. Learning goals are the same for all students, but students can progress through the material at different speeds according to their learning needs. For example, students might take longer to progress through a given topic, skip topics that cover information they already know, or repeat with which they need more help.

Differentiation refers to instruction that is tailored to the learning preferences of different learners. Learning goals are the same for all students, but the method or approach of instruction varies according to the preferences of each student or what research has found works best for students like them.

Personalization refers to instruction that is paced to learning needs, tailored to learning preferences, and tailored to the specific interests of different learners. In an environment that is fully personalized, the learning objectives and content as well as the method and pace may all vary (so personalization encompasses differentiation and individualization). (p. 28)

Teleresearch and Telecollaboration

While most forms of professional development still largely involve learning that happens to teachers outside the classroom, equally effective forms of teacher professional development involve helping teachers learn technology-based instructional design methods to create projects that they implement with their students. One such example involves teachers designing teleresearch and telecollaboration projects.

The Internet is still used predominantly in one of three ways: as a tool for research (searching for information), as a communication/collaboration tool, and as a creation tool. Capitalizing on this dominant pattern of Internet use, Harris (1998) designed the concept of "activity structures," a form of instructional design that helps teachers use the Internet to design and carry out Internet-based activities with students. As figure 5.8 outlines, activity structures are patterns and structures of Internet use that can support the generation of customizable, Internet-related teaching activities. Information collection activities are a form of teleresearch. Problem-solving activities are a form of telecollaboration. Interpersonal exchanges are a form of telecommunication, combining elements of both teleresearch and telecollaboration.

Figure 5.8: Internet Activity Structures (Harris, 1998)

	Interpersonal Exchanges
1. Key pals	▪ The first and most popular type of interpersonal exchange, key pals involves facilitating communication between individuals who attend different schools or who live in different regions.
2. Global classrooms	▪ Short- or long-term interaction takes place between groups, usually in two or more classrooms, based on a topic.
3. Electronic appearances	▪ Authors, scientists, or other professionals appear online to answer student questions or participate in discussion relevant to their own professional lives. ▪ These activities differ from electronic mentoring, in that they are usually restricted to very brief time frames.
4. Electronic mentoring	▪ Like electronic appearances, these, however, occur with subject area specialists for longer periods.
5. Question-and-answer services	▪ These provide short-lived communication via which students ask an expert about a particular topic.
6. Impersonations	▪ This type of electronic appearance is characterized by the presence of an individual who plays the role of a literary or historical character.

	Information Collection Activities
1. Information exchanges	▪ Students share information such as book reviews, favorite quotations, local weather conditions, recipes, etc.
2. Database creations	▪ Students construct a database of information, to be shared with students in other local or international schools.
3. Electronic publishing	▪ Students create an online publication, such as a newspaper, literary magazine, or electronic journal.
4. Tele-field trips	▪ Students electronically “tag along” with other individuals currently visiting other places. ▪ Students participate in the activity by e-mailing expedition members questions and by taking part in activities or experiments related to the project.
5. Pooled data analysis	▪ Students receive information from classes around the world, analyze it—looking for patterns, similarities, or differences—and then report their findings.
	Problem-solving Projects
1. Information searches	▪ Students are presented with a problem and clues to help solve it.
2. Peer feedback activities	▪ Students publish work online, and other students or subject-area experts provide constructive criticism.
3. Parallel problem solving	▪ Students in several locations are presented with a similar problem, which they solve separately and then together, electronically.
4. Sequential creations	▪ Students share in the creation of a new item or document, such as an electronic composition, by passing it from location to location.
5. Virtual gatherings	▪ Participants are brought together from different locations and time zones for a computer-mediated meeting.
6. Simulations	▪ Either person-to-person or through using software, participants explore a virtual world.
7. Social action projects	▪ Students around the world work together for change, a collaboration that can lead toward social action.

One of the assumptions driving activity structures is that by helping teachers use the Internet in a series of structured ways to support student learning, this process of designing and participating in Internet activities serves as an organic form of professional development for teachers. In their 2001–2002 Teachers' Telecollaborative Network project, the U.S.-based applied research organization SEDL[116] used this framework of activity structures via videoconferencing and CMCs to help teachers understand both the instructional possibilities of the Internet and the instructional design process.

The World Links[117] technology-based teacher training program used activity structures as one of its central tenets in its *face-to-face* teacher professional development. Its second module devoted 40 hours to instructing teachers in designing and carrying out telecollaborative projects. Where World Links still exists (for example, in Lebanon), teachers spend one week with instructors learning how to design an Internet-based telecollaborative activity. They then return to their schools and launch this project with their students and other teachers and students throughout the globe. The remainder of their professional development is carried out online with peers, as they and their students participate in their teleresearch or telecollaborative project. The idea is that once teachers have a taste of success using the Internet for collaboration, their formation continues heuristically with Internet-based teleresearch and telecollaboration projects—instructional design *cum* self-directed professional development.

Online Learning Communities

Online communities of all types have emerged as effective and (when the technology is in place) cost-effective solutions to teachers' needs for professional development and support. Online communities may be part of formal online courses or separate entities having their own organization and server space, such as Australia's me.edu.au, a component of the Educators Network of Australia (EDNA). Or they may be social media sites using a Ning platform such as *Les Professeurs Documentalistes*[118] or Classroom 2.0.[119] Unlike many formal professional development courses, online communities tend to focus on practice-based and informal learning. Together in an online community, teachers may co-develop lesson plans; share curriculum ideas; plan online collaborative projects; discuss pedagogy, classroom management, assessment, or content-related topics; post experiences, lessons learned, or self-assessments; and engage in peer mentoring. The benefits of these activities increase when teachers are *also* engaged in structured teacher training and/or professional development programs (Gaible & Burns, 2007: 64).

Two long-standing online communities are the International Educational and Resource Network[120] (iEARN), which originally began as a vehicle for study circles and has since served as the starting point for integrating ICTs into learning for thousands of teachers, most of whom have joined iEARN on their own. In addition to supporting collaborative projects, iEARN offers instructor-led online courses that help teachers

116 See http://www.sedl.org

117 See http://www.world-links.org/

118 See http://profs-doc.ning.com/

119 See http://www.classroom20.com/

120 See http://www.iearn.org/

enter into collaborative projects. Each nine-week course addresses a school subject, such as language arts, science, math, or the environment. Each course brings together teachers from at least 10 countries, ensuring that teachers who complete the course have many opportunities to arrange international collaborative projects for their students. The online courses complement iEARN's function as an online "meeting place" for teachers interested in collaborative projects (Gaible & Burns, 2007: 65). iEARN is more active in some parts of the world than others; for instance, it has a strong presence in the Middle East.

Tapped In[121] is a Web-based learning environment created in 1997 by Stanford Research Institute for professional development providers and educators. Tapped In enables providers to offer high-quality online professional development experiences and support to more teachers cost-effectively. Its aim is to bring together its thousands of members to a community that supports each teacher as a professional. Tapped In's peer network supports teachers in planning and conducting learning projects with colleagues and students, participating in topical discussion and groups, managing and attending courses offered by professional development providers, mentoring other educators, and trying out new ideas in a safe and supportive environment.

Though a powerful professional development tool and absolutely necessary to provoke and sustain school-based change, online communities are hard to form and sustain. For that reason, online professional learning communities are probably most effective when part of an overall, ongoing structured experience, such as an online course.

Webcasts and Webinars

As with print- and audio-based distance education, the Internet is fast redefining and appropriating television and video. Within the past few years, teacher training programs and educational organizations have used *webcasts*—Internet broadcasts of live or prerecorded video—as tools to provide and supplement pre- and in-service teacher education.

Webcasts (as distinct from webinars, discussed in the next few paragraphs) are one-way video transmissions in which a presenter or instructor presents audiovisual information via a Web-based platform, such as Elluminate,[122] or via prerecorded video. Because the format is so new, little research has been conducted into the impact of webcasts on teachers' content knowledge or pedagogical practice. Like all forms of broadcast, webcasts tend toward didactic and passive learning, though teachers often leave comments on the website housing the webcast. Webcasts are extremely popular, however, because they are multimodal (using text, audio, and video) and can be archived and viewed at the teacher's convenience.

Webinars, also known as virtual seminars, online conferences, live meetings, web meetings—and sometimes, confusingly, webcasts—are Web-based video seminars hosted by a synchronous live platform or Web-based conferencing system such as Elluminate, Adobe Connect, and WebEx, as well as free, open source platforms such as Big Blue Button[123] or (more awkwardly) free online platforms such as Skype.

121 See http://tappedin.org/

122 Elluminate is now Blackboard Collaborate

123 See http://www.bigbluebutton.org/

Webinars, particularly if using commercially based software that has more features, facilitate interaction between instructors and students via voice and chat, allow students to ask questions (via text or audio), provide quick formative assessments (via an electronic "show of hands"), and enable document exchanges. Like webcasts, webinars make for a versatile mode of distance-based professional development, because they are available on demand or prepackaged and can stream live or be archived for later viewing.

Webinars can be part of an ongoing program of online professional development—for example, EDC's ETLO program uses periodic webinars as part of its online professional development. They can serve an "extra" or an independent series of web seminars focusing on different topics, as is common with webinars offered by, for example, the International Society for Technology in Education[124] (ISTE) and the Center for Implementing Technology in Education.[125] Or they can be part of an existing educational portal such as the Canadian province of Alberta's Gateways2Learning[126] or designed online communities (in this case, for novice teachers) such as edWeb.net.[127] Some of the most popular teacher-focused webinars include the free Learning Times,[128] and commercial sites such as Discovery Channel's EdTech Connect and Scholastic's ReadAbout.[129] Webinars are so new as a teacher training tool that we were unable to find any reliable research, as opposed to descriptions and assertions, about their impact on teacher learning.

A variation of webinars is the proliferation of online learning conferences for teachers. The Reform Symposium[130] and the K–12 Online Conference[131] are but two. Online conferences are a fairly recent development. Over the course of a number of days, through a combination of synchronous, asynchronous, and immersive technologies, teachers can access and interact with a global array of colleagues and experiences much as they would in a place-based conference. These can be keynote presentations, concurrent sessions, or intensive workshops. Online conferences are also economically and pedagogically attractive because of their "anytime, anyplace" characteristics and low production and participation costs (Anderson & Christiansen, 2002).

Webinars and webcasts still tend to be fairly passive media, probably due to a number of factors associated with the separation from and inability to see other learners. For instance, webinar participants tend to "lurk" and not fully participate in the online experience. The webinar instructor may not feel comfortable or be able to facilitate online conversations successfully, leaving a few participants to dominate the conversation while others remain silent. The fact that webinars are not "face-based" makes it both

124 See http://www.iste.org

125 See http://www.cited.org/

126 See http://www.gateways2learning.ca/

127 See http://www.edweb.net/

128 See http://learningtimes.org/

129 Since these are commercial sites with unavailable content, their URLs are not included here. They can be accessed by typing their name in a browser address bar or through a search engine.

130 See http://reformsymposium.com/

131 See http://k12onlineconference.org/

challenging to facilitate people who cannot be seen, and even more daunting for individuals who may not know one another to participate and engage at a distance. Finally, since webinars are typically accessed by individuals in remote locations who cannot be seen, there is a tendency for participants to multitask or not fully engage.

As Web technologies evolve, natural interactivity should also evolve. In the meantime, there are a number of ways to move webinars and webcasts from a "talking head," didactic mode to a more interactive experience for teacher-learners. For example, the webinar instructor could require teachers to prepare a short presentation or questions to engage the group so that more voices are heard and more active learning assured, skip or minimize the presentation portion in favor of a larger discussion, limit the amount of lecturing (particularly since there is no way of knowing that learners are paying attention), announce that participants will be randomly "called upon" during the webinar, or require learners to prepare a post-webinar or webcast product demonstrating that they have absorbed and implemented what they have learned.

Portals

Portals are Web-based repositories or clearinghouses of "e-resources" and "e-content" designed to provide one-stop shopping for teachers. Alternatively known as intranets, virtual learning environments, limited area search engines, or learning platforms,[132] portals typically include instructional materials, lesson plans, worksheets, and sometimes access to professional development via multimedia applications, online chats, or webcasts and webinars. The provenance of portals is extremely diverse. They may be designed by ministries of education or regional/district/state education agencies to support pre-service and in-service teacher learning. Australia's EDNA[133] portal, Singapore's Teachers' Portal,[134] and Brazil's Portal do Professor[135] are three examples of national teacher portals that offer teacher support and resources in a broad range of educational areas. Lebanon uses a robust commercial portal to offer online professional development, collaboration, resources, and self-study courses to principals as part of its World Bank-funded principal leadership training program.

Portals may be created by other public sector agencies and serve varying jurisdictions. The European Unions' European SchoolNet[136] houses a host of portals, all aimed at helping teachers across the 27-member European Union use and integrate ICTs in classrooms. Learning Resource Exchanges for Schools,[137] a joint program endeavor among 18 European nations, is a tag-based, multilingual, multi-content area portal for teachers.

132 At the same time, these terms also have their own unique definitions.

133 See http://www.edna.edu.au/edna.go

134 See http://teachers.nie.edu.sg/mainpage/index.jsp

135 See http://portalprofessor.mec.gov.br

136 See http://www.eun.org/web/

137 See http://lreforschools.eun.org/LRE-Portal/Index.iface

Jordan's EduWave portal,[138] funded through the Jordan Education Initiative (a public-private partnership) provides content and instruction for Jordanian teachers and students. The Open University of Indonesia's Guru Pintar Online[139] portal has been set up as a place where teachers can seek out and consume independent, self-paced professional development.

Chile's Educarchile[140] is another example of a hybrid state project and privately developed portal that focuses on providing supports and services to all Chilean teachers in a particular area: instructional technology. The U.S. state of Texas's Best Practices Clearinghouse[141] has a distinctly local focus. It is an online clearinghouse of information relating to best practices of schools and school districts within Texas and is geared toward helping teachers find resources and practices and helping them comply with the state's content standards and accountability system. In the U.S. state of Wisconsin, the Milwaukee Public School District[142] offers a portal for several thousand teachers, students, and parents in the city's schools.

Professional organizations also develop portals for teachers. For example, the U.S.-based National Science Teachers' Association[143] offers five portals geared toward pre-service science teachers, as well as ongoing professional development for certified and practicing science teachers.

Portals may be private and noncommercial. Teachers' Domain,[144] funded by the U.S. National Science Foundation, provides free multimedia content (audio, video, and Flash interactives) as well as professional development using this content. Or they may be fee-based—a simple web search will call forth a multitude of commercial portals. Teachers.Teach-nology[145] is a portal that provides a mixture of free and commercial content.

Portals have moved well beyond simply being repositories of digital information and learning objects for teachers. Scotland's GLOW[146] offers multimedia content across dozens of topics and content areas. It also provides free shared space and collaborative tools for teachers to create and deliver lessons together and build communities of practice.

Portals have a number of advantages as a teacher education tool. First, they provide teachers with rich content, curriculum, and learning objects, often free and vetted, which can help to improve their content and assessment knowledge and instructional design skills. Second, they offer one-stop shopping, so to

138 "Eduwave" is a brand. The Jordanian portal (in Arabic) is found at http://www.elearning.jo/eduwave/elearningme.aspx

139 See http://gurupintar.ut.ac.id/

140 See http://rpi.educarchile.cl

141 See http://www.teabpc.org/

142 See http://www.milwaukee.k12.wi.us/portal/server.pt

143 See http://www.nsta.org/portals/pre-service/

144 See http://www.teachersdomain.org

145 See http://teachers.teach-nology.com/

146 See http://www.ltscotland.org.uk/

speak, which teachers may see as a time saver. Third, they often provide linkages to peers and colleagues. Some may even offer professional development. Finally, portals can serve as an effective self-study experience and tool for teachers with a high degree of self-efficacy and self-directed learning who both have access to Web-based educational content and possess the skills to navigate, download, evaluate, and integrate it.

However, portals have their weaknesses. Content is often poorly organized or updated, and teachers are rarely instructed in how to evaluate the content they find,[147] or even in how to search based on a particular desired instructional use. Portals are an older Web-based technology and are increasingly giving way to newer mash-ups, which enable users (as opposed to "experts") to add content. When portals are developed as a shortcut, rather than a supplement, to teacher training, they are not at all effective. Samoa's pilot SchoolNet project developed an educational portal, provided Internet access in community learning centers, and furnished technology training for teachers so that they could access and use portal content. Teachers' use of the portal, though, was disappointing, and research results demonstrated that teachers needed continuing professional development and follow-up to help them access, evaluate, and match Web-based content with standards, curriculum outcomes, and instructional goals (Strigel, Chan Mow, & Va'a in UNESCO, 2007). Portals often suffer from the "if you build it, they will come" syndrome. Simply creating a repository of rich and engaging resources does not mean that teachers will actually access them or use them. Placing courses and content online without active, expert facilitation and with no structure or accountability further diminishes for the chances of success. Finally, even if teachers use the content, it is a leap of faith to assume that the use of portal content will qualitatively contribute in any way to teacher learning or instructional quality.

Portals are highly variable in their quality and appropriateness. Even when included as part of a professional development offering or initial instruction for teachers, extreme care must be taken in choosing a particular portal. A good resource for evaluating portals is the Southern Regional Educational Board's online guide for assessing portals, *Educational Web Portals: Guidelines for Selection and Use*.[148]

Real Simple Syndication (RSS)

Information aggregators, also known as real simple syndication (RSS), are online applications that allow users to sift through content created on the Web each day from a variety of websites to which users have subscribed (Ferriter, 2009). Though more closely associated with Web 2.0 technologies, RSSs are situated in this chapter because they more often than not act as a Web 1.0 tool, serving as a customized information delivery system. Through RSS "feeds," teachers can subscribe to automated content from a particular website (such as a blog or wiki). Once new information is added to the site, that information is "fed" to teachers' e-mail inboxes or to a media application such as iTunes where they can read, listen to, or view the information at their own convenience. These "feed readers" can be programmed to automatically monitor certain websites for new content and deliver it via e-mail or iTunes. They also let teachers control how many updates they receive from a certain site, filter content, and add or delete subscriptions. Three well-

147 A good source to help teachers in this endeavor is http://school.discoveryeducation.com/schrockguide/eval.html

148 See http://info.sreb.org/programs/EdTech/pubs/PDF/Web_Portals.pdf

known information aggregators are Pageflakes,[149] Bloglines[150] and Google Reader.[151] Free aggregators like FeedStitch[152] enable users to combine various RSS feeds into one stream. And free tablet-based programs, such as Pulse[153] or FlipBoard,[154] allow users to organize their RSS feeds into an attractive, magazine-like layout, which they can read at their own convenience.

With the combination of instantaneous access to information via RSS feeds, layout programs like Pulse and FlipBoard, and digital tablets—discussed in "Chapter 7: Mobile Technologies for Distance Learning"—it is easy to envision a distance-based system in which content is loaded automatically onto teachers' personalized digital tablets, possibly eliminating the need for standard distance-based classes and standard textbooks. RSS feeds are a good way for teachers to access, share, and read information and can be an important *supplement* to any larger professional development, enabling teacher self-study or group study. But information is only one variable in the calculus of teacher learning. They cannot, and should not, serve as a stand-alone model for professional development.

Considerations: Web-based Learning as a Distance Learning Tool

Web-based learning certainly has numerous characteristics that make it an attractive professional development and teacher training option. Indeed, Web-based learning has fast become the "killer app" of distance learning.

Web-based learning allows teachers to remain in class while studying. It lessens the need for travel and face-to-face interaction; it provides the type of flexible access to experts and archival resources that fiscal and logistical constraints would otherwise limit; over time it may be less expensive than traditional face-to-face teacher training; and it blends all distance learning modalities such as print, multimedia, audio, and video with the real-time communication and collaboration characteristics of the Internet. Web-based learning is the only form of distance education that can offer access to such a wide range of resources, experiences, and human beings. Finally, in some cases Web-based learning alone can be as effective as face-to-face opportunities for professional development (Clark & Jones, 2001; Dobrin, 1999; Keogh & Smeaton, 1999; O'Dwyer et al., 2010).

Online professional development for teachers nevertheless possesses a number of intrinsic weaknesses that impact its quality and effectiveness. The expertise, skill, and responsiveness of facilitators all vary, as do levels of face-to-face support for learners; online discussions are inconsistent; and learning still tends to be largely text-based. Web-based courses are not ipso facto of high quality or interactive—they must be made so. But the most important weakness of Web-based learning remains one of effectiveness. Unlike

149 See http://www.pageflakes.com/

150 See http://www.bloglinkes.com/

151 See http://www.google.com/reader/

152 See http://feedstitch.com

153 See http://www.alphonsolabs.com/

154 See http://flipboard.com/

IRI, which is a proven and effective distance learning tool for teachers, overall research on the effectiveness and quality of Web-based professional development, though promising, is still relatively limited and inconclusive (Dede et al., 2005a). Finally, print-based reading has been demonstrated consistently to yield greater comprehension and retention than computer-based and hypertext-based reading (Carr, 2010).[155]

Web-based learning, for all its promise, is not a panacea and will not fix the logistical, financial, and human resource problems that beset teacher training programs. Online learning cannot fix recruitment and selection of poorly qualified teachers. In-service online professional development cannot fix low-quality pre-service education programs. Online education initiatives stand a greater chance of success when they target not only teacher upgrading but also other, equally critical components of the education system, such as assessment, supervision, and leadership.

While some forms of distance education suffer from low status (for example, IRI or IAI), online learning has the opposite problem: often undeservedly high status. Web-based learning is often seen as an attractive option for national teacher distance education programs, even when countries lack the necessary infrastructure, connectivity, resources, and readiness to ensure that Web-based learning has any chance of succeeding. Careful considerations about the quality of Web-based resources are often obscured by policymakers' infatuation with all things Web-based. And Web-based learning has very high entry barriers, making it a *poor* choice of distance education mode in many cases and many parts of the globe. We discuss three of these barriers here:

» **Online learning demands access to high speed Internet connectivity and robust technology.** Clearly, the Internet presents a rich array of offerings: real-time communication and collaboration capabilities; ability to provide audio- and video-based examples of good instruction; complex, content-based simulations and multimedia; and capacity for interactivity with content, people, and experiences. To take full advantage of these, teachers need access, near or at their places of employment, to well-functioning computers and high-speed Internet access capable of quickly transmitting audio, video, and multimedia files. Yet the uneven electrical supply, low bandwidth, and poorly functioning and maintained computers found in many countries or regions mean that distance education institutions have no recourse but to place lots of low-bandwidth text on a website. In this example of "old wine in new skins," Web-based learning devolves into an expensive print-based delivery system.

» **Instructors and learners need a range of skills to be successful in an online environment.** Web-based learning demands a diverse range of common "literacies" from instructors and teacher-learners—not least reading, writing, information retrieval and analysis, and technology skills. As discussed in "Chapter 14: Preparing Distance Instructors," online instructors specifically need to be able to facilitate online discussions that are rich and meaningful, respond in a timely manner to teachers, and model active learning strategies. Online learning requires that teacher-learners possess a certain level of "e-readiness"[156] as autonomous, self-directed, independent learners with

155 Screen-based means a computer screen, not a tablet or e-reader. This research was conducted only with subjects reading from a computer screen.

156 E-readiness is often spoken of in terms of placement of hardware and connectivity—such as connectivity, content, and capacity to use technology (Economist Intelligence Unit, 2008). In this guide we define the definition to include a learner's knowledge, skills and dispositions as they pertain to successfully participating in an online course.

strong time-management and organizational skills, who understand the importance of being an active member of an online community. Online learning's lack of boundedness to time and place means that these e-readiness skills are absolutely crucial. But they are often the very skills missing among teacher-learners who have been acculturated (as students and as teachers) in education systems that emphasize hierarchy, individual achievement, competition, obedience, passivity, conformity, and structure.

» **Teachers in an online learning environment need human support—maybe even more face-to-face support than in a traditional learning environment.** Online learning is not CAI, in which individuals interact with a computer-based "tutor" or drill-and-practice software. Online learning is about instructors and teachers interacting in a technology-mediated environment. Because online learning occurs in virtual—versus physical and temporal—space, in which learners are separated from instructors and the how, where, and when of working and learning are highly unstructured, human support is not *less* important in an online environment but rather *more* important for teacher success, especially for novice online learners. This support can be online, blended, or face-to-face—but it must occur. As international examples of Web-based distance education programs demonstrate, there are indications that online programs using such supports enjoy higher rates of success than those that do not (Means et al., 2009).

Summary of Web-based Distance Learning

Figure 5.9 summarizes the role of Web-based learning and its strengths and limitations as a mode of teacher distance education.

Figure 5.9: Overview of Web-based Distance Education (Adapted from Gaible & Burns, 2007: 67)

Roles in Teacher Professional Development	Strengths	Limitations
▪ It provides structured and unstructured training and professional development for teachers. ▪ It supports formal and informal teacher learning. ▪ Online mentoring, online community, CMC, and social networking sites provide school-based coaching, mentoring, and follow-up for teachers. ▪ It provides teachers with access to learning resources for use with students. ▪ Online coaching and mentoring are often used with new teachers as part of teacher induction. ▪ Accredited online courses help teachers upgrade qualifications or participate in enrichment or continuing education activities. ▪ Within an online course, teachers can study in a cohort, or alone (nonself- paced or self-paced). ▪ Via telecollaborative activities and teleresearch activities, teachers can partner with colleagues across the globe.	▪ The Internet blends all modalities of distance education—print, audio, visual—with real-time communication. ▪ It works "any time, any place, any pace" as long as an Internet connection is available. ▪ Teachers can interact with expert teachers across distances. ▪ Written communication (e-mail, discussion) can prompt more reflective and considered participation. ▪ It supports a range of learning styles. ▪ It offers scale—the potential to reach large populations of teachers. ▪ It provides teachers with experiences, resources, and human supports that might otherwise not be available. ▪ Online mentoring has been shown to reduce isolation experienced by new teachers (one of the major contributors to teacher attrition). ▪ It offers permanence—all materials and conversations can be archived and re-used. ▪ It leaves an electronic audit trail—teachers' use and activity can be monitored and quantified.	▪ It depends on regular access to computers and the Internet. ▪ Policymakers and planners often see online learning as cheap and easy professional development, requiring limited personnel and support. In fact, the opposite is true. ▪ Teachers must have computer, language, and technology skills to participate effectively. ▪ The language of the World Wide Web is English. There are comparatively limited local-language offerings. ▪ Many self-paced online courses lack high-quality or interactive content. ▪ Multimedia and interactive course materials require high bandwidth and robust video cards. ▪ Issues of quality control still plague online offerings. ▪ Teachers and distance instructors need release time, technology training, and professional development on how to integrate the Internet—and new ideas and strategies gleaned from the Internet—into their own instruction.

Chapter 6: Emerging Web-based Models for Distance Learning

Overview

The World Wide Web is a rapidly evolving medium—Hydra-like in its ability to replenish fading applications (e.g., bulletin boards) with more robust variations of itself (e.g., social media and social networking sites). And the Internet and World Wide Web are still taking shape. Though most of these new Web-based applications have yet to find a stronghold in teacher education, two in particular are worth exploring as potential distance education tools: Web 2.0 applications and immersive environments. Though these two emerging applications would seem, at first blush, to have little in common, they do indeed share several connections. First, they are creative and highly engaging media that, if structured well, allow users to have both individualized and collaborative learning experiences and tap into the collective wisdom of multiple sets of virtual colleagues. Next, they are applications with which many young people, including younger and novice teachers, are quite familiar and fluent. Finally, Web 2.0 applications and immersive environments are often used in tandem in order to exchange information, build teams, and strengthen team building among virtual partners. They also serve as a channel to provide induction, guidance, and support for new members of an immersive environment (Kopfler, 2009).

Web 2.0 Applications

The World Wide Web, like distance education itself, is referenced according to "generations." Web 1.0 is the first-generation, more "established" World Wide Web. Web 2.0, the second- generation Web, is a broad term that refers to the World Wide Web as a platform where users can not only access but also create and share content. (And yes, there is a Web 3.0 under development.) Since it can often be difficult to differentiate between the two Web generations, figure 6.1 attempts to outline these differences.

Figure 6.1: Web 1.0 Versus Web 2.0 (Adapted from Cormode & Krishnamurthy, 2008; Burns & Bodrogini, 2011; Hardogan, 2009; Maddux, Johnson, & Willis, 1997)

Component	Web 1.0	Web 2.0
General characteristics	▪ First-generation Web ▪ "Read" Web ▪ Three Rs—"reading, receiving, and researching"	▪ Second-generation Web ▪ "Read/Write" Web ▪ Three Cs—"contributing, collaborating, and creating"
Structure	▪ Static ▪ Closed ▪ Centralized	▪ Dynamic ▪ Open ▪ Decentralized

Component	Web 1.0	Web 2.0
Communication	▪ More passive ▪ Hierarchical—hub and spoke communication pattern ▪ May occur in real time, but communication typically asynchronous	▪ More active ▪ Flat—networked communication pattern ▪ Immediate, real-time, synchronous communication
User interactions	▪ May allow user-to-user connections, but often mediated by the website itself ▪ Greater use of the site's resources	▪ Allows users to form connections via links to "friends," members of "groups" of various kinds, and subscriptions or RSS feeds of "updates" from other users ▪ Greater use of cognitive tools over resources
Interaction with site	▪ Typically does not allow users to post content or do it only in a restricted or single media format (e.g., text-based comments on a website) ▪ Restricted privacy controls ▪ Typically does not facilitate sharing among users ▪ May be limited because of the "read only" or "read primarily" nature of the site	▪ Allows users the ability to post content in many forms: photos, videos, blogs, comments on other users' content, tagging of own or others' content ▪ Some ability to control privacy and sharing ▪ More interaction with the site because of its "read/write", "collaborate/communicate" nature
Content creation	▪ Content proprietary and copyrighted ▪ Site creation impossible without some degree (in many cases a high degree) of technical skills—programming, design, HTML, etc. ▪ Aggregated content somewhat segregated by data and function	▪ Use of Creative Commons or open sharing of content; nonproprietary ▪ Templates and design simplicity used to enable content creation with very little technical skill ▪ Content "mashed-up" and remixed to create hybrid variations

Component	Web 1.0	Web 2.0
Authorship	▪ Only "experts" allowed to be authors ▪ Content creation and consumption carried out by two separate sets of actors (producers and consumers)	▪ Any registered user allowed to be an author ▪ Users' own personalized content created and modified for their own use, with content frequently remixed ▪ Users can be both producers and consumers of content

The heart of Web 2.0 technologies is "social networking," the ability to connect and collaborate with networks of individuals or groups. Social networking occurs via the use of *social media*. Though social media are considered a subcategory of Web 2.0 applications, we would argue here that all Web 2.0 applications are in effect social media, since they all to some degree involve both content creation (using various media) and socialization around such content/media.

Examples of some common education-related Web 2.0 tools include the following:

» **Blogs.** Blogs ("Web logs") are online journals usually maintained by one person, though several people can maintain a blog. Typically free, they allow subscribed users to read, comment on existing ideas, and share new ideas. The *Top 100 Education Blogs*[157] is a Web compendium of the most frequently read education blogs. Blogger[158] is an example of a free blogging tool.

» **Wikis.** Wikis are akin to group journals. They allow multiple users to collaboratively create and edit webpages using a Web browser. The best-known example of a wiki is *Wikipedia*.[159] Wikispaces[160] and Wetpaint[161] are free wiki-creation tools.

» **Media sharing/file sharing.** These are sites that allow users to post media (e.g., images and video), tag media, have conversations around media, and form interest groups. These are also often called "peer-to-peer" or P2P sites. Examples include Flickr[162] and YouTube.

157 See http://oedb.org/library/features/top-100-education-blogs

158 See http://www.blogger.com/home

159 See http://en.wikipedia.org/wiki/Main_Page

160 See http://www.wikispaces.com/

161 See http://wikisineducation.wetpaint.com/

162 See http://www.flickr.com/

» **Social media.** Social media are Web applications that use simple composition and publishing techniques allowing users to interact and communicate, as in the case of micro-blogging. Examples include Twitter[163] and Facebook.[164]
» **Social bookmarking.** Users annotate websites through "tags," share Web-based resources, and communicate and form communities around such resources. Examples include Digg,[165] Stumble Upon,[166] and del.icio.us.[167]
» **Conferencing.** Web conferencing sites such as VYew[168] allow users to meet and collaborate in real-time.
» **Location-based services.** Available through the Global Positioning Service (GPS) function of mobile devices, these services or "applications" can be downloaded to smart phones or tablets. They pinpoint a user's geographic position as well as the position of others, and allow users to send text messages and communicate with one another. Two examples include FourSquare[169] and Scoville.[170] Far more powerful examples are Web 2.0 applications that allow users to view, edit, and use geographical data in a collaborative way from anywhere on Earth, such as OpenStreetMap[171] and Ushahidi.[172]
» **Data-visualization services.** These sites, also available via apps downloaded onto a smart phone, tablet, or computer, allow users to generate, share, and communicate data in a variety of visual formats. One such example is Daytum.[173]

A complete list of Web 2.0 applications can be found at Go2Web20.[174]

Web 2.0 applications have been enthusiastically embraced by teachers everywhere across the globe, in developed and in developing countries alike. Numerous teachers create blogs; participate in wikis; download and upload learning resources in Curriki;[175] journal the progression of a new activity through

163 See http://www.twitter.com

164 See http://www.facebook.com

165 See http://digg.com/

166 See http://www.stumbleupon.com/

167 See http://www.delicious.com/

168 See http://vyew.com/s/

169 See http://foursquare.com/

170 See http://www.goscotville.com/

171 See http://www.openstreetmap.org/

172 See http://www.ushahidi.com/

173 See http://www.daytum.com

174 See http://www.go2web20.net/

175 See http://www.curriki.org

Plurk;[176] connect with other teachers through Yackpack;[177] keep track of grades, assignments and attendance through Engrade;[178] share presentations through Slideshare;[179] analyze classroom video episodes with colleagues via VoiceThread; use Google Docs[180] to create lesson plans and classroom materials; design or participate in a course in Wikiversity,[181] a free, open, Web-based university; and create a social network with students via Twiducate.[182]

The appropriateness of social networking sites such as Facebook[183] or Elgg[184] as educational tools is under debate in many places. Nonetheless, whether as part of a formal face-to-face or distance learning approach or as professional development approaches in their own right, social networking sites are a promising teacher education tool, since they allow teachers to create their own personal learning network. In a statistic that is most likely underestimated, as of February 2010, there were 620 million Facebook groups (O'Neill, 2010). Social networking sites allow teachers to share ideas immediately and co-develop content with peers who may share a particular interest (sometimes referred as "social nicheworks"). Micro-networks such as Ning[185] and, to a lesser degree, Linked In,[186] have a content-specific focus and are increasingly used as networks in which professionals share ideas and resources in text, digital, audio, and video formats. Private social networking sites such as Yammer allow users to focus on content-specific pursuits (such as teaching with technology or book groups) that may be specific or unique to that particular group.

Research on Web 2.0 tools used for teacher education is limited, though growing. The real value of Web 2.0 tools for teacher education, however, is their ability to create, join, and expand one's personal learning networks (PLNs). Research on PLNs is also limited, but much of the value of online PLNs is extrapolated from research on face-to-face ones. There are indications that professional learning networks, facilitated by social media such as Yammer or Twitter, offer several benefits to teachers. First, they can establish and nurture strong professional relationships that allow teachers to share ideas, content, and strategies and collaborate on lessons and activities across distances. This kind of sharing has the immediate benefit of using networked technologies and social networking sites to bring resources and expertise to classrooms and teachers that may lack both. Such use is particularly valuable for young teachers wrestling with their

176 See http://www.plurk.com/

177 See http://www.yackpack.com

178 See http://www.engrade.com/

179 See http://www.slideshare.net/

180 See http://docs.google.com/

181 See http://en.wikiversity.org

182 See http://twiducate.com

183 See http://www.facebook.com

184 See http://elgg.org/

185 See http://www.ning.com/ (Ning has a free 30-day trial but is now a fee-for-service site.)

186 See http://www.linkedin.com/

first year of teaching or those who may feel ill equipped to teach a particular content area, as well as for more experienced teachers struggling with the conceptual and logistical burdens of implementing an innovation in their classroom (e.g., computers).

Second, developing networked relationships is one of the key factors influencing the effective functioning of small groups, particularly when such groups are engaged in knowledge-intensive work (Yuan & Gay, 2006). The development of professional and personal relationships with other teachers can begin to lay the foundation for communities of practice, discussed at length in chapter 16. When teacher groups are geographically dispersed, developing network ties becomes even more crucial, because teachers may otherwise have no opportunity to learn from one another.

Third, PLNs facilitated by social media can complement face-to-face relationships and provide a supplementary online community, which in turn can strengthen existing relationships, sometimes referred to as "bonding ties." Bonding ties often form the basis of communities of practice, which, as discussed later in this guide, are instrumental in helping schools and teachers institutionalize new ideas and practice.

Fourth, social networking can allow teachers to benefit from "the strength of weak ties"[187] (Granovetter, 1983). Novel or new information flows to individuals through weak ties versus strong ties. Since we move in the same circles as our peers, we tend to know the same information. But by interacting with new peers, particularly more experienced ones, teachers can acquire new knowledge and skills from people with whom they would not normally come in contact.

Fifth, social media sites, especially when combined with the use of mobile devices (discussed in the next chapter), offer highly personalized content and instruction to teacher-learners. The structure and interface of social networking sites like Podio[188] and Orkut[189] portend what distance learning may look like in the near future. Teachers, using Facebook or a private social media site such as Yammer, could engage with customizable content and interact with their own learning team, together sharing experiences and studying different components of teaching based on their own differentiated needs. For example, one teacher might need help with classroom management of an innovation, while another might want assistance using different assessment strategies with the intervention.

The social networking site itself allows for greater differentiated instruction by allowing teachers to tailor and share content and receive customized news feeds in a technically simpler, less uniform, and more dynamic way than is the case with more technically complex, closed, and "one size fits all" LMSs.

Next, these sites, by their very design, promote many of the characteristics associated with optimal learning environments. For instance, social media sites like Facebook epitomize many of the qualities

187 "Ties" or interactions refer to information-sharing activities. This notion is part of social network theory. Weak ties refer to infrequent or rare interactions among individuals. Strong ties denote frequent interactions among individuals.

188 See http://www.podio.com

189 See http://www.orkut.com

of a good "official" education technology in their reflective elements, mechanisms for peer feedback,[190] and compatibility with the social context of learning (Mason, 2006). In particular, Facebook's conversational, collaborative, and communal qualities are seen to "mirror much of what we know to be good models of learning, in that they are collaborative and encourage active participatory roles for users" (Maloney, 2007: 26). Immersive environments, such as OpenSim,[191] offer a range of specific learning opportunities in what is a "personalizable" and differentiated immersive social space. As a participation-based network, Second Life may help learners build communities of practice, collaborate with peers in group work, and create and share content. In addition, learning is facilitated in multiple ways, "from the community-managed etiquette of the various chat channels, to the didactic tutorials offered by the software" (Selwyn, n.d: 5).

Figure 6.2: A Few of the Many Offspring of Twitter

Twitter, the 140-character micro-blogging tool, has spawned a number of offspring—all designed to facilitate its "tweets"—including the following:

- **Twitterfall:** User views all tweets in real time.
- **Twiducate:** This is an online classroom for teachers and students.
- **Tweetdeck:** Users organize screen into columns, which organize tweets by sender, topic, etc.
- **Twiddeo:** This variation combines micro-blogging and video.
- **Tweetchat:** Users participate in topic-related chats.
- **Twitpics:** Users upload photos from a mobile phone to Twitter.
- **Twitter360:** This is an augmented-reality Twitter app for the iPhone.

Note: You can search for all of the above applications by typing: www.[name].com.

The seventh area of social networking to be considered is informal learning, which in this context means learning that is educational but is not required by the school curriculum and does not occur during the regular school day or as part of school requirements. Whereas formal learning is typically institutionally sponsored, school-based, and structured, informal learning "is not typically classroom based or highly structured, and control of learning rests primarily in the hands of the learner" (Marsick & Watkins, 1990: 12). Informal learning is seen to accrue from opportunities offered by Web 2.0 applications for learners to engage and collaborate in socially connected networks of peers and online services, allowing learners to take control of their own experiential learning (Selwyn, n.d) in nonschool spaces and at times and with colleagues of their choosing.

Finally, EDC's own research, using Web 2.0 tools as part of online instruction for Indonesian coaches, suggests that carefully cultivated personal networks, designed within a specific instructional framework and for the purpose of building participants' knowledge and skills, can deepen participants' professional knowledge. As an example, content analysis of coaches' communications via a variety of Web 2.0 tools revealed deepening reflection in terms of content, process, and premise (Kreber & Cranton, 2000)

190 Rypple is a social performance platform built for teams to share goals, recognize great work, and help each other improve. It offers multiple forms of feedback to work teams. Though designed for a business environment, platforms like Rypple could be adapted for education.

191 See http://opensimulator.org

about the domain of coaching and multidimensional types of "knowledge structures" (normative, causal, reflective, ideological, and practice-based) around the practice of school-based coaching (Burns & Bodrogini, 2011: 176).

Social networking sites have evolved to include a comprehensive array of offerings, including online communities and professional development. Two of the best known are Classroom 2.0[192] and Learn Central.[193] Classroom 2.0 is an online social network that offers synchronous meetings and professional development; resources, webinars, and teaching videos; ongoing conversations among educators; and a blog. Learn Central offers free content, virtual meeting space, access to experts, webinars, and resources. In many ways these sites function as portals (see "Chapter 5: Established Web-Based Models for Distance Learning"); however, both, in keeping with the spirit of Web 2.0, allow users to create, upload, remix, and share their own content; comment on another person's content; and create content together with online peers inside and outside the network. The convergence evident among technology platforms and applications is also increasingly evident in the Web 2.0 world. One example is SLOODLE[194] (Simulation Linked Object Oriented Dynamic Learning Environment) which integrates the multi-user environment of Second Life with the LMS Moodle.

Numerous distance learning programs employ Web 2.0 tools, in particular social media applications, to connect instructors with learners and learners with one another—the Open University of Malaysia and Britain's Open University are but two. Though there is evidence that the use of Web 2.0 tools is increasing in the field of teacher professional development, its uses are still limited, particularly in developing regions of the globe.

In Indonesia, EDC's DBE 2 project used Web 2.0 applications intensively as part of its school-based coaching/one-computer pilot program. Educators studying online to be coaches used the online mind mapping application MindMeister[195] to create "before" and "after" concept maps that detailed their understanding of and assessed their changing perceptions of coaching. They used the multimedia application VoiceThread to exchange video episodes of their classroom coaching activities and receive real-time feedback from colleagues. PicsViewer[196] allowed coaches to create annotated visual reports of coaching activities, while the blogging tool WordPress[197] served as an electronic portfolio (essentially a coaching handbook) of their work. When coaches from across Indonesia needed to talk to one another in real time, they accessed the Web-conferencing tool DimDim[198] to hold large-group and learning-team meetings.

192 See http://www.classroom20.com

193 See http://www.learncentral.org/

194 See http://www.sloodle.org

195 See http://www.mindmeister.com/

196 See http://www.picsviewr.com/

197 See http://wordpress.org/

198 See http://www.dimdim.com/

Qualitative data analysis of coaches' use of Web 2.0 applications showed a number of outcomes that are consistent with what is known about the benefits of Web 2.0 applications. Web 2.0 applications helped coaches have more "horizontal," peer-based conversations than would have occurred within the "walled garden" of their cohort-based LMS. Coaches reported, and staff observed, the creation of a variety of content-based information through the use of Web 2.0 applications. Finally, coaches reported that use of real-time, technically simple, multimodal Web 2.0 applications helped to make them feel part of a community of practice (Burns & Bodrogini, 2011).

Immersive Environments

One of the most recent and rapidly developing examples of Web-based teacher training and professional development is "immersive environments." As their name suggests, immersive environments allow people to become totally immersed in a self-contained artificial or simulated environment while experiencing it as real. Immersive environments can offer learners rich and complex content-based learning, while also helping them hone their technical, creative, and problem-solving skills. Because immersive environments are so rich and visual, users tend to be highly engaged.

There are numerous subcategories of immersive environments. Indeed, the whole taxonomy of immersive environments can be confusing for the layperson (and even for those involved in educational technology). Since immersive environments encompass a number of Web-based applications, the term means different things to different people. For example, immersive environments include virtual worlds (Najafi, 2009), virtual-reality programs, Web-based games, Multi-user Virtual Environments (MUVEs) and Massively Multiplayer Online Games (MMOGs).

To attempt to eliminate this confusion, figure 6.3 outlines examples and characteristics of the Web-based applications that comprise the term "immersive environments." The reader will note some overlap with figures 4.2 and 4.3 on pages 54–56, overlap derived in large measure from the ever-evolving nature of and convergence among immersive environments, digital games, and virtual worlds and a lack of rigorous theory base in relation to many of these applications.

Figure 6.3: Categorization of Immersive Environments (Najafi, 2009)

Type	Examples	Characteristics
Virtual worlds	▪ SmallWorlds ▪ Second Life ▪ Croquet ▪ Project Wonderland ▪ OpenSim	▪ Nongoal-oriented (can be modified to include missions, games, and goal-oriented communities) ▪ Share four characteristics: 1. Persistence: A virtual world exists whether or not a user is logged in 2. Multi-user: Must have the potential for population 3. Avatars: A user-created agent that performs actions in that world 4. Wide Area Network: have the potential to be global and large (Robbins-Bell, 2008)
Web-based video games	▪ Fable II ▪ The Sims	▪ Goal-oriented ▪ Can be multi-user ▪ Learning specific to game rule set ▪ Collaborative
MMOG, MMO	▪ Zon ▪ World of Warcraft	▪ Goal-oriented ▪ Emphasize multiplayer game play ▪ MMOGs not able to be "finished" in the typical sense of single-player games
MUVE	▪ River City ▪ Quest Atlantis	▪ Goal-oriented ▪ Specific learning objectives aimed to transfer across domains ▪ Collaborative
Virtual/ augmented-reality	▪ SmartBoard ▪ Wii ▪ Alien Contact! ▪ Haptic technology	▪ Goal-oriented ▪ Sensory/bodily interaction
Simulations	▪ Distributed Observer ▪ Network Google Earth ▪ Flight Simulators	▪ Simulations or reflections of the "real" ▪ Close representation of the physical world and governed by the same rules ▪ No avatars—you are yourself (McKeown, 2007)

What the above subcategories of immersive environments have in common is that they are synchronous (real-time), persistent, community-based, represented by avatars (with the exception of simulations), and facilitated by networked computers.

While all of the immersive environments outlined in figure 6.3 possess innate characteristics that make them potentially effective teacher education tools, we will limit our discussion here to two examples from figure 6.3—virtual worlds and MUVEs.

Virtual Worlds

Virtual worlds, as briefly discussed in chapter 4, are three-dimensional spaces inhabited by virtual representations of users (Klopfer et al., 2009). Content in virtual worlds runs the gamut from the best-known virtual world, Second Life,[199] to programs such as I Dig Tanzania.[200] Second Life is the most popular and mature multi-user virtual-world platform used in education. It is a three-dimensional (3-D) virtual world created by its residents.

The "world" of Second Life is inhabited by people, content, and experiences. Users create "avatars" to represent themselves and thereby interact with artifacts, take part in a range of educational and social experiences, and create their own content. A growing number of educators have begun to use Second Life to enhance distance learning. For example, many U.S. universities schedule discussion groups, lectures, and office hours in Second Life (Wong, 2006). Educational organizations with teacher-training responsibilities promote ongoing special events, workshops, and informal networking in Second Life, using it to develop ongoing professional learning networks of innovative educators who are seeking strategies for classroom instruction and management. Such organizations include the Foundations for the Future project of the Georgia Tech Research Institute,[201] which assists K–12 educators in incorporating technology into the classroom; the Florida Diagnostic & Learning Resources System;[202] Harvard University; ISTE[203] and TeacherLine[204] of Texas.

Its immersive, highly synchronous attributes make Second Life a potentially powerful distance education tool that can enhance learner interaction with content and users and allow learners to be "telepresent" at learning events that would otherwise be unavailable to them. As one example, the Digital Writing Research Lab within the University of Texas's Department of Rhetoric and Composition employs Second Life as part of its writing program. Undergraduates, many of whom are studying to be teachers, are organized in teams within Second Life. Together, their avatars must solve some problem that serves as the topic for their

199 See http://secondlife.com. Much of Second Life is free, but learning institutions that want to establish their own spaces within Second Life pay a fee.

200 See http://olpglobalkids.org/second_life/i_dig_tanzania/

201 See http://www.f3program.org/

202 See http://www.paec.org/fdlrsweb/

203 See http://www.iste.org

204 See http://www.pbs.org/teacherline

writing assignments. Students, in the form of their avatars, share drafts of their writing and provide one another with feedback.

Though by far the most popular virtual world for education, Second Life has seen defections because of the costs associated with the program. Open Simulator (OpenSim), an open-source virtual world that serves many of the same functions as Second Life, has two additional benefits. First, it is completely free. Next, it allows "hypergridding," enabling users to teleport seamlessly from one virtual world to another (Korolov, 2011). What this means is that teachers could teleport from their district's OpenSim site to a site at University College London and participate English-language instruction that was taking place there.

Incrementally, but increasingly, virtual worlds and immersive environments are also being used for teacher training. SimSchool is a simulation program in which pre-service and novice teachers can interact with a simulated classroom. They carry out the same activities as real teachers but receive real-time feedback from the simulation program and, presumably, from their education instructors. TeachMe is an immersive environment developed by the University of Central Florida that helps new and pre-service teachers develop classroom management and discipline skills by teaching a classroom full of student avatars (Sawchuck, 2011a). The teacher stands in front of a screen of student avatars (graphical representations of participants). The experience is live and spontaneous because actors, connected via audio or video, respond to the teachers as students would. The program has proved extremely popular with pre-service teachers, since it allows them to make mistakes in a fail-safe environment, receive feedback from their education instructors, and prepare virtually for live interactions with real students.

Virtual worlds such as Second Life are not without very real "entry point" drawbacks. They are highly graphics-intensive, as well as demanding very high bandwidth and computers with robust video cards. Navigating through Second Life can be disorienting, difficult, and distracting. Finally, individuals and organizations must buy classroom real estate in a virtual currency that involves laying out real money. Nonetheless, as virtual-world technology improves and high-speed Internet access becomes more prevalent, virtual worlds will at least warrant investigation in any design of distance education programs for teachers.

Multi-User Virtual Environments

Awareness of the potential of immersive environments as *student* learning tools is growing. MUVEs enable multiple participants to access virtual contexts, such as graphically represented buildings, simultaneously; interact with digital artifacts and tools, such as digitized images and virtual microscopes; represent themselves through avatars; communicate with other participants and with "agents" (personalities simulated by a computer); and participate in various types of collaborative learning activities (Dede, Clarke, Ketelhut, Nelson, & Bowman, 2005b). There are numerous MUVEs with an educational focus that allow learners to explore virtual coral reefs, re-create the Galapagos, or explore outer space. One of the broadest is Learning@Europe,[205] an Italian public-private partnership between the Politecnico di Milano and Accenture's Corporate Citizenship investment program and Fondazione Italiana Accenture, in which students across Europe re-create key events in European history in 3-D worlds through the use of avatars.

205 See http://www.learningateurope.net/

Perhaps the best-researched example of a MUVE in education is River City, developed by Harvard University's Graduate School of Education.[206] River City is a late-1880s city with a river running through it; different forms of terrain that influence water runoff; and various neighborhoods, industries, and institutions such as a hospital and a university. Upon entering the city, the students' avatars interact with one another, with computer-based agents, with digital artifacts, and with the avatars of instructors (Dede et al., 2005b). Their task is to find out why River City inhabitants are falling ill. As they do so, students also encounter various visual and auditory stimuli that provide tacit clues to possible causes of the illness.

River City began as a pilot project in eight Massachusetts schools in 2002 and has expanded well beyond that number. The results of a randomized controlled trial with a control group that used the exact same curriculum in a paper-based form showed that treatment students (i.e., those participating in the River City MUVE) demonstrated higher levels of science content understanding, greater knowledge about science inquiry, and more positive changes in attitudes and motivation toward science (Dede et al., 2005b) than did students in the control group.

Though little used in the area of teacher professional development, MUVEs hold promise as a potentially powerful mode of professional development. As students can benefit from interacting with virtual experiences that increase their knowledge of science and scientific inquiry, so too can teachers. And just as they do for students, MUVEs may also help teachers who need to develop problem-solving, inquiry, creativity, and technology skills. Participating in a highly immersive, engaging, and challenging environment could help teachers see learning from the point of view of a student and understand the importance of motivation, fun, and play in learning. Such a cognitively and affectively empathetic understanding of student learning might influence how teachers structure classroom learning opportunities. Finally, MUVEs could provide opportunities for teacher collaboration with regard to ideas, strategies, resources, and rich media (Waters, 2009).

There are a number of downsides to immersive environments. They can be disorienting, and teachers will need scaffolding and technical support, especially initially, to navigate any virtual environment. It may be extremely difficult for teachers who have never before been asked to think critically or independently to do so in an environment as different as a virtual world. It may also be hard for them to interact with complex simulation software, and without on-site support and scaffolding, teachers who lack persistence will simply give up when faced with technical problems or with the open-ended nature of many immersive environments. Some immersive environments, like some digital learning games, may involve the use of avatars, tasks, and behaviors that in many cultures may be considered inappropriate. Immersive environments are quite graphics-intensive and full of user-created content that places great stress on graphics capabilities and bandwidth at the user end. Though these technical issues raise questions about the viability of using virtual worlds and immersive environments for large-scale teacher professional development (Warburton, 2009: 418), the potential learning benefits of immersive environments certainly warrant exploration in some well-designed pilot or proof-of-concept programs.

206 See http://muve.gse.harvard.edu/rivercityproject/

Considerations: Emerging Web Technologies as a Distance Learning Tool

Because Web 2.0 technologies and immersive environments are such new phenomena—and rapidly mutating ones at that—we know little about their impact on teacher education. We do know that Web 2.0 applications can provide teachers with opportunities to access, develop, and share free, high-quality content, encouraging teachers to be creators, not simply users, of information. We know that Web 2.0 applications can foster cooperation and collaboration, promote real-world uses of technology, and broaden teachers' exposure to people, places, and resources. For this reason Web 2.0 applications should be—and increasingly are—integrated into existing Web-based professional development and also evolving into their own form of teacher professional development, both as self-study tools and as part of professional learning networks with other educators.

But Web 2.0 applications must be carefully selected and employed as either part of distance instruction or as a carefully crafted stand-alone professional development mode, and a number of design issues should be taken into account. First, the utility of Web 2.0 applications still depends on *human* networks—the key is a knowledgeable body of peers committed to sharing ideas and experiences. Next, care must be taken to design Web 2.0 applications as truly interactive, collaborative, and encompassing a network of users. Far too often education-related Web 2.0 sites have no evidence of interaction, preserve the broadcast nature of Web 1.0 applications by placing lots of text on a site, and fail to encourage feedback or conversation. As a result, these sites have a minimal number of users and limited potential as a PLN.

Third, the use of Web 2.0 applications must take place within an explicitly designed learner-centered approach that helps learners understand the importance of constructing knowledge and the importance of being members of an active, online community (Burns & Bodrogini, 2011). Finally, without quality control and vetting of teacher-created resources, teachers may simply recycle poor-quality lesson plans and activities.

Immersive environments, like Web 2.0 applications, also lack a professional development research base for teachers. However, their impact on student learning and the more procedural and conceptual types of knowledge that they can help to cultivate present a compelling argument for at least considering them as teacher education tools. Immersive professional development for teachers could provide a ladder of increasingly real and complex learning opportunities. For example, a teacher could practice teaching strategies in a virtual world before trying them online and then practice online before carrying them out with students in a school-based practicum.

Immersive environments are increasingly gaining attention as legitimate learning modes and models for adult learners. Immersive Education,[207] is a non-profit international collaboration of universities, colleges, research institutes, consortia and companies working together to define and develop open standards, best practices, platforms, and communities of support for virtual reality and game-based learning systems.

Immersive environments suffer from two limitations—one perceptual and the other financial/technical.

207 See http://immersiveeducation.org/

First, they may be seen as mere games or fantasy and therefore not serious modes of professional development. A second, bigger drawback is that immersive environments are expensive to create and are often not culturally appropriate for many educational contents. Yet because they are “locked” systems, they are currently impossible to modify. However, there are now moves afoot to allow modification of immersive environments. Increasingly, there is an “opening up”— allowing interactions between third-party developers and proprietary systems (Warburton, 2009). Sun Microsystems created Project Wonderland,[208] an open source, Java-based kit that allows users to create their own virtual 3-D world (Waters, 2009). Linden Labs, maker of Second Life, has released much of its code as open source.

A final word on Web 2.0 applications and immersive environments focuses on three gender-related issues. First, women and men interact with immersive environments and social media in very different ways. Gendered use of Twitter offers one such contrast: women tend to read tweets, whereas men tend to post them. The same pattern of use is found in social networking sites: women are more likely to look at images rather than post them, whereas for men the reverse practice is the norm (comSCORE, 2010).

Next, in many countries and regions, female teachers using Web 2.0 tools and immersive environments for their own professional learning may meet with resistance from husbands, fathers, brothers, and school principals who consider it inappropriate for women to communicate with mixed-gender teacher groups and find the idea of female avatars engaged in traditionally male behaviors and roles objectionable.

Finally, there is also evidence, some of it controversial, that girls and boys prefer certain types of immersive experiences and have different attitudes and proclivities concerning individual Web-based games and MMOGs (Lucas & Sherry, 2004). For instance, according to Lucas & Sherry (2004: 515), boys prefer virtual environments that emphasize physical enactment, strategy, and role playing, whereas girls prefer “traditional” virtual games such as cards, trivia, and board games. These patterns of preference and use have clear design implications for distance education providers who wish to use or incorporate these emerging forms of Web-based learning into distance education programs.

Summary of Emerging Web-based Technologies

Figure 6.4 summarizes the role of Web 2.0 applications and immersive environments and their strengths and limitations as a mode of teacher distance education.

208 See http://labs.oracle.com/spotlight/2008/2008-08-19_project_wonderland.html

Figure 6.4: Summary of Emerging Web-based Distance Education Technologies (Web 2.0 and Immersive Environments)

Roles in Teacher Professional Development	Strengths	Limitations
▪ Immersive environments allow teachers to interact with a variety of media—including text, audio, video, animation, and visuals—to solve a problem, address an issue, or find a creative solution to a real-world issue or scenario. ▪ Immersive environments allow learning by discovery, experimentation, guidance using a variety of instructional approaches, or practice and feedback. ▪ Teachers can use Web 2.0 tools to create online mind maps, posters, books and publications, and exams, thus increasing the quantity of available teaching resources. ▪ Web 2.0 tools, such as social media, allow teachers to collaborate and share ideas with distant peers. ▪ Teachers can access a trove of learning materials, create and publish their own, or publish with others. ▪ Virtual worlds can be used to help teachers develop propositional knowledge and procedural knowledge (see figure 3, p. 4), habits of mind, and 21st-century skills such as creativity and problem solving.	▪ For the most part, Web 2.0 tools require little technical training and are free. ▪ Both Web 2.0 applications and immersive environments allow for personal and participatory communication. ▪ Both are highly engaging. ▪ Both allow teachers to tap into collective wisdom of "the crowd." ▪ Because these are cloud-based applications, there is no need to purchase expensive software licenses. ▪ In virtual worlds, teachers can participate anonymously through avatars or pseudonyms, or use real identities. This environment supports as much anonymity or recognition as the teacher wants. ▪ Social media can eliminate "hub and spoke" patterns of communication found in many online courses, in which conversations occur between instructor and student rather than between student and student. ▪ Both allow teachers to form their own professional learning communities.	▪ With Web 2.0, there are issues of quality control: expertise and quality assurance may give way to the "cult of the amateur." ▪ Conversations are ephemeral in many Web 2.0 applications and can't be archived. ▪ Many Web 2.0 sites will be monetized (e.g., Ning was purchased by Pearson Publishing) and content and access to colleagues lost. ▪ Because these media are not understood, teachers can be left to their own devices and ignored. ▪ Immersive environments and Web 2.0 may not be seen as part of larger distance-based professional development programs. ▪ Immersive environments are graphics- and bandwidth-intensive. ▪ Users still need instruction and support to be part of an online community. ▪ Many national curricula do not have room for the type of creativity and problem solving cultivated by immersive environments.

Roles in Teacher Professional Development	Strengths	Limitations
	▪ Increasingly, online gaming and social media are extremely familiar to young teachers. They are engaging, and teachers often use them outside of work/study.	

Chapter 7: Mobile Technologies for Distance Learning

The previous chapters have focused on methods and modes of distance education. This chapter explores mobile technologies as vehicles for distance learning for teacher training.

In recent years mobile technologies have exploded as tools for student and, progressively, teacher learning. This kind of learning is referred to as mobile or *m-learning* and, increasingly, as ubiquitous or *u-learning*. M- or u-learning essentially involves e-learning through small, *mobile* networked devices—cell phones, smart phones, personal digital assistants (PDAs), tablets, and portable media players—so that learners can access information, colleagues, and resources *ubiquitously*.

Like radio, television, and desktop computers before them, mobile technologies have provided an alternative way to engage teachers and students in the teaching and learning process. For the most part, these devices are cheaper, more portable, and easier to use and maintain than desktop or laptop computers. Several initiatives—many in developed countries—have used cell phones to reinforce language learning and mathematics, conduct homework assignments, and provide Internet access. For example, teachers have sent homework assignments to students via SMS or multimedia message services (MMS). In terms of other mobile technologies, students have used PDAs to conduct Internet research. Portable media players have also been used to promote language acquisition, with students listening to and practicing along with recordings of language- instruction sessions.

To date, most initiatives using mobile technologies in developing countries have been small-scale and isolated, without definitive results regarding effectiveness. But efforts are growing, as pre-service and in-service teacher pre-service education takes advantage of the availability of mobile devices and ubiquitous networks. Mobile technologies have many advantages—they are ubiquitous, portable, and easy to use and can deliver audio, video, multimedia, and text—and the abundance of educational applications developed for these platforms makes them a highly promising mode of teacher professional development (Pasnik, 2007: 8).

Mobile Phones

We distinguish in this guide between mobile phones and so-called smart phones. “Mobile” or “cell” phones, discussed in the next few paragraphs, refer here to common Code Division Multiple Access (CDMA) and Global System for Mobile Communications (GSM) mobile or cellular systems that offer voice and SMS capabilities—and possibly the ability to record audio and video and take photos. However, according to this definition, they do not contain programs or applications and are not connected to the Internet. In contrast, “smart” phones possess features such as Web-enabled browsing, as well as location-aware and multi-touch screen capabilities, in addition to all of the features of standard cell phones. Much of their functionality is made possible through “mini-applications” or “apps.”

There are a number of mobile or cell phone–based education initiatives throughout the globe, some involving teacher training. For instance, The Indira Gandhi National Open University offers courses on mobile phones to more than 2.5 million students. In Finland, the MOOP mobile phone project helps teachers and students gather data and communicate with colleagues in other schools as part of inquiry-based learning. Mobile phones have been used for learning in Kenya (the SEMA project) via text messaging among teachers. They have been used in South Africa with the piloting of the Math on MXit[209] and MobilEd[210] programs introduced by the Meraka Institute (Farrell & Isaacs, 2007). Part of this program, *Dr. Math*, involves students sending SMS math questions to math tutors who provide cell phone–based tutoring (Snyman, 2010). In Bangladesh, BBC Janala[211] allows English-language learners to access two- to three-minute audio lessons through a simple voice call by dialing a four-digit code. To date, over two million people have accessed the 140 bilingual audio lessons that are currently available.

The *Projet d'Alphabetisation à Base Cellulaire* (Project ABC), a cell phone literacy project in Niger,[212] uses multimedia phones that have been programmed with a digital curriculum in the local languages of Hausa and Zarma. It incorporates a practical literacy component tied to obtaining market information via text messages.

The Project ABC literacy curriculum is taught by local facilitators trained by the Ministry of Education of Niger. Using very basic SMS, learners study basic functional literacy and numeracy three hours per day. In the first year of ABC, participants learn basic cell phone technology, including SMS. In the second year, interactive multimedia phones and a digital curriculum that includes phonetic activities and varied texts are used to develop literacy skills further. Participants also use skills in literacy, numeracy, and basic cell phone technology in a companion program that teaches them how to request and retrieve market information via SMS. Though there appears to be no extensive research, preliminary results from a randomized evaluation of Project ABC indicate that mobile phones have had a positive impact on participants' literacy skills.

Project ABC addresses an important constraint regarding previous functional literacy programs in Niger, where it has been difficult for adult learners to practice what they have learned by accessing timely, up-to-date, and relevant information in their local languages.

The Zambian Teacher Education College (ZATEC) used cell phones as a support in its print-based distance education program, designed to certify teachers with a Primary Teachers Diploma by Distance Learning

209 MXit is a free multimedia and SMS application for cell phones developed by the South African company MxIt Lifestyle. Because it allows mobile users to converse with each other at a fraction of the usual cost of sending text messages, it has become extremely popular throughout Africa.

210 MobilEd is a Finnish company that developed an audio *Wikipedia* app for mobile phones in which South African students send an SMS with a keyword to a cell phone number. In response, they receive a call, and a speech synthesizer reads an article on the subject. Students can fast-forward or rewind on their cell phones. For more information, see http://mobiled.uiah.fi/

211 See http://www.bbcjanala.com/

212 The program was designed by the Fletcher School at Tufts University, funded by USAID, and implemented by Catholic Relief Services, CARE, and Helen Keller International. See http://sites.tufts.edu/projectabc/.

after two years.[213] Groups of teachers were organized in rural areas, where each group received a fixed cellular terminal and a Motorola C-113 mobile pay phone, which can be used to sell talk time or make personal calls. Teacher resource centers (where the devices were kept) and student-teachers could also sell talk-time cards and talk-time minutes on this phone. Thus the project generated income, which covered the cost of communicating with the lecturers.[214]

Though cell phone reception was sometimes a problem and the calling schedule was not included in the printed material, as a result of which teachers did not get together to communicate with the lecturer as often as desired, the project was successful on several fronts. Teachers needed little training in the use of cell phones. Cell phones enabled lecturers to provide better academic support and counseling to student-teachers in rural areas and allowed them to contact a knowledgeable resource who could answer their questions immediately. Finally, teachers were able to communicate and consult with one another using cell phones.

Increasingly, activities that are associated with other (i.e., nonphone) platforms are shifting toward mobile platforms. For example, Facebook has developed a free, low-bandwidth version of its popular social networking site—Facebook Zero[215]—for mobile phones. And mobile reading, common in nations like Japan and Korea, where m-novels take advantage of high literacy rates and the ubiquity of mobile phones, is beginning to emerge in other global locations. In South Africa, for instance, the Yoza Project[216] has used mobile phones to explore the viability of such devices to support reading and writing by South African youth. Its first m-novel, Kontax, was published in English and Xhosa in 2009, and the project traces the numbers who read, comment on, and exchange the m-book. In addition to its stated goal of studying mobile devices as complements or alternatives to print-based literature to increase youth literacy, the project hopes to take advantage of the mobile-rich, book-poor situation in many developing countries to spur the creation of a local mobile phone publishing industry.

Finally, two mobile phone applications, little used in education but popular in other circles, demand mention here. First is SoukTel[217] which connects simple cell phone technology to a back-end database to provide mainly job-related information to young people. Souktel's overall structure is being used increasingly by educators. For instance, Teachers Without Borders[218] has used SoukTel services to communicate with and monitor teachers concerning their instructional, curricular, or professional development goals.

213 An EDC project, funded by USAID, ZATEC has two face-to-face sessions a year. Teachers come for two weeks for two residential training sessions. During the first two-week session, the teachers get all the printed materials they'll need until the next session. Between the two face-to-face sessions, teachers either send in their assignments or wait until the monitor comes to their school and hands in the assignment to him or her.

214 Thanks to Graciela Mann, formerly of EDC, for this information.

215 See http://www.facebook.com/blog.php?post=391295167130

216 See http://yozaproject.com/. The project was originally known as m4Lit—Mobile phones for Literacy.

217 See http://www.souktel.org/

218 See http://www.teacherswithoutborders.org/

Next is Bambuser,[219] a service that allows users to broadcast live video from their mobile devices to social media sites such as Facebook or Twitter. Bambuser is best known as one of the real-time streaming services used by protesters in the Arab Spring of 2011. It could be similarly deployed by pre-and in-service teachers to upload real-time video of classroom activities to a distance instructor or a mentor in a remote location.

Smart Phones

Simple voice- and text-enabled phones have demonstrated that they can, either alone or in tandem with other forms of distance education, be used as teacher education tools, either to deliver content and instruction, connect teachers to peers and facilitators, and/or provide in-class support mechanisms. Smart phones, which allow users to surf the Internet, download music, use online data services, make calls, and send text messages, are even more promising and powerful. So exponentially powerful are the iPhone and Droid (to name but two smart phone brands) that they are often referred to as "pocket computers."

Within teacher education, smart phones are still used primarily as communication and sharing devices for teachers. The Bangladesh Teaching Quality Improvement in Secondary Education Project (TQI-SEP) is a case in point. TQI-SEP provided teachers with smart phones with video, speakerphone, and three-way calling capability as a follow-up tool to support its traditional distance education project, which used print-based learning materials. Teachers reported that the ability to communicate (via voice, SMS, and audio conferencing) and share resources (via MMS) maintained their motivation and lessened feelings of isolation (Pouezevara & Khan in UNESCO, 2007). In South Africa the M-Ubuntu project[220] is a cell phone literacy project in which learners receive and read e-documents and produce their own magazines and articles using their cell phones.

The expansion of their capacity, particularly the development of mobile platforms, has made smart phones powerful teacher education tools. Nowhere, perhaps, is the power of mobile learning on greater display than in South Korea, where nearly 100 percent broadband Internet access and a partnership between KNOU and KT,[221] South Korea's main mobile phone provider, brings the nationally stated goal of ubiquitous learning closer to reality.

For the equivalent of US$2 per month, KNOU students are provided with a smart phone that connects to KT's network. KNOU has developed its own proprietary LMS for smart phones so that students can access their online courses via their phones. KNOU has transferred all of its online courses—all lectures, multimedia applications, IPTV programming, audio files, and Web-based instructions—to mobile devices. As of January 2009, 30,000 KNOU students were accessing their courses via mobile phones.[222]

One of the best-known phone-based educational projects is Bridge-It in Tanzania and the Philippines (formerly Text2Teach), which uses cell phones to deliver video to classrooms. Initiated in 2007,

219 See http://bambuser.com/

220 See http://jbtaylor.posterous.com/how-mobile-phones-and-m-ubuntu-are-improving

221 Formerly Korea Telcom.

222 Personal communication, T.R. Lee, January 14, 2010.

approximately 3,000 teachers in both countries have been provided with cell phones that contain subject-specific content videos. Teachers peruse the video catalogue and send their video order via SMS; the video is downloaded to the teachers' phones, which they then connect to a television and show to their students. This program has obvious promise as a classroom-based professional development tool for teachers and as a dual-audience, direct-instruction approach. Bridge-It teachers receive support through ongoing curriculum development and adaptation and through lesson plans built around new instructional teaching methodologies.

In Indonesia, where Internet connectivity can be problematic, especially outside the large metropolitan areas, EDC's DBE 2 project used Moodle Mobile,[223] the mobile version of the LMS Moodle, to offer its online coaching course, Strategies and Techniques for School-based Coaching, via Indonesia's extensive cellular network, as well as through the Internet. Coaches reported that despite the small screens of their Nokia handsets, accessing the online course via their smart phones was faster than doing so through an Internet service provider.

Much of the excitement surrounding smart phones as professional development tools focuses on the increasing availability and variety of applications, or "apps." Low-cost or free apps can be downloaded onto a smart phone or a tablet device such as the iPad. Apps can be small, like widgets, or fairly robust mini-applications such as one would find on a desktop or laptop computer.

While apps are primarily considered leisure and entertainment aids, they serve increasingly as a distribution channel to provide educational content to children and adults. All sorts of apps could be used as teacher training tools: game-based apps in which users participate in World War II, for example; apps that help users with mathematics; apps that allow users to download and read free books on a mobile device; and apps that help users learn a second language, to name just a few. Google, Inc., in partnership with a number of educational software companies, is developing a host of educational applications that can be used as part of online learning programs or as downloadable, stand-alone mini-programs. The Florida Virtual School has launched a set of "meStudying" iPhone, iPad, iPod Touch, and Android apps in Algebra I and reading (Watson & Murin, 2010: 48).

To date, educational apps are the fourth most commonly represented category in Apple's App Store, with approximately 25,000 programs (MacMillan, 2010).[224] Figure 7.1 examines the top 100 apps by the percentage geared toward adult learning.

223 See http://www.mobilemoodle.org/

224 As of January 2011.

Figure 7.1: Top-Selling smart phone Apps by Adult Learning Content (Schuler, 2009: 6)

Top-Selling Apps (1–100)	Percentage Targeted Toward Adult Learning
1–25	36%
26–50	60%
51–75	56%
76–100	76%

The numbers in the left-hand column break down apps by quartile. For example, of the first 25 top-selling apps, 36 percent are targeted toward adult learning. Of the next 25 top-selling apps, 60 percent are targeted toward adult learning, and so on.

Hand-held Devices

Hand-held devices such as PDAs are also used as professional development tools for teachers, though their use will surely diminish as smart phones become even more powerful and as tablets (discussed momentarily) become more pervasive. The Digital Education Enhancement Project (DEEP), sponsored in part by the United Kingdom's Open University[225] and the Teachers' Education in Sub-Saharan Africa (TESSA) program,[226] provides hand-held computers to teachers in Egypt and South Africa to improve instruction in literacy, numeracy, and science. In addition to mobile phones (through which teachers can send SMS and e-mail messages), teachers use hand-held devices as part of their professional development and to annotate course materials, view videos of other teachers' practice, produce lesson plans, take photos, and record speech. They also use hand-helds to create e-books, video, and audio and to access Microsoft Office software.

Research (Leach, Power, Thomas, Fadani, & Mbebe, n.d.) reports that teachers were very "positive" on the use of hand-held devices, perceiving them as "effective instructional tools" (Leach et al., n.d: 5). British teachers who used hand-held devices as part of an Open University course reported that the "anytime, anyplace" access to learning resources was one advantage of hand-held devices over computers (Waycott & Kukulska-Hulme, 2000, cited in Leach et al., n.d: 5). Teachers reported that hand-held devices helped them organize and plan instruction, find information, and gather and analyze data, as well as contributing to their own learning, self-improvement, teamwork , and collaboration (Pownell & Bailey, cited in Leach et al., n.d).

Further research into the use of hand-held devices by teachers in sub-Saharan Africa and Egypt shows that they have additional benefits as learning devices for teachers (Leach, Ahmed, Makalima, & Power, cited in SAIDE, 2008). As a result of the DEEP project, teachers stated that they were encouraged to use other types of ICTs, that hand-held devices facilitated new forms of teacher cooperation and collaboration, and that

225 See http://www.open.ac.uk/deep/Public/web/index.php.

226 See http://www.tessafrica.net/

students in classrooms where such devices were present quickly developed confidence and abilities in using both hand-held devices and desktop computers. Additionally, teachers reported that hand-held computers were just as useful a classroom resource as multimedia laptops. They claimed that they would select a hand-held device over a laptop if given the choice (SAIDE, 2008; Leach et al., n.d.).

Portable Media Players

One of the most recent innovations in audio-based open and distance learning for teachers is the use of podcasting, particularly to help teachers improve their content knowledge. Podcasts are a series of audio or video digital media files distributed over the Internet by syndicated download through RSS Web feeds to portable media players and personal computers. Portable media players include MP3 and MP4 players such as the iPod, Zune, and iPod Touch. (The iPod Touch is similar to the iPhone but without the phone.)

Though the same content may also be made available by direct download or streaming, a podcast differs from other digital media formats in its ability to be syndicated, subscribed to, and downloaded automatically when new content is added (*Wikipedia,* 2008). Podcasting is used increasingly in American, Australian, and European schools and universities to enhance student learning—for example, university instructors record lectures, and students create audio-based reports. Podcasts and language acquisition apps are especially effective for second-language learning. Numerous kindergarten teachers in the United States are installing age-appropriate multimedia applications onto the iPod Touch so that young second-language learners can learn the alphabet, basic phrases in English, how to count, and how to classify animal families. Increasingly, U.S. high school students are being given iPod Touch devices containing hundreds of apps that cover a range of functions, from allowing students to communicate with teachers if they have a question about a topic to multimedia encyclopedias, flash card makers, and homework reminders.

There has also been a huge increase in podcasting beyond industrialized countries. EDC's teacher training projects in Tanzania, for example, provided teachers with MP3 players and podcasts that conveyed exemplary teaching practices. Zambia's Quality Education Services Through Technology project (2004–2009), funded by USAID and implemented by EDC, piloted an MP3 player program to extend IRI into classrooms beyond the reach of daily radio signals. Video-capable iPods were loaded with 150 IRI lessons for grades 1, 2, 3, and 6, covering the entire Zambian curriculum for each grade. Classroom teachers were provided with speakers and an alternative energy source (solar panels or foot-pumped generators) for powering the speakers and charging the iPod. The iPods were loaded with an electronic resource library complete with podcasts and video podcasts ("vodcasts") of enrichment materials and practice activities.

Two sets of videos were uploaded to the iPods. The first set included content-specific videos for mathematics, science, and English for sixth-grade teachers. These videos followed the national curriculum and supported teachers in enhancing learning outcomes for those subjects. The second set of videos focused on general teaching practices and pedagogy for first-, second-, and third-grade teachers. Early results showed that many teachers, either due to the novelty of the technology or for other reasons, viewed the videos or made attempts to implement what they learned in their classrooms.

Though there is not yet much research on podcasting as a teacher training tool, podcasting offerings are expanding almost exponentially as professional development tools for teachers. MP3 players can hold large amounts of rich media and teachers can play, stop, and replay digital content as needed. This playback ability can help teachers review a particular classroom sequence, listen again to a university lecture, and re-use particular resources. Recognizing the potential of MP3 and MP4 players as adult learning tools, YouTube has created YouTube EDU,[227] a Web-based educational video-sharing site that aggregates free educational content uploaded by universities. Content can either be viewed online via desktop, netbook, or tablet computers or downloaded to MP3 players (in some cases through third-party software) via subscription services. A number of American, Australian, European, and Israeli universities have added free content to YouTube EDU.

U.S.-based sites such as the Educational Podcast Network[228] and Teachers' Podcast[229] are replete with podcasts that help teachers do everything from learning to use Microsoft Office software to teaching factoring in mathematics. Teachers receive content automatically through RSS feeds.

Finally, Apple Computer's education media site, iTunes University,[230] offers free lectures, discussions, and conferences from universities across the globe. In 2008, the U.S. state of Michigan began to leverage online content delivery for its teachers in the form of podcasts from iTunes University (Umpstead, 2008). A number of other U.S. states have followed Michigan's example. This iTunes content complements additional resources and training opportunities provided to teachers.

Though studies on the educational impact of podcasting are scarce, the research that exists is promising. At one U.S. university, researchers conducted experiments to see if students who received podcasts of lectures did as well as students who attended the lectures. Both groups were given print handouts of slides and took an examination the following week. Podcast students scored 9 percent higher on examinations than nonpodcast students, but only if they took notes on the handouts. Podcast students who didn't take notes scored the same as the non-podcast students (McKinney, Dyck, & Luber, 2009).

Digital Tablets

Digital tablets[231] include the iPad and other touch-screen portable devices. (Because these devices are so new, this section may read in part like a product review.) At the time of writing there appears to be little use of tablets in formal professional development programs, though this will almost certainly change, so such use can only be proposed, not documented. But tablets are already having a profound effect on how educational content is stored, displayed, and communicated.

227 See http://www.youtube.com/education

228 See http://epnweb.org

229 See http://www.teacherspodcast.org

230 See http://www.apple.com/education/mobile-learning/

231 This is another example of the heteroglossia that pervades the technology world. "Tablets" (more accurately, "tablet PCs") are very small laptops (notebook-sized) with the full functionality of a personal computer. Users input information via a keyboard or stylus. Tablets are touch-screen devices that are computer-like, but they look different from a PC, and they are not intended to run a full PC operating system or a complete set of applications with the full functionality of a PC.

Best known of the tablets is Apple's iPad, essentially a large iPhone with a 7- to10-inch screen, built-in wireless and Internet networking for "always on" Internet connectivity, dual cameras for videoconferencing (depending on the version), and the ability to print over a Wi-Fi network. The iPad has a long battery life (approximately eight hours), and it can be used to store and play audio and video and view images as well as access the Internet. Like the iPhone and numerous smart phones, the iPad uses a touch screen for navigation and keyboarding. Like smart phones, the iPad can accommodate thousands of apps, which technically make it a productivity tool. Though peripherals such as a keyboard can be added to it, the iPad's still awkward touch-screen keyboard, overly eager predictive text function, and lack of USB and optical CD or DVD drives still render it largely a consumption device.

Nonetheless, the promise of so new a device is noteworthy. Like a notebook computer, it allows users to communicate, create documents, and develop multimedia. Like the Kindle and Nook, it functions as an e-reader, but in addition it can hold thousands of education-related apps.[232] And like an MP3 player, it allows users to create store, download, and listen to audio files from just about anywhere.

Because of this versatility and relatively low price, the iPad is revolutionizing not just consumer technology but Web-based and mobile learning. Thousands of apps are being developed for it daily. Web developers are re-engineering websites to fit its dimensions. School districts from Canada to New Zealand are providing iPads to administrators, teachers, and students. Australia's University of Adelaide has distributed iPads loaded with multimedia science content to first-year science students. Numerous U.S. school districts are exploring the use of iPads as digital textbooks in place of more expensive desktop computers. For instance, one pilot project in four California school districts will replace 400 students' eighth-grade algebra textbooks with iPads in an attempt to prove the advantages of interactive digital technologies over traditional teaching methods. In Virginia, another pilot program has placed all social study curricula on the iPad. Each day in the United States, Europe, Canada, and Australia, another story emerges about how school districts are trading in paper-based textbooks for iPads. Presently in the United States, a major multiyear study is attempting to determine the quality of iPads as teaching and learning tools (Schaffhauser, 2010). So dramatic is the paradigm shift of Web-based content to content in the form of apps that reside on tablets that some technology prognosticators have proclaimed that the World Wide Web is—or soon will be—"dead" (Anderson & Wolff, 2010).

It is always dangerous to predict future technology trends, particularly when the full capabilities of a particular technology are not yet understood. (But we won't let such uncertainty stop us here!) As more peripherals are developed for tablets, as users become more familiar with touch-screen technology, and as the price continues to drop, tablets should dramatically impact both face-to-face and distance education and teacher training. First, the tablet should redefine the notion and format of "textbooks." As the concept of textbooks moves from one-dimensional print products to tablet-stored multimedia and interactive content, economies of scale will impel textbook publishers and educational content providers increasingly to design content specifically for tablet devices such as the iPad.

Next, tablets will redefine hardware design. The iPad and other tablets are hybrid devices blending a scaled-down laptop with a scaled-up cell phone. The success of this combination should further accelerate

232 See http://speirs.org/blog/tag/theipadproject for a list of secondary school apps for the iPad.

the trend from large to small computing devices and redefine what computing means. As touch-screen keyboards become easier (and more refined) and as touch-screen navigation replaces pointing and clicking, we can expect to see common peripherals such as the mouse disappear,[233] along with big changes in the graphical user interface.

Third, and more important for our purposes, tablets will continue to influence concepts of how, where, and when learning occurs. For countries in which portable devices are common, online learning is widely available, and notions of professional learning more flexible, this development is not dramatic. But in parts of the globe where learning is time- and place-bound, where professional knowledge is fixed in a national canon of information, and where information is transferred by a more expert "other," the changes wrought by networked mobile devices in general and tablets in particular will be dramatic indeed. If such changes are encouraged, they will expand how learning in a distance environment occurs; if they are ignored or assimilated with the existing static system, they will neuter the potential of tablets as transformational learning devices.

Fourth, tablets should make possible the movement toward personalized, differentiated learning, including teacher learning. They are small; portable; allow users to download, play, modify, and share multimedia; and possess an array of education-related apps and customizable digital content. Together, all of these features make it easy to envision a tablet as a teacher's own personalized professional learning device, which the teacher could use to access his or her own PLN and customized menu of professional learning opportunities, via changeable and customizable apps, anytime and anyplace.

Finally, tablets (and e-readers, discussed below) promise to transform not just text, but the whole experience of reading and, by extension, learning. Publishers are continuing to explore visual interfaces that include immersive environments, collaboration tools, and video (New Media Consortium, 2011). Currently, numerous magazines and periodicals integrate interactive graphs and maps for smart phones and tablet versions of content. Publishers of digital content have begun substituting or supplementing text with video clips or voice-overs. In 2010, Apple began publishing iPad versions of classic texts that allow readers to interact via the touch screen with images in the text.

E-Readers

E-readers, also known as e-books or digital readers, are slate-like devices that use electronic ink to deliver books digitally. Unlike tablets, they are designed exclusively for reading. They function just like a paper book: the user can turn pages, skip ahead to the end of the book, annotate sections, and save his or her place with a "bookmark." The benefit of e-readers as a teacher education tool is that they can store hundreds of books and documents, thus mitigating issues associated with physical storage or postal delivery and giving the teacher access to an entire library that is both portable and lightweight. Amazon's Kindle[234] e-reader has gray backlighting, making it ideal for reading in bright sunshine, and a battery that

233 We will probably also see the disappearance of other hardware, particularly single purpose tools such as digital cameras and e-readers as a result of tablets and Smart Phones.

234 Throughout this guide we do not provide Web addresses for commercial products.

lasts for weeks, or even months. Barnes and Noble's Nook e-reader is color-enabled. iPad apps such as iBooks have adjustable color background for optimal reading in sunlight and darkness. These e-readers, like the iPad, can access cellular networks that allow the user to download a book onto the e-reader instantly. Other e-readers can access the Internet.

"Chapter 1: Print-based Distance Education" mentioned many of the drawbacks associated with print-based and text-based distance learning. E-readers do not remedy all of these issues—for example, the prerequisite of literacy and the inefficiency of text as a tool to convey complex information— but they do address many of them, especially the problems of storage and updating information. Many e-readers come with text-to-speech options and support note taking and handwriting. Additionally, initial evidence, though incomplete, suggests that e-readers may enhance reading enjoyment. A survey of 2,000 U.S. students ages 6 to17 reported that students who normally dislike reading paper-based books enjoyed reading from digital readers and would read more books if they had e-readers (Bosman, 2010). Adjustable font sizes and types make it easier for those with vision problems to use an e-reader than to read a paper book. As digital readers become more popular—and Amazon currently sells 143 Kindle books for every 100 paper-bound books (Kirsner, 2010) and more e-books than paper books are now sold in the U.S. and Europe—the price drops, and more commercial and free books are created to take advantage of the medium. Finally, e-reader manufacturers are looking to distinguish their products by adding new features such as providing support for audio books, including other types of media, or using digital rights management to allow users to lend e-books to friends. Presently, e-readers are proprietary (Kindle) but it is likely that they will move toward becoming more open source.

Though tablets are certainly more multipurpose in design and offer a better aesthetic user experience, e-readers have several advantages over tablets. They are generally more lightweight and less expensive and have a longer battery life—weeks versus hours. E-readers such as the Kindle serve exclusively as an electronic book, so readers cannot become distracted by the games, apps, networking features, and music found on a tablet. At the same time, Sony's e-reader, for example, functions like a tablet, allowing users to write, draw, create audio files, and communicate. (For those who cannot decide between e-readers and tablets, at least one company makes a double-screen dual e-reader and tablet!)

In Mali, the USAID-funded and EDC-administered *Programme Harmonisé d'Appui au Renforcement de l'Éducation* uses Sony e-readers with primary school teachers to help improve both teachers' and students' literacy skills. An e-reader with headphones is distributed to each participating teacher's classroom so that students can carry out shared reading activities. Teachers create simple storybooks on the e-readers, including illustrations. Students, too, are encouraged to write and illustrate their own short stories for their classmates and save them on the e-reader.

Other Portable Devices

RazorBee

We conclude this discussion of mobile technologies with a discussion of the RazorBee, an offline/online media player. Though much larger than the devices discussed here, the RazorBee qualifies as a mobile device because it is specifically designed to be transported to wherever teachers work and learn. Designed by Ariem Technologies in Bangalore, India, the RazorBee captures online multimedia content and allows users to create custom playlists. The device has five gigabytes of storage; is highly peripheral-dependent; operates via Ethernet cables, USB flash drives, headphones, and microphones; and is controlled by a device that resembles a cross between a cell phone and television remote control. The RazorBee uses the Safari browser but is moving toward Android so that it can support Flash and Flash Lite. It is presently power-dependent, though designers are investigating how it could run on a battery and be used with the small, portable Pico projector. A television monitor, projector, or LCD projector is needed to project from the RazorBee.

RazorBee tends toward simple and uniform usage. Teachers search for content on the Internet and download multimedia, video, audio, and text files onto the device. They then assemble this material to create lesson playlists to complement the instructional process, adding audio in the local language to enhance comprehension. This playlist can then be broadcast or shared.

The advantage of the RazorBee is that it allows teachers with no Internet access to capture and remix Web-based content to be used in their own classrooms. But its real potential appears to be twofold. First, it serves as a face-to-face or distance-based professional development tool for the teacher. By connecting microphones to the RazorBee, groups of teachers, all in different locations, can engage in the same professional development and communicate with one another via audio as they interact with the same multimedia content.

Next, it serves as a “bridge” to the Internet, bringing Web-based content to areas with limited or no Internet access and allowing teachers, via the remote control, to create their own multimedia content without much need for technology training.

The RazorBee has been used in several Indian states and is being piloted by EDC as a professional development tool for teachers in Kenya and Zambia; however, at this point there are no data on its effectiveness or impact.

Considerations: Mobile Technologies as Distance Learning Tools

Much of this guide has discussed convergence of distance education modes. Since the 1990s we have also seen the convergence of devices, as computers become smaller and cheaper and morph into a new range of devices that combine the power of computers with the portability, flexibility, and ease of use of a phone. Within this category of mobile technologies, we should soon begin to see winners and losers in terms of teacher distance education. PDAs will most likely be replaced by tablets, cell phones will continue to mature into smart phones, single purpose e-readers will morph into multi-purpose tablets, and computers will lose market share to both tablets and smart phones.

The most promising technologies for teacher distance education in developing countries are cell phones—in particular, smart phones and tablets. Indeed, cell phone ownership exceeds computer ownership in Asia and Africa (International Telecommunications Union, 2011). Since 2000, we have seen dramatic increases in both absolute ownership and the rate of cell phone ownership per 1,000 inhabitants (from under 20 in 2,000 to 80 in 2011) (International Telecommunications Union, 2011). These technologies, particularly cell phones and smart phones, make sense for a number of reasons. First, cell phone networks (through which both devices can connect to the Internet) are generally cheaper and more widespread than Internet coverage, providing universal access to resources and people in ways the Internet cannot do.[235] Many countries with poor Internet connectivity have excellent cell phone coverage. Next, cell phone use is not compartmentalized, as it is with computers. Users employ phones for all facets of life—recreation, leisure, education, and economic purposes, to name but a few (Donner, 2010). The "killer apps" of cell phones—voice and text—are still the most basic and powerful of learning tools. Third, it is becoming increasingly easy for smart phone users to create their own customizable apps.[236] Fourth, cell phones can offer teachers, many of whom are already cell phone users, just-in-time resources and assistance and personalized and individualized support and instruction in a way that desktop and laptop computers—where ownership is lower, access more difficult, and connectivity problematic—cannot. Finally, the two areas of the globe with the most acute teacher education needs are sub-Saharan Africa and South Asia, particularly India. Sub-Saharan Africa has the fastest rate of cell phone subscriber growth in the world, while India has been adding more cell phone subscribers per month than any country in the world (*Economist,* 2010).

The proliferation of and competition among smart phone providers means that the development of new phone-based services will continue to reach beyond text and voice. Mobile networks and low-cost computing devices are poised to offer the benefits of full Internet access to people in developing countries in the coming years (*Economist,* 2010). As the *Economist* (2010) suggests, data services for education in poorer countries could mimic what has been seen in other sectors (e.g., crop process and phone-based agricultural advice). Certain brands of smart phone, such as the iPhone, can be used for "tethering,"[237] and if a phone has 802.11 capabilities, it can both transmit and receive data, becoming a "hot spot" in which it can be accessed by other 802.11 devices. And thanks to variable-bit-rate compression, smart phones, even with limited bandwidth, are increasingly becoming devices for watching video. Compressed video streamed via the Internet is now a viable alternative to DVD players, and new television sets such as the Sony Brava can play video directly from Internet feeds to smart phones (Naone, 2010).

This increasing convergence is not limited to hardware. There is also a continuous stream of dual-platform applications, cell phone-enabled software that functions with the World Wide Web, in effect making cell phones an extension of computers or vice versa. For example, users can send text or voice messages from their phones to VoiceThread. Thwapr[238] allows users to send videos to cell phones. Photobucket[239] enables uploading images from cell phones to a website. Drop.io[240] permits cell phone users to send text messages to websites, transmit audio files from a mobile phone to someone's e-mail address and/or website, and

235 For instance, India enacted telecommunications reform in 1999, and many African nations have opened up their telecommunications market to competition, thus depressing costs.

236 See, for example: http://developer.qt.nokia.com/

237 Tethering is a general technique available on many cell phones and smart phones that allows users to connect their phones to a computer and use the phone's 3G Internet connection to provide wireless connectivity to the computer.

238 See http://www.thwapr.com/

239 See http://www.photobucket.com

240 See http://drop.io/

embed cell phone audio files as MP3 files that can be uploaded to a Web platform (such as Moodle) and downloaded as MP3 files. Line2 turns the iPhone into a dual-mode phone with the ability to make or receive calls either using the cellular network or over the Internet and turns the iPod Touch into a full-blown cell phone (Pogue, 2010). GoogleGoggles[241] allows searching by images on Android phones. Quick response (QR) code readers enable cell phones and camera-enabled tablets to capture print, multimedia, and Web-based data so that such data can be viewed, published to social media sites, and tracked. Finally, numerous applications (such as Flash) have been developed for both computers and cell phones, and other types of software (Microsoft Office-type productivity software) have been developed for smart phones and tablets.

The limitations of mobile devices as distance learning tools spring largely from their novelty. First, since many mobile devices are so new, much of their potential may be simply that—*potential*. There is little empirical or experimental evidence on how they function or on their impact as professional development tools. Next, though this is beginning to change, because of different phone operating systems and phone platforms, content developers must create several versions of the same content—a disincentive to developing content (especially educational content) for mobile phones. Third, mobile devices are still not the productivity tools that laptops or desktops are, though this situation is changing. Fourth, because so many of the tools (tablets, e-readers) are so new, it is difficult to gauge their life span, plan procurements, and factor in total cost of ownership accordingly. Finally, there is the issue of "planned obsolescence." Device makers are constantly updating, upgrading, retrofitting and re-engineering such devices: an e-reader that is in the vanguard today may well be obsolescent in a year.

Summary of Mobile Technologies

Figure 7.2 summarizes the role of mobile technologies and their strengths and limitations as a mode of teacher distance education.

241 See http://www.google.com/mobile/goggles/

Figure 7.2: Summary of Mobile Learning Technologies for Distance Education

Roles in Teacher Professional Development	Strengths	Limitations
▪ Devices can provide professional development and ongoing support and communication for teachers. ▪ Audio, video, and multimedia can target teachers' content, instructional, and assessment skills. ▪ They offer teachers access to learning resources for use with students. ▪ They can provide in-class support and consultation for teachers. ▪ As more software is developed for cell phones and tablets, they will become more of a professional development option. ▪ The abundance of apps can allow districts, regional education offices, or universities to offer customizable, differentiated, and personalized learning opportunities.	▪ With "anytime, anyplace" learning, teachers can access help and resources from their own classrooms. ▪ Relatively inexpensive, cheap phones, and phone cards can be purchased and distributed to more teachers (compared to computers). ▪ Mobile technologies such as cell phones require very little training for teachers. ▪ Smart phones function as mini-computers so can support "micro" learning. ▪ In areas with poor Internet connectivity, teachers can access the Internet via cellular networks, since cell phone coverage is often more prevalent and reliable than Internet access. ▪ MMS capability of cell phones permits resource (video, audio, still image) sharing. ▪ The use of styluses and gesture-based input makes keyboarding a less important skill. ▪ They capitalize on technologies (phones) that teachers own, with which they are familiar, and on which they rely for a variety of functions.	▪ They depend on regular access to computers, a cellular network, or the Internet. ▪ Multimedia and interactive content still require high bandwidth. ▪ Their size and portability makes mobile devices easy to steal, lose, and damage. ▪ There is often a bias against mobile devices as "real" computers. ▪ Input/output devices (small screen and small keyboard) make typing and reading awkward. ▪ Touch-screen mobile devices make inputting information easier but drain battery life. ▪ Planned obsolescence: Tablets and smart phones are designed to last only a few years. ▪ In the case of smart phones, Internet access may be robust in cities with 3G/4G coverage but limited in rural areas that lack 3G/4G. ▪ Tablets are expensive.

Roles in Teacher Professional Development	Strengths	Limitations
		▪ iPad's inability to display *Flash*-based content severely proscribes the type of multimedia content teachers can access. ▪ Despite improvements in functionality, it is still easier, for those with some experience with personal computers, to use PCs/laptops for production purposes.

Chapter 8: Section I Summary

This section of the distance education guide has focused on modes of distance education for teachers specific to a particular type of technology and models of particular programs within each. It has also discussed many of the shifts in and convergence among *platforms* (phones, tablets, and television), *modalities* (radio, the Internet) and content *format* (audio, multimedia, visual).

While the technologies used to support distance learning are important for a well-functioning distance education program, more critical for teacher learning are the *type* and *quality* of instruction offered with and through these technologies (Jegede, Fraser, & Fischer, 1998). With this in mind, we turn our attention in the next section to "best" or optimal teaching and learning methods across all modes and models of distance education. But before doing so, we conclude with some remarks about the technologies discussed in this section.

Distance learning has been criticized for imposing a "one size fits all" approach on learners. Yet as seen in the previous chapters, distance learning has been rapidly transformed as a result of the evolution, proliferation, and convergence of networked and wireless technologies and platforms—and the new types of interactions such changes spawn. This confluence has re-engineered awareness of how learning experiences, instruction, and support must be structured within a distance learning model; how instructors and learners act and interact within a distance learning environment; and how technology can or should be used to support such shifts. Figure 8.1 categorizes and contrasts many of these shifts in distance education.

Figure 8.1: Paradigm Shift in Distance Learning Models (Adapted from Naidoo & Ramzy, 2004: 96; Trilling & Hood, 1999)

Characteristic	Traditional Distance Education Models	New Distance Education Models
Technology	▪ Broadcast/dissemination ▪ Drill and practice ▪ Information delivery ▪ Computers as a subject of study ▪ Static media presentation	▪ Interactive/community-building ▪ Exploratory ▪ Information exchange ▪ Computers integrated into learning experience ▪ Dynamic media presentation

Characteristic	Traditional Distance Education Models	New Distance Education Models
Instruction	▪ Lecture-based/text-based ▪ Instructor-centered or technology-centered ▪ Delivered at a certain time or location ▪ Grounded in behaviorism	▪ Multimodal/multimedia ▪ Learner-centered ▪ Open, flexible, "any time, any place" learning ▪ Grounded in constructivism
Role of instructor	▪ Knowledge source ▪ Evaluates product of learner's work ▪ Provides no ongoing support	▪ Co-learner ▪ Assesses and supports learner's process, progress, and products
Role of learner	▪ Focused on learner as individual ▪ Largely isolated, with some face-to-face interactions	▪ Learner as member of community of learning and practice ▪ Promotes collegiality and shared learning ▪ Constant communication and collaboration among learners ▪ Combines online and face-to-face interactions
Learning	▪ Single-sense stimulation ▪ Passive	▪ Multisensory/multichannel ▪ Active
Knowledge	▪ Theoretical, abstract ▪ Fact-based, knowledge-based ▪ Identification, comprehension	▪ Practical, authentic ▪ Problem-based ▪ Application, analysis, synthesis, creativity, evaluation, and critical thinking
Assessment	▪ Academic, artificial ▪ Purely summative ▪ Exam-focused ▪ Assesses content knowledge (facts, concepts) ▪ Assessed by instructor	▪ Practically based/performance-based/ focused on classroom application ▪ Diagnostic, formative, and summative ▪ Assesses knowledge, skills, behaviors, and attitudes ▪ Assessed by instructor, peers, and self

As the information in figure 8.1 demonstrates, distance education has to shift from a static to a dynamic model that accommodates new educational and vocational contingencies and learner needs. As the preceding chapters document, rapid technological changes in modes of distance education delivery are redefining distance education, erasing the concept of "distance," reframing our notions of "learning" and "education," and forcing learners and their instructors to interact, learn, and work in previously unimaginable ways. Learning, even at a distance, means that institutions, administrators of distance education programs, distance instructors, and distance learners (both pre-service and in-service teachers) need to re-examine how and where learning occurs, their roles and daily tasks within an ever-shifting technological and learning environment, and by extension how teaching and learning occur in the classrooms these teachers manage. This reality, encapsulated in figure 8.1, summarizes the preceding chapters of this guide. It also frames the remaining chapters of this guide.

Section II:
Methods: What Leads to Successful Teaching and Learning in a Distance Environment?

Chapter 9: Developing "Good" Teachers

Overview

"Good teachers matter." This phrase, "good teachers matter," is used so often that it has become a cliché. Yet high-quality teachers are the single most important factor in a child's education. To be worth their investment, distance education programs related to teacher education must have as their core mission the development of "good" teachers who in turn provide "good" teaching.

Measures of teacher preparation and certification are by far the strongest correlates of student achievement in reading and mathematics. Research (Hanushek, 1992) estimates that the difference between having a good teacher and a bad teacher can exceed one grade level in annual achievement growth. Rockoff (2004), in a 10-year study of the same set of teachers, estimated that differences in teacher quality account for 23 percent of the variation in student test scores. Sanders (1998) and Sanders & Rivers (1996) state that lower-achieving students are the most likely to benefit from increases in teacher effectiveness and that these effects are cumulative over time.

Good teachers matter in industrialized nations. In 2010 the *Los Angeles Times* conducted an investigation into why many poor Latino students do well academically in Los Angeles public schools and why many others fail. The newspaper concluded that the difference between success and failure was not a function of income or family or native intelligence, but rather the result of the quality of the child's teacher (Felch, Song, & Smith, 2010).[242]

But good teachers *really* matter in non-industrialized countries. Figure 9.1 includes data that are often viewed as proxies for effective teaching: a lower teacher-pupil ratio, the teacher's education level, the teacher's level of experience, and even, perhaps controversially, the teacher's salary. The two columns show the percentage impact each indicator has on student achievement as measured by exams. While these inputs obviously impact student achievement in industrialized countries, they have an even higher impact on student achievement in non-industrialized countries, where many teachers receive pre-service instruction via some distance learning mechanism.

242 These results and the methodology employed have been vociferously disputed by teachers and many teachers' unions.

Figure 9.1: Teacher Inputs That Impact Student Achievement (Hanushek, Rivkin, & Taylor, 1995, 1997; OECD, 2008)

Input	Industrialized countries (percentage impact on student achievement)	Non-industrialized countries (percentage impact on student achievement)
Teacher-pupil ratio	15%	27%
Teacher's education	9%	55%
Teacher's level of experience	29%	35%
Teacher's salary	20%	30%

What Constitutes a Good Teacher?

Though we are far more adept at identifying and criticizing bad teachers, there is often a lack of consensus among policymakers and planners about the qualities that characterize good teachers. As it turns out, however, we actually *do* know many of the qualities that make a good teacher. We discuss these here, since it is important to develop a shared technical language and definitions of practice for the purpose of clarity. There may be more qualities than those listed here, and the process of developing good teachers is not as straightforward as simply blending these ingredients together. Nonetheless, five inputs continually figure throughout the research categorizing good teachers (Darling-Hammond & Bransford, 2005; OECD, 2008). Each is discussed below:

1. Content Knowledge. Good teachers have strong knowledge of their subject matter. Student achievement is significantly related to whether teachers are fully prepared in the field in which they teach. Research demonstrates that the amount of college math and science coursework teachers have taken in their content areas is positively related to student achievement gains. Teachers' courses in content area and scores on subject-matter tests correlate strongly with student achievement, though the former (content area courses) shows more frequent positive effects than the latter (test scores) (Hanushek, Rivkin, & Taylor, 1995; Darling-Hammond & Bransford, 2005; OECD, 2008).

2. Structured Instructional Approach. Good teachers adopt a structured, planned approach to instruction. This can be a traditional, more direct, structured approach or a constructivist approach. Research (OECD, 2008) suggests that these different teaching styles be adopted as the teaching context (phase of presentation of the subject matter, type of students, etc.) requires (see figure 9.2).

In terms of which approach is better for student achievement, the evidence favors activities that are aligned with a constructivist approach: hands-on learning and activities that emphasize higher-order thinking (see points 2 and 3 in figure 9.2). Further supporting a constructivist pedagogy, research suggests that students are better able to acquire complex thinking skills when their teachers help them understand the underlying concepts and patterns that tie together the ideas they are studying, provide models for how to approach the task and reason through problems, offer scaffolds or structured steps that support the learning process, and coach students as they apply their knowledge to real-world tasks. Finally, students become more proficient when their teachers help them learn to evaluate and regulate their own learning (OECD, 2008).

Figure 9.2: Models of Teaching and Learning (U.K. Department for Education, n.d.).

Research and practice suggest that student attainment can be enhanced by the consistent use of specific teaching and learning models. The models outlined here have been developed as a direct consequence of theories about learning:

1. Direct teaching models are effective in helping students learn new skills and procedures and acquire academic knowledge. These models include modeling and sequences for teaching reading and writing.
2. Cognitive teaching and learning models help learners to process information, build concepts, generate and test hypotheses, and think creatively. These models include inquiry, inductive learning, and teaching through analogy.
3. Social models require learners to collaborate and learn together and help them construct new knowledge and understand concepts. These models include learner-centered instruction and group problem solving.

3. Pedagogical Content Knowledge. Teachers' preparation in content and pedagogy is associated with teaching practices, which in turn influence achievement. Good teachers have strong pedagogical content knowledge (Shulman, 1986), that is, they know not just their content, but specific strategies for teaching this particular content. Some of the key elements of pedagogical content knowledge are listed below (Shulman, 1986):

» Know how to select topics, useful forms of presentation, analogies, illustrations, examples, explanations, and demonstrations.
» Understand what makes learning of specific topics easy or hard for students (including knowledge about the conceptions and misconceptions students bring to the subject).
» Acquire deep knowledge about content and structure of the subject matter.
» Know the appropriate teaching materials, technology, and media and have strategic knowledge in the application of teaching strategies.
» Teach specific topics or skills by making clear the context in the broader fundamental structure of a field of knowledge.

4. Knowledge of how students learn. Teachers with a good understanding of child development and learning are more likely to be effective in the classroom. Teachers who have completed coursework in learning and development are more likely to stay in teaching; and teachers who understand how learning occurs are better able to select and develop a curriculum that supports, rather than undermines, the learning process. Research on successful teacher education programs in the United States has found that many of them have particularly strong coursework in child and adolescent development that is tightly linked to clinical observation and analysis of learning both in school and out of school (Darling-Hammond & Bransford, 2005).

Figure 9.3: "Effective" and "Highly Effective" Teachers (U.S. Department of Education, 2009: 12)

Effective teachers are those whose students achieve acceptable rates (e.g., at least one grade level in an academic year) of student growth. States, local education agencies, or schools must include multiple teacher performance measures, provided that teacher effectiveness is evaluated, in significant part, by student growth. Supplemental measures may, for example, include multiple observation-based assessments of teacher performance.

Highly effective teachers are those whose students achieve high rates (e.g., one and one-half grade levels in an academic year) of student growth. States, local education agencies, or schools must include multiple teacher performance measures, provided that teacher effectiveness is evaluated, in significant part, by student growth. Supplemental measures may, for example, include multiple observation-based assessments of teacher performance or evidence of leadership roles (which may include mentoring or leading professional learning communities) that increase the effectiveness of other teachers in the school or district.

5. Efficacy. Many studies (OECD, 2008) have found a positive relationship between teachers' beliefs about their efficacy and student achievements in core academic outcomes. Efficacy is a broad term that deals with attitudes, beliefs, and perceptions. Teachers with strong *self-efficacy* believe that they can be successful. Teachers with strong self-efficacy also have strong beliefs in their students' efficacy—a belief that students can be successful.

Teachers who have strong efficacy are better able to motivate students, because they set high standards and believe that they can teach their students what they need to know to attain these standards. Finally, teachers with high efficacy also demonstrate caring and respectful behaviors toward students and provide a safe learning environment. This concept of efficacy underlies the importance of motivation in teachers' work (OECD, 2008).

Good Teaching

Placing good teachers in the classroom is only half the battle. The other half is making sure that they teach well. Good teaching is situationally and contextually defined. To teach well, teachers need time to plan and work with students. They need materials and resources with which to instruct children. They need reasonable class sizes and leadership that both understands effective instructional practices and empowers teachers to use such practices. They need a curriculum and assessment system that facilitates rather than thwarts students' true academic potential, and ongoing learning and professional development in current best or innovative practices throughout their entire teaching career. Without such a framework, even the best teachers are likely to languish.

Conclusion

Within education, we are often quite good at identifying and analyzing the problems associated with poor instruction. However, we are much less adept at identifying factors that contribute to good teaching and implementing systems that develop the skills necessary to be good teachers. Therefore, we need to come to a consensus on what *constitutes* good teaching so that we can establish practices that support the cultivation of the factors that *contribute* to good teaching.

Teaching involves an extraordinarily complex set of practices. Teachers must know their content, be fluent in numerous instructional approaches, know how to transfer content knowledge to students through a variety of activities and experiences, understand how students learn, and have a value system rooted in the belief that all children can learn. Each year they must be educators, counselors, parents, social workers, disciplinarians, and mentors to hundreds of children who enter classrooms with different personalities, learning styles, socioeconomic backgrounds, family situations, tribal affiliations, religions, castes, classes, abilities/disabilities, and life experiences. Creating an effective distance education system, indeed any system, for teacher pre-service and in-service training means inculcating and cultivating this set of knowledge, skills, and beliefs in those who are, and those who wish to be, teachers. It also means immersing pre-service teachers in high-quality learning experiences with instructors who themselves embody the characteristics of good teaching. The following chapters discuss the practices that best support the development of good teachers, particularly as they pertain to distance learning environments.

Chapter 10: Professional Development

Best practice: ***Distance models for pre- and in-service teacher learning must be governed by the same best practices that apply to face-to-face professional development.***

Overview

Any distance education program must cultivate in teachers the skills, knowledge, and dispositions necessary to succeed in a world that increasingly demands workers who are creative, collaborative problem solvers and critical thinkers. Without this understanding, and without professional learning opportunities and instruction that are grounded in best practices associated with high-quality professional development, distance learning programs and distance learners themselves risk failure (Commonwealth of Learning, 2008; National Staff Development Council, 2007; Dede et al., 2005a; Sparks, 2002).

High-Quality Professional Development

After years of research (National Staff Development Council, 2007; Kleiman, 2004; Sparks, 2002) to identify its characteristics, we now know a lot about what constitutes high-quality professional development. Professional development should:

- Be competency-based—focused on helping teachers develop the knowledge, skills, attitudes, and dispositions demonstrably shown to improve teaching
- Be based on an understanding of teachers' needs and of their work environments
- Focus on deepening teachers' content knowledge and pedagogical skills
- Model the exact behaviors teachers are supposed to employ in their own classrooms
- Include opportunities for practice, research, and reflection
- Use information related to student learning for teacher development
- Be embedded in educators' workplaces and take place during the school day
- Be sustained over time
- Be grounded in a sense of collegiality and collaboration among teachers and between teachers and principals to solve important problems related to teaching and learning
- Build professional learning communities (technical and social support provided by professional learning communities helps to overcome inertia of status quo and helps teachers make complex changes)
- Build teacher leadership and distributed leadership
- Focus on a small number of student learning goals
- Match adult learning processes to intended outcomes

As mentioned in "Chapter 9: Developing 'Good' Teachers," teachers need sound knowledge and skills in content, instruction, and pedagogy, along with an understanding of child development and a strong sense of efficacy. Professional development programs that positively impact student learning successfully prepare teachers in these five areas (Schulman, 1986; Schulman, 1987; Kennedy, 1999; Loucks-Horsley et al., 2003).

Though there is no “correct” number of professional development hours per year, research suggests that on average teachers need at least 49 hours per academic year before they show any sign of improvement (Darling-Hammond, 2008). And although there is no correct model of professional development, research (Sparks & Loucks-Horsley, 1989; OECD, 2008) also indicates that certain forms of professional development—such as coaching and mentoring, study groups, lesson study, action research, and observation and assessment—are more effective than workshops or trainings, and can in fact improve the efficacy of workshops and trainings alone.

High-quality teaching demands high-quality professional development. And high-quality professional development demands time and resources. Countries that are recognized for having high-quality teachers and high student achievement levels typically also offer teachers extensive and rigorous professional development opportunities. They also provide teachers with the release time and support necessary to enhance their qualifications.

For example, Sweden[243] and the Netherlands require teachers to have 104 and 169 hours of professional learning per year respectively beyond the hours they spend on instructional planning (OECD, 2005; OECD, 2008; Barber & Mourshed, 2007). The Singaporean government pays its teachers for 100 hours of professional development each year, in addition to granting them 20 hours per week to visit one another’s classrooms to observe lessons and to work with other teachers on lesson design (Darling-Hammond, 2008). After their fourth year of teaching, South Korean teachers are required to take 90 hours of professional development courses every three years, most of which they do online. These countries also link teachers’ professional development with the developmental priorities of the school (OECD, 2005: 123).

These same countries also provide time for teachers’ professional development by building it into the workday and providing class coverage from other teachers. For example, more than 85 percent of schools in Belgium, Denmark, Finland, Ireland, Norway, Sweden, and Switzerland provide time for professional development during the teacher’s workday or work week (OECD, 2004)—after school, during common planning time, or on specially designated professional development days. Schools in Denmark, Finland, Hungary, Italy, Norway, and Switzerland provide regular time for teachers to collaborate on common areas of instruction. Teachers in Finnish schools meet one afternoon a week to plan and develop curriculum jointly, both within schools and across schools in the same community (Darling-Hammond, 2008).

Sweden, as noted, requires 104 hours per year for teacher in-service training and supports teachers through its “Lifting the Teachers” grant, which pays tuition for one university course for all compulsory and preschool teachers and 80 percent of a teacher’s salary if the teacher continues to work 20 percent time while studying for a master’s or doctoral degree (Darling-Hammond & Bransford, 2005).

243 Though laudable, it appears there may be some holes in this requirement. In June 2011 the author interviewed several Swedish teachers in Stockholm who were unaware of this professional development requirement and had not participated in professional development “in years.”

Conclusion

Professional development should address the five areas we know foster good teaching: content, instruction, pedagogical content knowledge, knowledge of learning and development, and efficacy. For professional development to be effective it must

- Be long-term
- Be sequential
- Be differentiated based on teachers' needs and realities
- Provide opportunities for teachers to view the intended practice and study it
- Help teachers plan and design for application in the classroom
- Provide teachers with practice and feedback
- Have opportunities for revision

But no professional development system, whether conducted at a distance or face-to-face, can be effective enough to redress weaknesses in overall teacher quality. A strong professional development system can exist only within an education system that does the following:

- Emphasizes recruiting, preparing, supporting, and compensating teachers on the front end rather than reducing teacher attrition and firing weak teachers on the back end.
- Provides teachers with regular and effective support that directly addresses the instructional challenges where they teach.
- Evaluates teachers on a variety of indicators that provide formative feedback useful in improving instruction and on multiple indicators for summative performance evaluation.
- Engages teachers in the design of curriculum, instruction, and assessment so that they are aligned and strengthen teachers' understanding of how to reach agreed standards (Asia Society, 2010).

Figure 10.1: Feedback (Goetz, 2011: 130; Bandura, 1986)

Feedback is the process of providing guidance and information that helps learners "close the gap" between where they are in the learning process and where they should be. It consists of the following four stages that constantly "loop" back or form a cycle:

1. **Evidence:** The data or information about performance should be measured and stored.
2. **Communication:** Information is conveyed to the individual, not as raw data, but in a format that makes it emotionally "resonant" and relevant to the person.
3. **Consequence:** The information must "illuminate" a specific path forward.
4. **Action:** The individual recalibrates behavior, makes choices, and acts on them. (The cycle/loop begins again.)

Feedback is essential to improved performance. Giving individuals a clear goal, and the means of evaluating their progress, increases the likelihood that they will attain their goal. This process is critical to individual self-efficacy, the belief that with the right tools and information, individuals can attain their goals and be successful (Bandura, 1986).

At its core, distance learning is not about the mode of delivery but about the quality of the learning opportunities provided to those who are, or wish to become, teachers. Developing, building, improving, or changing the skills of any professional is a complex and arduous task; but it is one that fortunately, in the case of teachers, comes with some general guidelines outlining the contours for success. The remaining chapters of this guide, from instructional design to technology, lay out a path toward high-quality professional development in a distance education environment. This path is not always straightforward, and some teachers and programs may not reach their final destination. However, distance education programs can help teachers reach this destination by designing high-quality learning experiences, employing strong instructional practices and assessment for learning, preparing instructors and learners to teach and learn at a distance, designing for communities of practice among learners, offering ongoing support to distance learners, ensuring quality, finding the right content, and selecting appropriate technologies.

Chapter 11: Instructional Design

Best Practice: ***Distance education programs must pay careful attention to instructional design.***

Overview

Whatever the distance education model, it must be grounded in a specific set of learning objectives: increasing teachers' knowledge in a particular domain, helping teachers master content-specific pedagogical approaches, or developing other practical skills such as questioning techniques (Moon, Leach, & Stevens, 2005). The high-quality professional development described in chapter 10 is contingent upon well-designed distance learning experiences.

This chapter focuses on instructional design to support quality teaching and learning in distance education programs. *Instructional design* is a broad term that encompasses the selection, organization, sequencing, and assessment of content and the tools and experiences required to help learners attain a certain set of goals. Instructional design is particularly critical in a distance learning situation, because the student's learning experience is almost entirely mediated through some form of technology. Poorly designed technology-based courses can confound learning, frustrate learners and instructors, and result in high attrition rates (SAIDE, 2007: Center for Children and Technology, 2008).

The literature and research on best practices in instructional design is vast. This chapter presents in fuller detail the most salient themes regarding good instructional design for distance education courses. (For a quick synthesis of good learning design, see the list in figure 11.1.) Some of the considerations noted here obviously pertain to some modes of distance education more than others. Where that is the case, it will be noted.

Characteristics of Good Instructional Design

The research regarding effective instructional design for distance education suggests that it should have seven major characteristics:

1. Grounding in an understanding of the learning process. An effectively designed distance learning environment must take into account multiple factors: the characteristics of targeted learners, the nature of the content, the role of the community in shaping learning, and integration of ongoing feedback and assessment. Any learning environment—be it face-to-face, distance, or a combination of these two—needs to be contextualized within a real situation and embedded in real communities of peers and experts. It should provide connections between the learner's prior knowledge and course content (McGhee, 2003) and should offer ample opportunities for practice and expert feedback to guide the development of knowledge in action (National Research Council, 2000).

2. Grounding in an understanding of the needs of adult learners. Research (Knowles, 1984) demonstrates that adult learners share common characteristics and beliefs that must be integrated into any learning experience.

» They need to be treated with respect and recognition and have their professional experiences integrated into workshops and discussions.
» They are practical and want solutions they can implement to address real-life challenges.
» They are self-directed and need to be given the opportunity to reflect on and analyze their own practice.
» They need to process information as part of learning.
» They have varied learning styles.
» They need the support of peers.

Figure 11.1: Characteristics of the Best Learning Designs (McTighe, n.d.).

Expectations in the best learning designs

- Provide clear learning goals and performance expectations
- Cast learning goals in terms of genuine and meaningful performance
- Frame the work around genuine questions and meaningful challenges
- Show models and exemplars of expected performance

Instruction in the best learning designs

Involves the teacher as a facilitator/coach to support the learner

- Targets instruction and relevant resources to equip students for expected performance
- Uses the textbook as one resource among many
- Involves the teacher uncovering important ideas and processes by exploring essential questions and genuine applications of knowledge and skills

Learning activities in the best instructional designs

- Accommodate individual differences (e.g., learning styles, skill levels, interests) through a variety of activities and methods
- Involve a variety of work and methods for both group and individual work
- Are active and experiential to help students "construct meaning"
- Use a "model-try-feedback-refine" cycle to anchor the learning

Assessment in the best learning designs

- Leaves no mystery as to performance goals or standards
- Is diagnostic and checks for prior knowledge, skill level, and misconceptions
- Allows students to demonstrate their understanding through real-world applications (i.e., genuine use of knowledge and skills, tangible product, target audience) and use methods that are matched to achievement targets
- Uses ongoing, timely feedback
- Provides learners with opportunities for trial and error, reflection, and revision
- Involves periodic self-assessment

Figure 11.1: Characteristics of the Best Learning Designs (McTighe, n.d.). *(continued . . .)*

Sequence and coherence in the best learning designs

- Start with a "hook": Immerse the learner in a genuine problem/issue/challenge
- Move back and forth from whole to part, with increasing complexity
- Scaffold learning in "doable" increments
- Teach as needed; don't "over-teach" all of the basics first
- Revisit ideas—have learners rethink and revise earlier ideas and work
- Are flexible (e.g., respond to student needs, revise plan to achieve goals)

Source: Based on surveys of 1,200 U.S. primary, secondary, and university education faculty.

3. Links between theory and practice (Perraton, 1993). Some forms of distance education are better than others for teacher learning. For example, print- and audio-based instruction may help teachers understand the characteristics of differentiated instruction, but may be far less effective in helping teachers understand how to actually teach the same content in a differentiated manner. In contrast, televisually based distance modes are effective tools for helping teachers understand processes, procedures, and practices, such as how to implement a problem-based science activity.

Distance education has been criticized for its relative failure to integrate theory with practice compared with face-to-face instruction (Robinson & Latchem, 1997). As a case in point, Robinson (1997) contends that in many distance education programs, concepts such as "pedagogical knowledge" remain more conceptual than practical and assume multiple meanings, as figure 11.2 shows.

Figure 11.2: Learning Goals and Strategies to Attain These Goals (Robinson, 1997)

Types of Pedagogical Knowledge	How These Are Exemplified
Knowledge ***about*** practice	▪ Teacher/teacher-candidate is able to explain a concept and can produce an essay or exam on this concept.
Knowledge ***applied to*** practice	▪ Teacher/teacher-candidate is able to plan an activity based on a concept and discuss how it will be used in the classroom.
Knowledge ***in/into*** practice	▪ Teacher/teacher-candidate is able to conduct a particular activity with students based on the concept.

Many distance-based teacher education programs largely focus on theoretical knowledge, in large measure because of design, distance, and technology constraints. Teacher-learners often matriculate from a distance education program knowing *about* good practice, but they may be unable to apply knowledge *to* practice (instructional design) or put this knowledge *into* practice (actual instruction). Since classroom instruction represents the intersection of theory and practice, distance education programs must design experiences through which teachers can attain all of these levels of knowledge and, in particular, knowledge *in* practice (Robinson & Latchem, 1997). The best way to do this is for teachers to practice a new approach or try out new content in a classroom, with students, under the supervision of an experienced and knowledgeable instructor or supervisor who can offer guidance and corrective feedback. Therefore, teaching "practica" or micro-teaching should be central to the design of any distance education program that aims to improve the quality of instruction and impact student learning. Many distance education programs have accomplished this knowledge-into-practice challenge (see figure 11.3) in different ways.

Figure 11.3: Models of Teaching Practica in Distance Education Programs (Robinson & Latchem, 1997; Robinson & Latchem, 2002)

Model	Example	Comments
University-based micro-teaching	Belize Teacher Training College	▪ Eliminates logistical difficulties of school-based practicum (such as supervision) ▪ Limited and somewhat artificial practical experience (in classroom but not type of classroom in which teacher may find herself)
Classroom-based practicum as separate block in the course (before/after other academic blocks)	Diploma of Education program: INGOU	▪ Logistical simplicity that allows teachers to move from one mode of study to another ▪ Runs risk that theory is unrelated to practice because there is no close integration between the two
Classroom-based practicum supervised by visiting university/ ministry staff	Zimbabwe ZINTEC; Ghana UTDBE program	▪ Integrates theory and practice ▪ Highly dependent on strong supervision. which may not be locally available ▪ Supervision of this kind weakest part of this approach, according to Zimbabwe experience
Classroom-based practicum under guidance of mentor in schools (who in turn is under guidance of distance education instructor)	Open University (U.K.) Post-graduate Certificate of Education	▪ Integrates theory and practice ▪ Decentralizes supervision to local schools ▪ Can result in school-based mentoring ▪ Offers expertise that may not be available locally ▪ Depends on coordination between instructor, mentor, and teacher/teacher-candidate

Technology can play a role as teachers apply theory to classroom-based practice. For example, Britain's Open University and Chile's *Enlaces* program have used Web cameras to document teachers' instructional practices, while many Chinese distance education institutions have done the same with analog and digital video and television (Perraton, Creed, & Robinson, 2002). In the absence of inspectors/mentors or supervisors who can travel to a remote school to supervise a practicum, hand-held video devices can record the practicum so that supervisors or distance education instructors at another location can review and provide feedback at a later date.

Real-time video—through such devices as videoconferencing systems or Web cameras—can capture "live" practice. While many stationary video systems may not provide a full picture of student interactions and behaviors, 360-degree camera systems can capture entire class interactions, and applications such as Yellowbird can allow the video to be seen in a 360-degree, interactive, Web-based view. Using Web cameras, two-way videoconferencing (like TeamViewer or Skype), and Bluetooth headsets (described in "Chapter 3: Televisually-based Distance Education") can provide live support to teachers in their micro-teaching or school-based practica. Videotaping teachers' practice at certain points in the school year can provide a visual archive of teacher progression or regression in a certain area and a mechanism for self-study. Video can also be shared with other teachers as a study tool, as discussed in chapter 3. These advantages notwithstanding, there appears to be little to suggest that video is an adequate substitute for actual in-person, real-time supervision and assessment of teacher practice.

4. Accommodation of its audience's range of learning styles. Gardner (1983) has written extensively on the nature of intelligence and how instructors can identify and scaffold instruction to elicit learners' "multiple intelligences."[244] These cognitive models or "frames of mind" shape the way learners perceive and process information and suggest that an individual's ability to learn is influenced by the manner in which information is organized and presented.

Typically, distance education courses have focused mainly on addressing and developing learners' verbal, written, and mathematical skills. Yet teachers, like their students, may have undiagnosed learning disabilities (such as dyslexia), or they may have poorly honed reading and writing skills. The challenge for distance learning programs is to incorporate as many of these "frames of mind" or "intelligences" into its design as possible to address teachers' learning strengths and compensate for their weaknesses. There are two ways to do this.

Instructional Variety. As the "father" of instructional design, Robert Gagné (1965) noted that not all instruction is equal. Therefore, it is important to integrate an array of assignments, activities, and assessments that allow learners to interact and practice with content in multiple ways, on multiple cognitive levels (comprehending information, applying it, analyzing its effects and evaluating its impact), and using multiple measures and methods to assess learning.

Multimedia. A second strategy involves the use of multimedia (see chapter 4 for more on this topic). Since multimedia satisfies many, though not all, types of learning preferences that one person or a group

244 Gardner originally identified seven types of intelligences: visual-spatial, bodily-kinesthetic, linguistic, logical-mathematical, musical, interpersonal, and intrapersonal. Since compiling this original list, Gardner has added and eighth type: naturalistic (focused on nature). While Gardner's theory is a popular one in instructional design for its seeming intuitiveness, it has not been supported by research. There are other theories of intelligence besides that of Gardner. For example, Sternberg's (2003) theory of "triarchic" intelligence categorizes intelligence as being analytical, creative or synthetic, or practical.

of learners may embody, a mix of media is more effective for learning than reliance on one type of media (Mayer, 2000). Particularly in often text-heavy print- and Web-based professional development courses, the use of still, animated, visual, or audiovisual media can help poor readers better understand content.

Lane (n.d.) suggests that a variety of decisions be considered when choosing media that are appropriate to learning styles. *Print* instruction should be delivered in an individualized mode that allows the learner to set the learning pace. *Visual media,* such as animations and simulations, can help learners enhance their understanding of concepts, such as object identification and spatial relationships. *Full-motion video* can be used to depict performance so that learners can copy the processes, procedures, or behavior. Visual media, which portray motion, can demonstrate psychomotor or cognitive domain expectations by showing the skill as a model against which learners can measure their performance. *Images* can enhance vocabulary instruction and reading comprehension for poor readers. *Audio* narration can help poor readers comprehend information, and music can serve as a memory aid. Literacy research shows that readers remember what they have read if key words are highlighted by different *colors and font styles* (but not font sizes). Color coding is also an effective visual mnemonic (Viau, 1998; Lane, n.d.). And *realia*—tangible, real objects—are useful to teach motor and cognitive skills and may be used to illustrate abstract spatial or somewhat abstract concepts, as in the case of using math manipulatives (Lane, n.d.).

5. Flexible design. One of the most common misconceptions in distance education is that face-to-face curricula can be transferred wholesale to a distance education format. Although this has unfortunately often been the approach, distance education courses must instead be designed flexibly (Williams, 1999; Hope, 2006) and specifically for the medium through which they will be delivered—be it radio, television, immersive environments, multimedia, or online courses.

"Flexible design," like the rubric under which it falls, instructional design, is a broad term that advocates providing learning resources and technologies to all learners in order to create, store, and distribute content (Hope, 2006). It proposes that content be organized in multiple formats, used in a variety of activities, and accessible through a variety of technologies to allow for customized learning experiences. Here are some of the key dimensions of flexible design:

- *Medium of delivery:* The strengths of the technology delivery model or modality should be maximizing, while its weaknesses should be mitigated.
- *Organization:* Content,[245] activities, and experiences should be sequential, cumulative, and coherent (SAIDE, 2005). They should be highly interactive and allow for a range of levels of learning, learner entry points, and experiences. Information should be "chunked" and move sequentially from simple to complex, concrete to abstract, and general to specific. Where there is text, it should be clear, concise, and simple (Commonwealth of Learning, 2008).
- *Design clarity:* This includes ease of access and navigation, as well as design features such as—in the case of Web-based and multimedia materials—the use of sufficient white space, graphic organizers, bulleted and "chunked" text, and visuals and color to aid in comprehension and retention of

245 Content refers to text-based and multimedia content, including learning objects, all supporting materials (handouts), and technology elements such as video and audio.

information. Research demonstrates that such clarity and the intuitive organization of materials significantly influence learners' satisfaction and perceived learning of course material in online learning environments (Swan, 2001).

» *Types of learner experiences:* Flexibly designed courses favor "ill-structured"[246] activities over well-structured ones, interactivity over passivity, inductive over deductive instruction, and activity over text and lecture. Such course design supports both individual and group learning and promotes applied approaches to learning (Austin & Brown, 1999).
» *Digital tools:* These must be functional, must provide multichannel opportunities to build understanding of complex concepts, and must allow for the completion of a range of tasks (finding information, communicating, writing, reflecting, organizing information, etc.) (Moon, Leach, & Stevens, 2005). Specifically for an online course, LMSs, such as Blackboard, Sakai,[247] and Moodle, and digital libraries should be easy to navigate and understand. Technology should be not just a medium of delivery but a learning aid that provides opportunities for concrete, contextually meaningful experiences through which learners can search for patterns; raise their own questions; and construct their own models, concepts and strategies (Fosnot, 1996).

There are a number of online resources that help educators develop good instructional design practices. For instance, EDC's EdTech Leaders Online (ETLO) offers a 10-week program in online course development. Palestine's Al Quds Open University[248] uses video to teach its faculty about instructional design.[249]

Since most online courses still use text as the primary information medium, particular care must be taken in organizing text-based information. Research (Carr, 2010; Nielsen & Pernice, 2010) points to the inefficiency and difficulty of reading from a computer screen (though not from tablets or e-readers). Those of us who read online tend to spend less time on a web page, hyperlink to new sites or pages without returning to the original content, and in an effort to absorb as quickly as possible large amounts of text, tend to read in an "F" pattern. Using "eye tracking" software on hundreds of individuals reading through various websites, Nielsen & Pernice (2010: 15) found that when we read a Web page, we begin by reading the first couple of lines of text in their entirety. However, our eyes quickly move down the left-hand part of the screen using the first word of each line as shorthand to inform us about remaining information in that sentence. We may, mid-way down the page, read across another line of text, though usually not in its entirety before we again continue with eye movement down the left-hand side of the screen. Nielsen & Pernice (see Reference section of this guide) offer help on designing online "hot spots"—placing the most important information where readers will naturally find it. Further, the Online Journalism Review[250] offers good synopses on designing Web materials with users' eye tracking practices in mind.

246 "Well-structured" content is learned in an orderly, sequential fashion so that learners demonstrate mastery of a concept. "Ill-structured" content requires learners to understand complex interactions among several concepts and demands that learners find additional information and draw their own conclusions, demonstrating evidence to support such conclusions.

247 See http://sakaiproject.org/

248 See http://www.qou.edu/. The videos are heavily narrative and didactic.

249 In addition to these resources, there are also a number of other commercial and free Web-based programs (such as Thinking Cap Labs: http://lab.thinkingcap.com/Pages/Main.aspx) and apps (such as DesignJot) that aim to improve, assist with, and facilitate the instructional design process.

250 See http://www.ojr.org/ojr/stories/070312ruel/

In addition to resources that help educators with online instructional design, there are number of good online tools, rubrics, and websites to help designers evaluate their instructional design. One simple rubric for evaluating self-paced online learning designs is *Cathy Moore.com*.[251] (Materials and content will be discussed later in this chapter and again in "Chapter 18: Developing Content.")

Figure 11.4: Deductive Versus Inductive Reasoning

Deductive reasoning works from the more general to the more specific. It is sometimes informally called a "top down" approach. Learners might begin with thinking up a *theory* about a topic of interest. They then narrow that to a more specific *hypothesis* that they can test. They narrow it down even further when they collect *observations* to address the hypothesis. This approach ultimately leads learners to be able to test the hypothesis with specific data—a *confirmation* (or not) of their original theories.

Inductive reasoning moves from specific observations to broader generalizations and theories. Informally, this is sometimes called a "bottom up" approach. In inductive reasoning, learners begin with specific observations and measures, start to detect patterns and regularities, formulate some tentative hypotheses that they can explore, and finally develop general conclusions or theories.

Both deductive and inductive reasoning are important skills that must be taught to teachers and their students. Historically though, education systems have privileged deductive over inductive reasoning, in part because it is easier to teach in a deductive manner.

6. Flexible delivery. In addition to being flexibly designed, distance courses should be flexibly delivered. Luschei, Dimyati, & Padmo (2008) define "flexible delivery" as a client-centered approach in which the providers commit to tailor courses to meet learners' individual needs. Flexibly delivered courses offer the following:

» Realistic options and choices in terms of time, place, and technology
» Multiple modes of delivery—in the workplace, in block modes, modules, interactive formats, and other nonstandard modes of delivery
» Alternative options—including on-campus, in-class, independent lectures, seminars, tutorials, and practical sessions
» Accommodation of learners' diverse learning needs and styles
» Use of technology and resources to provide options to any students to access and use materials in their own place (e.g., Web-based teaching materials and exercises or assessments that are not time- and location-specific)

Through its own evaluation of and research on distance education courses, the South African Institute for Distance Education (2005) admonishes that an inadequately designed course promises deleterious repercussions for the health of a distance education program. A poorly designed course may require excessive amounts of teaching and person power in terms of presentation to compensate for it, it may have a high failure rate, or it may result in the lowering of exit performance standards—or all of these.

251 See http://www.cathy-moore.com/resources/checklist-for-strong-elearning.pdf.

7. Accessibility. Finally, distance learning courses should be accessible to all learners. One way to do this is to make sure courses are "universally" designed. Universal Design for Learning (UDL) advocates that all learning experiences should be purposefully designed to be "barrier free" and accessible by providing multiple and flexible methods of the following elements:

- » Presentation of information and knowledge (e.g., voice-to-text applications, screen readers, digital books)
- » Expression with alternatives for students to demonstrate what they have learned (e.g., concept mapping)
- » Engagement to tap into diverse learners' interests, challenge them appropriately, and motivate them to learn (choices among various scenarios for learning the same competency) (Rose & Mayer, 2002)

An example of a barrier would be stairs that are accessible to those who can walk but not, in many cases, to the elderly, nor to people in wheelchairs. A universal design to counter this barrier would be a ramp. Ramps make the building accessible to everyone: people in wheelchairs, the elderly, *and* those who are ambulatory.

As mentioned earlier in this chapter, teachers, like their students, often have undiagnosed disabilities, for example, poor vision or hearing, dyslexia, or dysgraphia, that negatively affect their abilities to learn. As distance learning expands its reach, instructional designers are increasingly designing with this realization in mind, particularly in the case of Web-based learning. Figure 11.5 lists various principles of UDL and demonstrates how designers can develop a Web-based distance education program that conforms to these principles.

Figure 11.5: Universal Design for Learning Principles: Example of Application for Web-based Learning (Adapted from Elias, 2010)

Universal Design for Learning Principle	Examples of Materials and Design That Create Universal Accessibility
Equitable use: The design is useful and accessible for learners with diverse abilities and in diverse locations. Same means of use are provided to all students.	▪ All content online ▪ Anytime, anyplace ▪ Content available in local languages ▪ Context is localized ▪ Educational culture reflected in content and assignments

Universal Design for Learning Principle	Examples of Materials and Design That Create Universal Accessibility
Flexible use: The learning design accommodates a wide range of abilities, preferences, schedules, and levels of connectivity. It provides learners with choice in methods of use.	▪ Multiple formats for information (print, audio, video, online, and CD-ROM/DVD/VCD-based) for learners with variable rates of connectivity ▪ Mind maps/diagrams/visual displays ▪ Conferencing tools ▪ Video/audio presentation and assignment tools ▪ Slide presentation tools ▪ Links to additional information ▪ Choice of study of topics/assignments ▪ Assignments addressing multiple learning styles
Simple and intuitive use: The course interface is easy to understand regardless of the user's background or knowledge.	▪ Simple interface ▪ Direct link to new posts ▪ Easy-to-navigate menus ▪ Books ▪ Searchable forums and content ▪ Mobile interface ▪ Access to offline resources
Perceptible information: The design communicates necessary information effectively to the user, even if the user has sensory impairments (e.g., vision problems, reading disabilities).	▪ Screen preferences, adequate font size, masking, and colors ▪ Screen readers ▪ Text-to-speech and speech-to-text capabilities ▪ Captions for images and videos ▪ Simple language ▪ Chunk information (bullets, short paragraphs) ▪ Sufficient white space on pages ▪ Meaningful images with important text highlighted
Tolerance for error: The design minimizes adverse consequences of mistakes. Users can easily undo their mistakes.	▪ Easy for users to get back to where they were after making a mistake ▪ Ability to edit after posting ▪ Spell check ▪ Confirmation before sending ▪ Confirmation before deleting ▪ Warnings when leaving course site

Universal Design for Learning Principle	Examples of Materials and Design That Create Universal Accessibility
Low physical and technical effort: The design can be easily and comfortably used with minimal physical and mental fatigue.	▪ Predictable and realistic amount of work ▪ Sufficient bandwidth so user doesn't need to wait too long for audio, video, and multimedia content to load ▪ Voice recognition ▪ Word prediction ▪ Built-in assistive technologies ▪ Limited use of external links ▪ Embedded multimedia/assistive technologies (e.g., screen readers) ▪ Browser capability checker ▪ Automatic redirection to resources
Community of learners and support: The learning environment promotes interaction and communication among students and between instructor and students.	▪ Uses community learning approach ▪ Organizes offline activities (such as study groups, face-to-face meetings) ▪ Links to support services ▪ Ample opportunity for large-group and small-group discussions ▪ Social media (Skype, VoiceThread, etc.) that allow users to see one another in real time ▪ Online or face-to-face *coaching* for learners ▪ Online or face-to-face *mentoring* for learners ▪ "Verbal immediacy" from instructor—respond to learner's questions/ concerns immediately ▪ Regular communication (e-mail, SMS, chat, cell phones) from instructor to learners
Instructional climate: The instructor communicates high expectations. The instructor's comments are welcoming and inclusive.	▪ Instructor involved in discussions ▪ Instructor available through several means (face-to-face, via internet, via phone) for one-to-one discussions and assistance ▪ Nonjudgmental instructor ▪ Students motivated by instructor ▪ Noncritical useful feedback offered by instructor, helping learners address misunderstandings

The awareness of making all digital and distance learning opportunities accessible to all learners regardless of disability is increasingly in the forefront of instructional design. In the United States, the National Instructional Materials Accessibility Standard stipulates that all U.S. textbooks be available as digital source files, that is, fully marked up Extensible Mark-up Language (XML) source files based on the Digital Accessible Information System (DAISY) international standard.[252] In this way the digital source file can be transferred to formats needed by students with disabilities (e.g., a Braille book or digital talking book), and one piece of content then can be displayed in many different ways.

Instructional Design Approaches

A number of instructional design approaches[253] can be used to design distance courses. One such approach is ADDIE (*a*nalyze, *d*esign, *d*evelop, *i*mplement, *e*valuate), which is frequently used by universities. Another approach, "rapid prototyping," involves course content authors or experts in a particular subject interacting with prototypes and instructional designers in a continuous review and revision cycle (Thiagarajan, 1999). A particular instructional module is tested with a student audience to see how learners respond to content, instructional strategies, and activities and how well the technology serves as a conduit for each. Students provide feedback, designers make fixes, and the prototype is tested again by students. This process continues until there is confirmation of the final product. Gagné's *nine-step instructional design process* (1965) has been an established standard in instructional design since the 1960s, both in face-to-face and distance learning. Here are the nine steps:

1. Gain the student's attention.
2. Inform learners of objectives.
3. Stimulate recall of prior knowledge.
4. Present the content.
5. Provide learning guidance.
6. Elicit performance.
7. Provide feedback.
8. Assess performance.
9. Enhance retention and transfer.

In addition to these three instructional design approaches (there are many more) instructional designers increasingly have come to recognize the importance of Understanding by Design (Wiggins & McTighe, 2005), a framework for learning that can result in deep understanding. Central to Understanding by Design is "backward design," an instructional design approach that guides teachers in developing a lesson or activity.

252 The DAISY consortium is an international association that develops, maintains, and promotes international DAISY standards. See http://www.daisy.org/

253 "Approach" means an outline or path for designing for instruction. It does not mean technical design specifications. For a full list of instructional design approaches, see Instructional Design Central at http://www.instructionaldesigncentral.com/htm/IDC_instructionaldesignsites.htm.

Traditionally, instructional design has typically followed a *content*-focused rather than a *results*-focused design. In contrast, a backward design approach is a three-stage process that begins with the end in mind. It by no means excludes ADDIE, rapid prototyping, or Gagné's nine-step instructional design process and can in fact dovetail with these approaches, albeit with some modifications. Backward design is sequenced as follows:

- **Identify the desired results or goals.** What should learners know or be able to do as a result of this learning experience?
- **Determine acceptable evidence.** How will instructors know that learners have achieved desired results? What kind of formative and summative assessment should be built into the activity?
- **Plan learning experiences and instruction.** What exactly will teachers need to teach? How should students be grouped? How much time should activities take? What activities will best help students meet learning goals? What materials and resources will students need? How much should be lecture? How much should be self-discovery on the parts of students?

Conclusion

One of the major benefits of distance education is that it can provide opportunities to a broad expanse of learners and to nontraditional or traditionally underserved learners. But to reach students who learn in nontraditional ways, distance education must move beyond a traditional one-size-fits-all approach and offer multimodal learning opportunities that address multiple learning styles and abilities and that are differentiated according to needs. Distance learning demands instructional design that is grounded in an understanding of learning—specifically adult learning. Instructional design within a distance context also requires that theory be linked to practice, that overall design be flexible, that learning materials be accessible to all learners (regardless of abilities or disabilities), and that the distance learning experience capitalize on and customize various technologies, such as multimedia, to reach the greatest number of learners possible and ensure their academic success.

Chapter 12: Instruction

Best Practice: ***Successful distance learning programs model best practices in instruction.***

Overview

Many distance education programs have been characterized, in the words of some observers, as "one step ahead for technology and two steps back for pedagogy" (Mioduser, Nachmias, Lahav, & Oren, 2000). In particular, early "generations" of distance learning, such as print, radio, and television, have tended to be didactic. Even newer online technologies can be as didactic as older forms of technology. If distance education is to help develop good teaching among primary and secondary school practitioners, appropriate technologies must be matched with appropriate instructional methods.

Not all instruction is equal. Distance education raises instructional issues that depend on a number of factors: whether the course is taught synchronously (in real time) or asynchronously, what technology is used—for example, teaching via videoconferencing is very different from online instruction—and what the educational outcomes of the distance learning program or course are. Nevertheless, it is critical in all modes of distance education to model effective instructional techniques. Teachers must be taught using the same instructional methods with which they are expected to teach students and, as much as possible, participate in a variety of appropriate instructional models. These include *direct instructional models* (transmission of concepts, skills, and procedures), *cognitive models* (inductive reasoning, teaching via analogy) and *social models* (learner-centered instruction) (Boethel & Dimock, 1999; Maor & Zoriski, 2003; Gaible &

Figure 12.1: Learner-Centered Instruction

- Learning is a highly personal event—it builds on prior knowledge and is predicated upon a particular individual's learning strengths, or styles (Gardner, 1983).
- Learners construct knowledge in a variety of ways, using multiple tools, resources, and experiences (Dimock, Burns, Heath, & Burniske, 2001).
- Learners acquire knowledge by interacting with subject matter that is meaningful and relevant to their own experiences.
- Learning is a dynamic, developmental, and cumulative process in which learners assimilate, accommodate, or reject new information according to existing frameworks (Dimock et al., 2001).
- Learning has a social dimension: we learn with and from one another (Vygotsky, 1978).
- Learning has affective, behavioral, and cognitive dimensions.
- Learners need commensurate amounts of scaffolding, support, practice, and internal and external motivation.
- Cognitive and behavioral change that results from learning is a long term, nonlinear, complex, and cumulative process (Hord et al., 2006).
- Learning is developmental and exploratory, providing a variety of teaching and learning opportunities (National Research Council, 2000).

Burns, 2007; Dede et al., 2005a).[254] Since learner-centered or constructivist learning is often difficult for instructors to grasp, particularly in a distance environment, it is discussed in greater detail below. Figure 12.1 summarizes the main tenets of learner-centered instruction.

Learner-Centered Instruction

Learner-centered instruction[255] is not a single pedagogical approach, but rather a family of instructional approaches in which learning goals and content drive how information is organized, understood, presented, and assessed. Figure 12.2 outlines the main instructional approaches that form part of learner-centered instruction.

Figure 12.2: Types and Characteristics of Learner-Centered Instruction

Learner-centered approach	Characteristics
Collaborative learning	▪ **Positive interdependence:** Team members need one another to complete their task, ▪ **Individual accountability:** Each team member is responsible for a certain part of the task or fulfills a certain role. ▪ **Social negotiation:** Team members must learn to handle conflict and argue constructively. ▪ **Face-to-face interaction:** Team members work together in a common space to complete their task. ▪ **Group processing:** Team members help one another understand how learning occurred. (**Source:** Johnson & Johnson, 1988)

254 Learner-centered instruction is grounded in constructivist learning theory, which is explained in chapter 2 and defined in the glossary of this guide.

255 Also referred to as child-centered/student-centered/active learning.

Learner-centered approach	Characteristics
Project-oriented learning*	▪ **Organizing issue/question:** It builds on students' knowledge or interest. ▪ **Complex:** It focuses on an issue of some complexity—a project. ▪ **Real world:** It provides a meaningful and authentic context for learning. ▪ **Learner responsibility:** Learners must access and manage their own information and design process for reaching a solution. ▪ **Assessment:** The final product is not a test, but a project or report that is typically performance-based. (**Sources:** Tec de Monterrey; Intel Education; Buck Institute)
Inquiry-based learning	▪ **Question:** It begins with a learner's scientifically oriented question/ inquiry. ▪ **Observe:** Learners observe and question phenomena. ▪ **Hypothesize:** Learners pose explanations of what they observe. ▪ **Experiment:** Learners devise and conduct experiments in which data are collected to support or contradict their theories. Learners give priority to evidence in responding to questions. ▪ **Generate knowledge:** Learners analyze data and draw conclusions from experimental data. Learners formulate explanations from evidence. Learners connect explanations to scientific knowledge. ▪ **Test and apply knowledge:** Learners design and build models and communicate and justify explanations. (**Sources:** National Science Teachers Association; National Research Council)

* Project- and problem-based learning are often erroneously conflated in the literature (as an example, Latchem & Jung, 2010: 102), but in fact they are two different instructional methods or pedagogies.

Learner-centered approach	Characteristics
Problem-based learning	▪ **Begins with a real-world problem situation:** Problems are relevant and contextual. ▪ **Reliance on problems to drive the curriculum:** The problems do not test skills; they assist in the development of the skills themselves. ▪ **Ill structured:** There is not one solution, but multiple solutions. As new information is gathered in a reiterative process, perception of the problem, and thus the solution, changes. ▪ **Use of real-world tools and resources:** Technology, primary source data, and experts are used. ▪ **Self-directed learning:** Learners must be independent and make their own decisions based on availability of evidence. ▪ **Cooperative teaming:** Learners work together in a team to solve a problem. (**Source:** Adapted from Stepien & Gallagher, 1993)
Case-based learning	▪ Students learn desired educational objectives through interaction with an actual case—a real-world story presented in either narrative, audio, or video format. ▪ Cases are context-based, relevant, and realistic. ▪ Learners are motivated to explore, investigate, and study. ▪ All important concepts, facts, and decision-making skills are learned within the context of the case. ▪ This method promotes autonomy, creativity, and problem-solving abilities while simultaneously building hands-on skills needed for success as entrepreneurs, (**Sources:** Tec de Monterrey; University of Medicine and Dentistry of New Jersey)

Broadly, what does a learner-centered distance course look like in a distance learning setting?

First, learner-centered distance education *courses* are based on learners' needs. As mentioned earlier, they draw on learners' practical, classroom-based experiences in both the design and delivery of the course. This way learning is authentic and relevant so that teachers can improve their classroom competence. Learner-centered distance education courses incorporate school-based activities that build on and add to teachers' repertoire of knowledge and skills. Technology and organized activities and assignments provide multiple routes for communicating, understanding, presenting, and assessing knowledge.

Next, *instructors* in learner-centered distance education courses embody a number of tacit and explicit behaviors. They communicate high expectations; elicit teacher-learners' prior knowledge; encourage contact between learner and instructor; facilitate and support both individual and collaborative learning; encourage active learning and sharing of beliefs and opinions; foster reciprocity and cooperation among students; respect and model diverse talents and ways of learning; provide feedback; and assess performance, progress, and the learning product (Chickering & Gamson, 1987; Gagné, 1965; Commonwealth of Learning, 2008; Dimock et al., 2001).

Finally, *learners* in student-centered distance education courses are invested in the process of learning and have a sense of ownership of their own learning. They question, collaborate, investigate, apply, and evaluate what they have learned. They recognize that they are members of a technology-based (and possibly face-based) community and interact with tools, peers, materials, instructors, and experiences to fuel the online sharing and collaboration that in turn fuels learning. They use higher-order thinking skills to determine the quality, authenticity, and applicability of the tools, materials, and resources with which they are interacting (Dimock et al., 2001; Huang, 2002; Commonwealth of Learning, 2008).

Increasingly, and with positive results, both face-to-face and distance instructors are using more interactive instructional methodologies, whether they term them learner-centered" or not. For example, many university lecturers now prerecord lectures and make them available via video, audio, or text so that they can instead use class time—whether face-to-face, online, via television broadcast or two-way radio—for more activity-based learning such as small-group discussions, helping students with problems, small-group tutorials with students, and student group work. Sometimes known as "flip teaching" or "deliberate practice," such a method inverts the traditional learning paradigm in which students use class time to receive information but wrestle with the "hard stuff," practical application of theory, on their own out of class. Such an instructional method has been demonstrated to be even more beneficial to learning than one-on-one tutoring (Deslauriers, Schelew, & Wieman, 2011).

Conclusion

An instructional approach alone is no guarantee of quality instruction: it is only part of the recipe. If their students are to learn in a distance medium and emerge as qualified teachers, distance instructors—in particular, online instructors—must model *high-quality* teaching skills.

Fortunately, the behaviors identified as "high quality" in face-to-face instruction are similar to those in distance instruction (DiPietro, Ferdig, Black, & Preston, 2008: 10). Guidelines from such organizations as the National Education Association,[256] Southern Regional Education Board,[257] American Distance Education Council,[258] and International Association for K–12 Online Learning (iNACOL)[259] all list the behaviors associated with high-quality online instruction; however, they do not address the unique skills

256 See http://www.nea.org/assets/docs/onlineteachguide.pdf (see section IV)

257 See http://publications.sreb.org/2006/06T02_Standards_Online_Teaching.pdf

258 See http://www.adec.edu/admin/papers/distance-teaching_principles.html

259 See http://www.inacol.org/research/nationalstandards/NACOL%20Standards%20Quality%20Online%20Teaching.pdf

required to teach in other modes of distance education. Nor do they address the fact that instruction is very much culturally defined and situated and that in reality many best practices will need to adapt to cultural imperatives.

The topics discussed in the past four chapters—understanding the qualities that define good teaching, high-quality professional development, instructional design, and instruction within a distance learning program—are among the most critical components of a distance learning system. Together, these elements help to develop the high-quality teachers so essential for student academic success. For any program to inculcate in teachers the critical skills of instructional design and knowledge of effective instructional methods, there must be strong alignment and articulation between knowing what contributes to good teaching, the professional development framework of the distance education system, the way learning is designed, and the instructional experiences and activities by and through which teachers learn within the distance education program itself.

A fifth area, assessment, is critical to the success of teachers within a distance-based teacher education system. Assessment is treated in this guide as a separate component, and in many ways it is. But assessment is also a part of instructional design and of instruction itself. This theme will be the focus of the next chapter.

Chapter 13: Assessing Distance Learners

Best Practice: ***Successful distance learning programs use a range of formative and summative assessments to improve instruction and to measure teachers' knowledge, skills, and competencies accurately.***

Overview

What gets measured gets taught. This is one of the great truisms of education.

Assessment drives instruction. Yet assessment is typically the weakest component of any distance education program. In many cases assessment is characterized by a number of practices that impede, rather than enable, learning. Many in-service and distance-based continuing education programs may be reluctant to assess summatively whether and what teachers have learned as a result of the program. Distance programs may use standardized tests that measure out-of-date skills—focusing on declarative knowledge (facts) versus procedural, conceptual, and epistemological knowledge (application of skills, deep understanding, and methods of knowledge acquisition, respectively). Assessments may be exclusively summative (occurring at the end of a learning module or at the end of the distance learning course of study) and not formative (ongoing). They may be separate from the distance technology employed. Issues of distance, finance, and logistics, together with a lack of well-trained personnel who understand assessment, often make it difficult to support more valid and realistic performance-based assessments, such as in-class observations of teachers teaching or electronic portfolios of teacher and student work. Finally, many entities may not wish to assess teacher learning; their aim may simply be to get teachers and teacher-candidates in and out of the distance education system as effortlessly as possible.

Figure 13.1: Assessment Versus Evaluation

"Assessment" and "evaluation" are often used synonymously, but they are different. Assessment in this guide refers to individuals, whereas evaluation refers to programs (though that rule does not apply in real life—individuals can be evaluated and programs can be assessed).

Assessment refers to any of a variety of procedures used to obtain information. It includes numerous types of measures of knowledge, skills, and performance, usually in the service of learning. Assessment may have an evaluative component—a summative assessment, such as a final exam—that places a value or judgment on performance.

Evaluation is a set of procedures for determining the value or overall worth of a program. It essentially examines impact or outcomes based on predefined criteria.

Because of the element of distance, distance education programs face a particular dilemma in assessing pre- and in-service teacher matriculation; how to measure teacher-candidates' progress and process in learning, the products of their learning, and their "fitness" as teachers—and how to do so in ways that contain direct, observable evidence of "teaching in action."

Successful distance education programs have overcome many of the above issues by using a range of formative and summative assessment as appropriate. They recognize that assessment is a process that is inextricably linked to teaching and learning (Heritage, 2010: 1) and therefore

Figure 13.2: Types of Standards (Hosp, 2010: 5)

Normative standards: These involve comparing one learner's performance on an assessment with that of another.

Criterion standards: These involve comparing a student's performance with an empirically derived level of proficiency (such as a cut score that determines whether a learner has mastered a particular skill).

Ipsative standards: Ipsative standards are sometimes referred to as "growth" model standards and are often used for goal setting and motivation. These involve using the learner's prior performance as the basis for comparison with his or her current performance.

use multiple and flexible types of assessments—quizzes, discussions, interviews—as part of learning. Such programs capitalize on the strengths of the distance technology employed to administer and score assessments and assess higher-order thinking skills. They use a multitude of measures—performance-based assessment, growth models, or valued-added models—to assess teacher practice. Most critically, they realize that assessment, even when summative, should always have a "formative" component, that is, instructors should always use assessment results to further refine instruction within a distance environment.

This chapter focuses on *assessing* teacher performance in a distance education program. Chapter 20 will discuss *evaluating* distance education programs. Because assessment and evaluation are so closely linked, the reader may find some overlap between the two chapters.

Strengthening Assessment Within a Distance Education System

There are several strategies for strengthening both formative and summative assessment of learners within any distance education model. We discuss some of the major ones here:

1. Develop standards as determinants of success. It is often difficult either to measure teacher quality or to assess the fitness of a pre-service candidate as a teacher, because we may lack a clear image of what good teaching is—hence the reliance on grades and examination scores. Perhaps the most critical component of assessing teachers' readiness, fitness, or quality is to design standards for performance, instruct teachers according to these standards, and then measure teacher performance against them. This approach allows educators to have a shared vision and language and, just as important, a shared definition of specific behaviors, which can be identified and measured. Figure 13.2 outlines the types of standards for teacher performance that distance education systems can design.

2. Make formative assessment an explicit part of instruction (Heritage, 2010). Traditional instruction in a distance program may involve organizing the curriculum into chronological units or modules of study and then assessing learners' understanding of the material at the end of the learning unit (Guskey, 2010: 53). Yet assessment theory tells us that students learn best when assessment is part of, not separate from, instruction. Rather than separating assessment from instruction and making assessment a purely summative exercise, distance education courses should promote assessment as part of actual instruction. Referred to by Bloom (1971) as *mastery learning*, this process involves several steps explained in detail below (Guskey, 2010: 54–57):

- **Diagnostic pre-assessment with pre-teaching.** Instructors administer a short pre-assessment to learners before instruction to determine whether they have the prerequisite knowledge and skills for success in the content they are about to study. In a distance education environment this can be done in a number of ways: through a brief online survey (e.g., Survey Monkey[260]), via SMS (learners are asked a series of multiple-choice or short-answer questions and respond with the appropriate letter or short-answer response), or via audio-based or phone-based interviews.
- **Initial instruction.** The instructor then provides high-quality group instruction that is research-based, adapted to local conditions, and addresses learners' learning styles.
- **Progress monitoring through regular formative assessment.** Following the initial instruction, the distance instructor administers a quick test that both assesses learners' understanding and reinforces the most important learning objectives. These can be short quizzes; process journals; an e-mail summary of understanding of main concepts; or a "show of hands" in a learning platform such as Elluminate or WebEx or via the free audio or text-response cell-phone application PollEverywhere,[261] which then sends SMS/voice results to a website.
- **Corrective instruction ("re-teaching").** Following the formative assessment, the instructor provides corrective instruction or re-teaching of the skills and concepts in which learners demonstrated difficulty. Re-teaching does not mean employing the same instructional technique as before, but making accommodations in the types of materials used and differentiating instruction by perhaps offering one-to-one tutoring for one set of learners, "think aloud" protocols with another, or peer tutoring with a third.
- **A second formative assessment.** Following the above corrective activities, learners are given a second, similar type of formative assessment that helps determine the effectiveness of the corrective instruction and allows them to demonstrate mastery of the concept. This second assessment also provides a more reliable measure of learners' competencies than one singly administered assessment.
- **Enrichment or extension activities.** Mastery learning offers enrichment activities to provide challenging learning experiences to students who do not need corrective instruction. This form of differentiated instruction allows learners who have easily grasped content to immerse themselves in more challenging learning situations, while the distance instructor offers remedial and corrective instruction to those who need it.

3. Measure instructional performance, not simply knowledge. While it is important to assess teacher knowledge *about* or *of* teaching, it is more important to measure a teacher's instructional practices, including content-specific pedagogy, instructional methods, and assessment practices. One way to measure teacher practice is through a performance-based assessment, the most common and direct of which is a classroom observation instrument. Classroom observation instruments are often rubric-like in their design and can be classified as either "low inference" or "high inference" in nature[262] (see figure 13.3). A low-inference instrument, sometimes called a "category instrument," may be a checklist or may list objective, observable indicators of teacher practice along a scale (1–5, for example). These numbers may then be

260 See http://www.surveymonkey.com/

261 See http://www.polleverywhere.com/

262 There are also "moderate inference" instruments, but these are omitted from this discussion for the sake of space.

recorded as frequency counts (Rosenshine, 1970: 281). While low-inference classroom observations are easy to complete and can be carried out by less experienced or less well trained classroom observers, they simply measure the quantity, not the quality, of a behavior; and they fail to capture the complexity, breadth, and depth of teacher classroom practice.

High-inference tools, or rating systems, incorporate descriptive information or "constructs" of classroom practice and rate these along some sort of scoring scale (such as a Likert scale).[263] With high-inference classroom observation tools, the observer must infer the constructs to be rated—such as enthusiasm, clarity of presentation, or empathy—recording the frequency through such scales as "consistently," " sometimes," or "always" (Rosenshine, 1970). Because they involve a high degree of interpretation and inference, high-inference classroom observation forms should be used by well-trained observers. Though they are more demanding to use, if used well, high-inference classroom observations yield information that is both reliable and valid.[264] Such information also better captures the quality, complexity, and intricacies of classroom instruction.

Figure 13.3: Characteristics of High- Versus Low-Inference Classroom Observation Systems (Adapted from Rosenshine, 1970)

Characteristics	Low-Inference Observations	High-Inference Observations
General description	Descriptive	Inferential
Recording procedures	Categories	Signs and scale
Items	Low-inference (observation)	High-inference (judgment and interpretation)
Format	Check/binary (yes/no)	Likert scale or some other continuum
Coding	Simple coding	Multiple coding
Focus	Frequency	Quality
Observer skill required	Low	High
Reliability	Low	High

263 The New York State Department of Education has developed a number of high-inference classroom observation rubrics. See http://usny.nysed.gov/rttt/teachers-leaders/practicerubrics/

264 To read more about classroom observations, see figure 20.5 in "Chapter 20: Evaluating Distance Programs."

Another commonly used, but far less direct measure of teacher performance is the examination of teacher and student artifacts and related materials representing classroom instruction. These artifacts can be measured through some sort of assessment protocol and process, for example, the National Center for Research, Evaluation, Standards, and Student Testing's[265] "Scoop" notebook. Though it is recommended that such assessment be used *with* classroom observations, this "examination of artifacts" is a useful proxy when actual classroom observation is not possible. Assessing students' artifacts and related materials as a proxy for instruction is challenging: the artifacts and materials must represent classroom practice "well enough" so that a person "unfamiliar with the teacher or the lessons can make valid judgments about selected features of practice solely on the basis of those materials" (Borko, Strecher, & Kuffner, 2007: 1).

4. Measure teacher productivity. As mentioned previously, the dilemma in assessing pre- and in-service teacher matriculation through a distance education system has been how to measure teacher-candidates' progress and process in learning, the products of their learning, and their fitness as teachers—and to do so in ways that contain direct, observable evidence of "teaching in action." One method of doing so is a performance-based system that assesses teachers' instructional practices, such as a classroom observation tool. But performance-based assessments alone are not enough, since they traditionally do not measure teachers' productivity, that is, how the combination of teachers' content knowledge and instructional practices impacts student learning. Thus, performance-based assessments should be part of an overall teacher assessment system that, when summatively assessing teachers, gives appropriate weighting to a number of considerations (teacher knowledge of content, communication skills, etc.).

Value-added statistical methods are one additional measure of classroom productivity that, when combined with performance-based assessment, may be a good foundation for making judgments about teachers' productivity and, ultimately, the value of the distance learning intervention. Many educational researchers consider value-added statistical methods to be the best available measures of teacher productivity, though many others also accuse these measures of bias and unreliability.[266] Value-added models estimate the contribution of a teacher to student learning by comparing the average level of achievement of a particular teacher's students to the level of achievement that would be expected for an average group of students with similar characteristics, including prior level of achievements. The difference between the *expected* and *actual* level of achievement is the estimate of the value added by that teacher. According to Milanowski (2011: 23), "Most value-added estimates are best interpreted as relative measures of growth since the expected achievement is generally based on an average." However, value-added and instructional practice measures represent two different constructs. While they can be *used* together, they should not be *added* together (Milanowski, 2011: 23).

265 See http://www.cse.ucla.edu/

266 The "value" of value-added models is the subject of rigorous debate. For instance, Kane & Staiger (2008) used value-added estimates of teachers to predict the student achievement patterns of approximately 3,000 students in 78 classrooms, and then randomly assigned teachers to these classrooms. The value-added models were significant predictors of actual outcomes (Sawchuck, 2011b: 2); however, value-added models are highly susceptible to the statistical methods used, such as the nonrandom assignment of students and teachers to schools and classrooms, different effect sizes or results based on the statistical models used, differences in the tests that supply the underlying data, and the fade-out of teacher effects (Rothstein, 2009; Sawchuck, 2011b: 3).

5. **Take advantage of technology for assessment.** Many, perhaps most, distance education programs still employ paper-based assessment systems. Yet where possible, assessment should be tied to the mode of distance education delivery. While certain types of distance education have more opportunities to assess learners than other forms (e.g., online learning versus IRI), all types of technology combined with assessment theory can identify new and better ways to assess what matters, conduct formative assessment, and involve multiple stakeholders in the formulation, design, administration, and analysis of assessment data (U.S. Department of Education, 2010).

The major challenge with any assessment is efficiency—gathering enough data to draw reliable conclusions without creating undue burdens on instructors, undue expense for a distance education provider, and unduly delayed results for learners. The last several years have seen breakthroughs in technology-based assessment that measure complex thinking; lower the cost differential, because assessment takes less time to score and store; enable quick turnaround of assessment data to the instructor and learners, allowing instructors to assess learner performance at a much more granular, detailed level; and allow more reliable scoring and valid data interpretation (Burns et al., 2010; Burns, Christ, Kovaleski, Shapiro, & Ysseldyke, 2008: 18).

In addition to the advantages mentioned above, computer adaptive tests (CATs) can be used with a number of the distance-based modes, such as online learning and multimedia learning, discussed in this guide. CATs can collect sufficient data for highly reliable results in a relatively short time by using the power of technology to select items presented as the test progresses, based on students' answers. CATs typically use item response theory, which measures the difficulty[267] of each test item as well as the probability that the learner will get it right. The computer then matches the difficulty of question to the student's previous performance, so that scores are always comparable to the previous administration.[268] This means that no two students, even if seated next to one another and being assessed on the same content, would take the exact same test, though they would be assessed on the same constructs. Thus, CATs can eliminate redundant questions and questions that are too easy or too difficult and zero in on a student's performance range, thus reaching reliable conclusions in a very short time (Burns et al., 2008: 18).

267 "Difficulty" indicates the level of challenge in answering a particular test item correctly and is determined by the percentage of students likely to get the test item correct. Test items with values near 100 indicate easy test items, while test items with values near 0 indicate difficult ones. Most test items fall into the 60–70 percent range.

268 Effective assessments have a high "discriminating power," which indicates their ability to distinguish between high- and low-performing examinees. Assessments with high discriminating power mean that examinees who answer correctly truly are higher performers than those examinees who do not, and that the answer is based on expertise versus random guessing. Assessments with low discriminating power do not distinguish between high and low performers or do so poorly. In assessments with low discriminating power, examinees may arrive at a correct answer through guessing.

Computer-based assessment[269] provides real versatility in the types of learning that can be measured within any distance education system focused on teacher learning (Rennie Center for Education Research & Policy at MassINC, 2005: 27), for example:

» **Multiple-test administrations.** Learners can take multiple, short, reliable assessments administered during the school year. The data gathered from these assessments can be correlated with national or regional standards so that teacher-learners can be measured on these standards.
» **Dynamic and individualized assessments.** Tests can be personalized and tailored to individual students. The level of difficulty of each question is modulated depending on the learner's previous responses.
» **Immediate feedback to current learners.** Computers can score tests in minutes, allowing distance instructors to make real-time instructional changes based on assessment evidence. Learners thus receive real-time information about their learning and performance. Distance instructors —or the assessment itself, depending on its design—can help and guide learners on what they need to do in order to improve (Black & William, 1998).
» **Vertically aligned tests.** Tests can be anchored to test the same core knowledge at increasing levels of difficulty. This is criterion-based testing.
» **Horizontally aligned tests.** Tests can be scored in such a way that learners can be compared against one another (norm referenced), which is critical for sorting and choosing students for teaching posts, scholarships, and so forth. Raw test scores could be given phase wise[270] or as a total. Learners could receive a letter grade or percentile score to determine their relative position vis-à-vis other learners.
» **Value-added growth measures.** Tests measure individual growth over time, so programs are able to benchmark where learners should be at the end of the year based on tests from the beginning of the year.
» **Greater amount of test items.** This is particularly important for high-stakes assessments that determine whether or not a learner graduates, moves to the next level, or receives certification. For such critical assessments, more test items are necessary than for low-stakes assessments. Computer-based assessments, because they draw from a back-end database of test items, typically comprise more test items than fixed paper-and-pencil exams.
» **Help learners with disabilities.** If computer-based assessments are universally designed (see pages 146–148), they may form less of a physical impediment to test taking than is the case with paper-based tests. For example, screen readers, magnification tools, and text-to-voice or voice-to-text applications can help learners with visual, auditory, and motor impairments; learners with dyslexia; and learners who simply need more time to complete a test.

269 Computer-based assessment is not the same as computer-adapted assessment. CATs adjust or "adapt" the level of difficulty of a test based on a student's responses and are thus more efficient, targeted, and precise than "regular" tests. To do this though, CATs need a large, well-constructed test item pool: highly precise exams need more test items than estimates of achievement, and if the range of skills to be measured is broad, a larger pool of items with increasingly difficult items about a particular domain is also necessary. While CATs are part of computer-based assessment, not all computer-based assessments are adaptive.

270 Step-by-step or in phases.

Yet computer-based assessment is not simply about online or computer-based tests. Technology offers a wealth of authentic assessment opportunities for distance learners, both synchronous and asynchronous, Web-based and non-Web-based, using standard technology (laptops and desktops) and nonstandard technologies (cell phones). For instance, learners can create electronic portfolios, digital representations, and collections of their work in a distance-based course. Online discussions and social media conversations can be a rich source of assessment data. As an example of the latter, learners could work across distance in collaborative assessments in which teacher-learners create joint products to showcase their learning (e.g., folksonomies[271]). Using cell phones, teacher-learners can be assessed on national language abilities (Hindi, English, Swahili) or participate in oral assessments, and their scores can be immediately tabulated and sent back to the same phones. Similarly, learners can use the texting features of cell phones and quickly send answers to a multiple-choice or closed-response quiz, test, or exam, which can be analyzed and tallied, with the score returned via text messaging.

Extensive writing via word processing or a digital writing tool—in which learners put forth a thesis statement, support their idea with evidence and supporting ideas, and come to a conclusion—has been shown to be better than writing by hand if learners go through the complete writing cycle of drafting, editing, revising, and rewriting (Warschauer, 2009). Developing blogs, wikis, and websites, particularly with hyperlinked resources, can demonstrate learners' understanding of an issue, their appreciation of its complexity, and their knowledge of appropriate resources that address this issue. Audio- and Web-conferencing tools allow learners to present information to one another and the instructor and to engage in debates about a particular teaching-related or content-based issue.

Similarly, computer games, as discussed in "Chapter 4: Multimedia-based Distance Learning," can be used as assessment tools. Games, virtual worlds, simulations, and MUVEs provide a developmental sequence of challenges that gradually increase in difficulty, so that players are working at their highest abilities. Indeed, a number of educators (Gee & Shaffer, 2010b) advocate that assessment in general, and computer-based assessments in particular, should use gaming for assessment in one of three ways:

» **Adopting gaming principles in assessment.** Gee & Shaffer (2010b: 14) suggest that assessment designers incorporate the core design features of games into assessments. These include feedback, hints, just-in-time resources, the capture and storage of multiple sources of data over long periods to provide information about learners' work, and the presentation of complex problems that can be solved only through collaboration, systems thinking, and creativity.
» **Use existing games as assessment.** Distance education instructors and assessment designers could have learners play existing, content-focused digital learning games and use "think aloud" protocols to explain their game-based decisions and rationale for such decisions to the instructor.
» **Design games for assessment.** Finally, distance programs could design their own games built around central problems in an academic domain or real-world profession (Gee & Shaffer, 2010b: 17).

271 A folksonomy is a classification system that organizes websites into categories via the use of tags or keywords for easy retrieval. Tagging can be carried out collaboratively so that websites can be shared. This whole process is also known as "social bookmarking" and can be carried out through social bookmarking sites such as *del.icio.us* or *Slashdot*.

Web-based Student Response Systems (SRSs) or "clickers" can be used like hand-held clickers as a diagnostic and formative assessment tool for question-driven instruction (Beatty & Gerace, 2009) and to promote student reflection and metacognition. These Web-based response systems can be accessed via laptops or smart phones.

SRSs or clickers have been associated with higher student achievement when used as part of assessment-based instruction (Marzano, 2009). In such a formative instructional model, the instructor in a webinar or online course poses a multiple-choice conceptual or probing question at strategic junctures in the lesson or lecture, to which learners respond using their clickers. Rather than revealing the correct answer, the instructor asks learners to discuss answers and help their peers understand the correct answer via evidence-based persuasion and reasoning. After some time and discussion, the instructor then repeats the same question with the same multiple-choice responses and learners "revote" using the SRS. The instructor and students examine differences in responses, and learners reflect on the changes or lack thereof in their responses.

Finally, back-end data from LMSs, such as number of log-ins, time on task, and number of discussion posts, can be linked to hard assessment data such as examinations or performance-based data to provide a fuller assessment of a learner's effort and progress in an online course.

However computer-based assessment has weaknesses. For instance, research shows that learners often "game" the technology system, manipulating the technology features of games, ITS, or CAI to arrive at the correct answers instead of wrestling with content (Baker, Mitrović, & Matthews, 2010). The ease of finding information online also makes it easier for examinees to cheat. Despite our wishes to the contrary, younger users of the Internet report that they are likely to cheat, plagiarize, and copy and paste from the World Wide Web without attribution (Haney & Clarke, 2007; Olt, 2002).

While computer-based technology spawns such problems, it also holds the key to their solutions. The following design strategies can reduce cheating in online examinations:

- Design and develop basic password certificates based on authentication methods (Schnipke & Scrams, 2002).
- Use sophisticated biometrics to identify users, so that a friend cannot take an exam for another (Schnipke & Scrams, 2002).
- Stagger the time of assessments or randomly sequence exam questions (Olt, 2002).
- Design exams with conditional branching—where an exam moves to a different question based on a certain answer or condition being met.
- Copy and paste essays into a Web-based search engine to determine authorship.
- Use higher-order questioning techniques to reduce the probability that learners can find standard answers online.
- Pose questions that relate to specific and unique course events, as opposed to general concepts, as deterrents to plagiarism (Olt, 2009).
- Employ a computer-based system virtual proctoring system that installs a proctor (a camera) at each computer workstation to monitor that learner throughout the exam. The room is also outfitted with cameras that provide a bird's-eye view. Once there is evidence that a learner has

cheated, the computer-based exam locks down and remains that way until video recordings are examined and a decision is reached.

- Use plagiarism detection websites such as Turnitin.com and Measure of Software Similarity (MOSS).[272] MOSS is an Internet service that takes multiple source code files and returns a report containing the files that are suspiciously similar to one another. It works with all common programming languages. While MOSS cannot determine if a student copied a solution from the Internet, it can determine if two or more students are copying one another.
- Assign different examination questions to different students.
- Allow learners to participate in the creation of academic honesty policies (Austin & Brown, 1999).
- Use a range of assessment formats—for example, computer-based, performance-based, and face-to-face—in a central location with proctors and invigilators.
- Use improved facial recognition software to help authenticate the identity of the test taker.

6. Design a "flexible assessment" system. Chapter 11 discussed the need for distance-based instructional design (and instruction) to be flexible. Assessment, too, should be designed flexibly (Commonwealth of Learning, 2008; Moon et al., 2005). To understand flexible assessment, it is first important to examine the four functions of assessment.

Assessment can generally be used for the following purposes:

- **Choosing/sorting/screening.** To assign learners to a particular slot, spot, seat, position, or level based on performance.
- **Certification.** To assure that the student has met/exceeded guidelines.
- **Instruction.** To inform the instructor how well, or poorly, learners understand content. This allows the instructor to reteach information or change the course of instruction.
- **Learning.** To measure the student's grasp of content on an ongoing basis (Partnership for 21st Century Skills, 2005).

Because assessment serves a variety of functions, what and how we assess demand a variety of assessment tools. This point is extremely important for distance education programs. Assessment is a tool to measure student learning. Like any tool, its use is specific to its intended outcome; and if not used appropriately, it will produce a poor measure or product. Assessment tools are not co-equal in addressing every purpose. More often than not, in many educational contexts, assessment tools are used so inappropriately that they fail to measure what they are intended to measure.

As figure 13.4 demonstrates, the purpose of the assessment drives the kind of assessment that will be used. It is therefore critical that a distance learning program's assessment be flexible and adaptive enough to support the multiple purposes for assessment and multiple types of assessment.

272 For more information on MOSS, see http://theory.stanford.edu/~aiken/moss/. MOSS was developed by Stanford University for noncommercial purposes. Institutions and teachers can obtain a free MOSS account by contacting Stanford University at moss@moss.stanford.edu. The body of the message should appear exactly as follows on two lines: (line 1) register user mail (line 2) *username@domain*.

Figure 13.4: Common Types of Assessments and Their Advantages and Disadvantages (Adapted from Commonwealth of Learning & Asian Development Bank, 2008: 4–13, 4–14)

Assessment	Good For . . .	What's Being Assessed	Advantages	Disadvantages
Multiple-choice questions	Quick assessment of: ▪ Learning ▪ Instruction	▪ Facts ▪ Understanding of ideas ▪ Application of principles	▪ Fast and reliable marking ▪ Can assess many more topics broadly ▪ Faster return of exam results to students ▪ Assesses declarative knowledge	▪ Harder to assess procedural or conceptual knowledge ▪ Very difficult to create good multiple-choice tests (especially with good "distracters") ▪ Harder (though not impossible) to assess higher-level thinking ▪ Can't assess skills of organizing or originality

Assessment	Good For . . .	What's Being Assessed	Advantages	Disadvantages
Essays	▪ Choosing/sorting ▪ Instruction ▪ Learning	▪ Understanding of ideas ▪ Ability to organize information ▪ Ability to formulate an argument, support it with ideas and evidence, and formulate a conclusion based on arguments and evidence	▪ Assesses higher-order thinking ▪ Assesses procedural and conceptual knowledge ▪ Allows students to express their knowledge in a less constrained, more open format than a closed test (such as multiple-choice, short answer, fill-in-the-blank)	▪ Needs scoring rubrics, or grades are very unreliable ▪ More difficult to assess validity ▪ Takes longer to grade ▪ Without well-designed rubrics, subjectivity of grader always a major concern ▪ Needs writing to be emphasized or taught in curriculum to prevent mechanical and rhetorical difficulties from getting in the way
Oral assessments	▪ Choosing/sorting ▪ Certification ▪ Instruction ▪ Learning	▪ Oral fluency ▪ Assessing reasoning behind thinking ▪ Assessing abilities such as speaking, poise, thought processes	▪ Flexible ▪ Possibility that give-and-take of conversation/oral communication may be more natural to the learner ▪ Useful to confirm other assessments	▪ Needs a rubric ▪ Time-consuming to mark ▪ May be difficult to standardize questions ▪ Possible introduction of bias due to personal nature of assessment

Assessment	Good For . . .	What's Being Assessed	Advantages	Disadvantages
Field work	▪ Certification ▪ Instruction ▪ Learning	▪ Application of principles ▪ Understanding of information and ability to transfer to and use in new, practical situations	▪ Assesses procedural and conceptual knowledge ▪ Calls for more open-ended assessment (journals, portfolio, video, examples of student work, etc.)	▪ Needs a rubric ▪ Time-consuming to mark ▪ Difficult to come up with a standard assessment due to variation of field work among learners, ▪ Since field work sites may be so varied, may also be difficult to assess by reliable means
Project, thesis	▪ Choosing/ sorting ▪ Learning ▪ Certification ▪ Instruction	▪ Reveals depth of knowledge ▪ Assesses creativity and organization of information ▪ Assesses writing, documentation of skills	▪ Assesses declarative knowledge ▪ Mainly assesses procedural and conceptual knowledge	▪ Time-consuming to grade ▪ Potential subjectivity, lack of validity, and reliability without well-developed rubric

Assessment	Good For . . .	What's Being Assessed	Advantages	Disadvantages
Portfolio	▪ Choosing/ sorting ▪ Learning ▪ Certification ▪ Instruction	▪ Same as three points above ▪ Multiple levels of assessment (from knowledge of facts to analysis and evaluation of information to self-reflection)	▪ Encourages learners to display knowledge and understanding in multiple formats using portfolios, especially electronic or Web-based ones	▪ Same as above

Designing assessments for higher-order thinking. Too much assessment focuses on learners' recall of discrete and decontextualized facts. Yet as every professional knows, beyond the academic environment we are rarely ever asked to furnish declarative knowledge (facts). Rather, we are judged professionally on skills, conceptual knowledge, procedural knowledge, aptitudes and disposition.

Most educators are familiar with Bloom's taxonomy of cognitive skills, which categorizes knowledge along a continuum from *knowledge* (recitation of information) to *evaluation* of information. Figure 13.5 outlines the Cognitive Domain of Bloom's Taxonomy.

Figure 13.5: Cognitive Domains of Learning (Bloom, 1956)

	Competence	Skills Demonstrated
Lower-level learning	**Knowledge**	▪ observation and recall of information ▪ knowledge of dates, events, places ▪ knowledge of major ideas ▪ mastery of subject matter *Question cues:* list, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.
	Comprehensive	▪ understand information ▪ grasp meaning ▪ translate knowledge into new context ▪ interpret facts, compare, contrast ▪ order, group, infer causes ▪ predict consequences *Question cues:* summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend
Higher-order thinking skills	**Application**	▪ use information ▪ use methods, concepts, theories in new situations ▪ solve problems using required skills or knowledge *Question cues:* apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover
	Analysis	▪ see patterns ▪ organize parts ▪ recognize hidden meanings ▪ identify components *Question cues:* analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer

	Competence	Skills Demonstrated
	Synthesis	▪ use old ideas to create new ones ▪ generalize from given facts ▪ relate knowledge from several areas ▪ predict, draw conclusions *Question cues:* combine, integrate, modify, rearrange, substitute, plan, create, design, invent, what if?, compose, formulate, prepare, generalize, rewrite
	Evaluation	▪ compare and discriminate between ideas ▪ assess value of theories, presentations ▪ make choices based on reasoned argument ▪ verify value of evidence ▪ recognize subjectivity *Question cues:* assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize

Distance-based assessment systems are faced with the challenge of preparing teachers to teach in a 21st-century educational and economic environment that emphasizes what Bloom termed "higher-order thinking skills." For teachers to help students develop such skills, teachers themselves must develop these critical thinking faculties. And for teachers to develop these skills, distance education systems must instruct and assess teacher-learners in higher-order ways. They must assess teachers' abilities to apply new information, analyze divergent information, synthesize discrete topics into one unified idea, and evaluate the merits and demerits of a particular teaching strategy or curriculum guide. Distance-based programs must assess both the product of learning and the thinking process of learners—what teachers have learned and how they learn. As figure 13.6 demonstrates, these various types of higher-order assessment demand various types of assessment tools.

Figure 13.6: Specific Strategies for Assessing Higher-Order Thinking (Brookhart, 2010: 144–147)

To assess how well learners can . . .	Provide this kind of material . . .	And ask learners to . . .
Focus on a question/ identify the main idea	▪ Text, speech, problem, policy or experiment and results	▪ Identify the main issue, main idea, problem and explain their reasoning
Analyze arguments	▪ Text, speech, or experimental design	▪ Identify what evidence the author gives that supports/contradicts the argument ▪ Identify assumptions that must be true to make the argument valid ▪ Explain the logical structure of the argument (including irrelevant and contradictory structures)
Compare and contrast	▪ Two texts, events, scenarios, theories, experiments, works of art	▪ Identify elements in each ▪ Organize elements based on their similarities and differences
Evaluate materials and methods for their intended purposes	▪ Text, speech, problem, policy, or experiment and results	▪ Identify the author/designer's purpose ▪ Identify elements in the work ▪ Judge the value and validity of these elements in accomplishing the intended purpose ▪ Explain their reasoning and support with evidence
Put unlike concepts together in new ways	▪ Complex task/problem	▪ Generate multiple solutions ▪ Produce something new
Make or evaluate a ***deductive*** conclusion	▪ Statement or premise	▪ Draw a logical conclusion based on reasoning and evidence ▪ Select a logical conclusion from a set of choices
Make or evaluate an ***inductive*** conclusion	▪ Statement, scenario, information in form of graph/ chart, set of examples	▪ Formulate a hypothesis ▪ Test hypothesis and revise ▪ Formulate a definition or concept based on examples and non-examples

To assess how well learners can . . .	Provide this kind of material . . .	And ask learners to . . .
Identify/define a problem	▪ Scenario, problem description	▪ Identify the problem that needs to be solved ▪ Identify the question that needs to be answered
Reason with data	▪ Text, graph, chart, data table, problem that requires more information or a solution	▪ Solve the problem and explain reasoning using data
Think creatively	▪ Complex problem/task requiring brainstorming new ideas/reorganizing existing ideas or a problem with no currently known solution	▪ Produce an original text, product, concept, or idea ▪ Organize materials in new ways ▪ Reframe a question/problem in new ways

Conclusion

Realigning assessment within distance learning programs toward recognized best practices involves a number of approaches that will be new in many systems, including the following:

» Defining and analyzing “instructional quality” into discrete measurable indicators
» Using discrete, differentiated modes of assessment to monitor teachers’ progress and learning (formative assessment) and evaluate their final performance (summative assessment)
» Measuring only the core skills and competencies that teacher education programs seek to enhance, rather than measuring everything (Moon et al., 2005)
» Designing grading policies that combine self-, peer- and instructor assessment of the products, processes, and progress of learning (Marzano, 2000)
» Using a wider range of context-based, complex tasks that can be used with multiple approaches and solutions, instead of using only assessment items that are short, skill-focused, single-answer, and decontextualized (Voltz et al., 2010)
» Training assessors so that they can effectively and reliably use a range of high-inference assessment tools.

In sum, realigning teacher assessment within a distance learning system will require shifting from traditional, exam-based, closed-response assessments, in which knowledge of discrete facts is measured and where cheating is more prevalent, to a more learner-centered approach using open-ended essay questions that probe understanding; projects; portfolios; and performance-based assessments that measure what, how, and why students have learned (Marzano, 2000).

Before concluding this chapter, it is important to note that the many teachers with whom we will interact in any distance education system are extremely diverse. They are diverse in terms of language ability, experience, time in the classroom, gender, and educational and professional opportunities. They are diverse in their approaches to learning and in their learning styles or "intelligences." They are diverse in their likes and dislikes, in their personal strengths and weaknesses, and in their levels of commitment to learning. Therefore, just as no distance education system can impose a one-size-fits-all instructional approach, no distance education system can impose a one-size-fits-all assessment approach. It is important to make any assessment system as diverse as possible in order to be as fair and sensitive[273] as possible to a variety of learners. "Fairness" does not mean that every teacher-learner receive the same test—though we recognize that for some purposes, standardized and normative tests are necessary. Rather, it means that every learner has an equal opportunity to be assessed in the manner that best showcases what he or she knows and can do.

To employ assessment with diverse learners, assessors should use inferences from multiple and balanced sources of evidence rather than using one single source of evidence (Grant & Sleeter, 2007: 207–208; Voltz, Sims, & Nelson, 2010). As one example, U.S. teachers applying for National Board Certification[274] are assessed based on 10 assessment measures, including an examination of content knowledge, a comprehensive portfolio of teacher practice and student work, and interview-based methods developed by the National Board for Professional Teaching Standards.[275]

Undoubtedly, in many countries in which this guide will be read, teachers speak a number of languages other than the national language. The importance of providing assessment in a learner's mother tongue has been widely acknowledged as a best practice in assessment. Numerous distance education systems have made reasonable accommodations for non-national-language speakers by making test taking more flexible to allow examinees to have time to think and respond to questions in the national language, or by providing dictionaries and visual and audio information to learners in their native language and language of instruction (e.g., Kannada, English; Bambara, French; Sundanese, Bahasa Indonesia, etc.) (Grant & Sleeter, 2007; Ariza, 2006; Diaz-Rico, 2004). Better still, of course, is conducting the assessment entirely in the learner's mother tongue.

273 "Sensitive" here is used in an assessment sense—designing instruments in such a way that they accurately measure what they are supposed to measure.

274 National Board Certification is an advanced teaching credential in the United States that complements, but does not replace, a U.S. state's teacher license. It is valid for 10 years. National Board Certification is achieved upon successful completion of a voluntary assessment program designed to recognize effective and accomplished teachers who meet high standards based on what teachers should know and be able to do. See http://www.nbpts.org/ for more information.

275 See http://www.nbpts.org/the_standards

Chapter 14: Preparing Distance Instructors

Best Practice: *Successful distance education programs provide high-quality professional development for distance learning instructors.*

Overview

Teaching at a distance can be a major paradigm shift, particularly in videoconferencing and Web-based environments. Distance instructors may need to learn how to use technology and may view the technology as supplanting the instructor as an authority. Instructors may need to embrace and model the learner-centered instructional approaches outlined in chapter 12. These new types of pedagogy may conflict with instructors' beliefs about the role of the instructor. Instructors without a strong knowledge of technology or pedagogy face a steep learning curve (Robinson & Latchem, 1997). Those with more knowledge may still find it difficult to integrate technology and pedagogy. Instructors who have never used technology and learner-centered pedagogy and resist the changing relationship between teacher, student, and technology may face the most difficult challenges of all.

In their study of how Australian university faculty embrace online technologies and pedagogy, Maor and Zoriski (2003) explain that instructional staff approach online learning in different ways. An emerging group of lecturers enthusiastically adopts online learning to match a social constructivist approach to teaching. Another group uses technology but does not extend pedagogy to capitalize on the interactive potential of technology. A third group uses constructivist approaches in face-to-face sessions but does not use online learning for the same procedures. A fourth group does not acknowledge the potential of e-learning as an interactive tool for teaching and learning and therefore deliberately does not use technology in teacher training.

Preparation for Distance Instructors

For these reasons, all distance education programs must make sure to develop minimum *competency standards* for distance instructors and provide them with ongoing, high-quality professional development, so that they in turn can provide the high-quality instruction (outlined in chapter 12) that will hopefully result in improved student learning. Figure 14.1 outlines the iNACOL standards for instructors in online and virtual school environments. iNACOL, along with numerous other forms of research and practice on distance education for teacher training, emphasizes that distance learning programs must help instructors develop the following competencies:

- Learn how to teach in the same distance education medium in which instructors will be teaching (iNACOL, 2008).
- Focus on the core areas of teaching: content knowledge, instruction, and organizing for learning and assessment.
- Become conversant with distance education instructional teaching standards.
- Model key behaviors in effective distance teaching, such as providing timely and meaningful feedback, maintaining and sustaining student interest and motivation, promoting interaction and shared reflection (Kearsley & Blomeyer, 2003), and knowing when and how to provide ongoing

technology-mediated and face-to-face support (Kearsley & Blomeyer, 2003; Moon, Leach, & Stevens, 2005).

- Differentiate instruction and support to learners according to their needs, skills, and professional context (iNACOL, 2010).
- Work in face-to-face and distance-based supervisory settings with their learners (Moon, Leach, & Stevens, 2005).
- Know how to use technology as well as design and teach with technology (e.g., using e-mail, chat, bulletin board systems, LMSs and understanding threaded discussions, blogs, and Web 2.0 tools).
- Create quality assessments that capitalize on the benefits of the particular distance technology (iNACOL, 2010).
- Understand grading and administrative procedures, particularly within an LMS.

Figure 14.1: Standards for Online Instructors (iNACOL, 2008)

- Holds professional academic and teaching certification
- Possesses prerequisite technology skills
- Plans, designs, and incorporates strategies to encourage active learning, interaction, participation, and collaboration in an online environment
- Provides online leadership in ways that promote student success through regular feedback, prompt response, and clear expectations
- Models, guides, and encourages legal, ethical, safe, and healthy behavior related to technology use
- Has experienced distance learning from the point of view of a learner
- Understands and is responsive to learners with special needs
- Demonstrates competencies in creating and implementing assessments in online learning environments to assure validity and reliability of instruments and procedures
- Develops and delivers assessments, projects, and assignments that meet standards-based learning goals and assesses learning programs by measuring learner achievement of learning goals
- Demonstrates competencies in using data to modify instructional methods and content to guide student learning
- Demonstrates frequent and effective strategies that enable instructor and learners to complete self- and pre-assessments
- Collaborates with colleagues
- Arranges media and content to transfer knowledge most effectively in distance learning environment

What Skills Do Distance Instructors Need?

Every mode of distance education presents its own unique set of instructional challenges. Research on Web-based or e-learning reveals that online instructors face a diverse and unique set of additional challenges that require added professional development and support (Center for Children and Technology, 2008; Chickering & Gamson, 1987). This professional development includes the following:

Content knowledge. Distance education instructors must know their content and must know how to help learners develop an understanding of content in a distance environment. Often, assumptions prevail that all distance learning is a self-study process in which content (for example, online readings) serves as didactic materials and that learners can learn key content ideas on their own simply by watching a video or reading text. In such an environment, distance instructors focus on communication, record keeping, and administrative tasks. Distance instructors need to know content well, but most of all, they need to know how to help learners develop a deep understanding of content and know how to use content-appropriate instructional strategies in a technology-mediated environment.

Blend pedagogy, technology, and content. Distance learning programs often struggle to find well-qualified instructors who understand how the intersection of technology, pedagogy, and content can provide meaningful learning experiences for learners; who exhibit skills of self-direction and time management that enhance their efficacy as online instructors; and who understand the importance of and have the skills to provide active facilitation and technology-mediated support (Vanourek, 2006). Distance learning programs also struggle to find instructors who know how to modify the instructional practices and pedagogical techniques used in face-to-face settings for the online environment (Tallent-Runnels, Thomas, Lan, Cooper, Ahern, Shaw, & Liu, 2006). These struggles arise from two sources: The first is that very few distance programs train instructors in the distance medium in which the instructor is supposed to teach. The second is that distance instructors are often recruited in face-to-face settings where this intersection of technology, pedagogy, and content is quite different from online settings. Three immediate solutions to these two issues are listed below:

» Engage distance instructors in the sorts of quality and extensive professional development (see “Chapter 10: Professional Development”) and support (“Chapter 17: Supporting Distance Learners”) that can help them make such connections.
» Prepare distance instructors to teach in the medium in which they will instruct (this issue will be discussed in greater length later in this chapter). Medium-based instruction can help instructors develop the necessary skills to foster interaction and communication with and between learners during the online learning experience. It also shows distance instructors how to use telecommunication tools in support of instructional methodologies that can encourage learner collaboration and knowledge acquisition (Swan et al., 2001: 11).
» Introduce distance instructors to frameworks of knowledge, such as *technological pedagogical content knowledge*, which emphasize connections among technologies, curriculum content, and specific pedagogical approaches so that instructors can blend technology, pedagogy, and content to produce effective, discipline-based teaching via technology (Harris, Mishra, & Koehler, 2008: 396).

Establish an online presence. In an online learning environment, the instructor plays a critical and multifaceted role. He or she is the “face” of what can be, for novices, a disembodied and potentially disorienting experience. Facilitators must work to establish a welcoming presence, set a tone that encourages reflection and inquiry, broaden and deepen online communication, assess both individual and group learning and interactions, make critical judgments about whether and how well participants are gaining content-specific knowledge, encourage those who fall behind in posting, know when and when not to intervene, and summarize participant learning (Burns, 2010b). Most critically, to make the online environment feel like a conversation and foster a sense of belonging, facilitators must provide "verbal immediacy" and "just-in-time" assistance. Strong and skilled facilitation—of knowledge, of the learning process, and of helping learners manage their time and tasks—is even more important when learners are new to online education and/or used to traditional, didactic learning environments (Chamot, 1990).

Reading and writing skills. Distance learning doesn't eliminate the need for strong literacy skills; in fact, some forms of distance learning, especially online learning, magnify the need. Online learning makes instructors and learners vulnerable because it demands good reading skills—and many instructors, like their students, don't like to read, read poorly in a national (as opposed to local) language, or are simply poor readers.[276] Online learning also demands strong writing skills. In particular, instructors and designers must develop thoughtful writing prompts to spur meaningful online discussions. Prompts must provide the writer with some background knowledge of the question being asked and balance openness with specificity so that the writer understands expectations and can hypothesize and demonstrate his or her understanding of a particular topic. At the most basic level, instructors must master conventions of grammar, spelling, and mechanics so that students understand what they write.

Effective communication. Online discussions are often the "tie that binds" a collection of individual learners into a collaborative learning community. Without such discussions the learning opportunity becomes a solo endeavor, and opportunities for deeper learning are lost (Burns, 2010b). The promotion of such collaborative communities through online discussion groups requires skilled facilitation by instructors, who employ strategies to elicit learners' beliefs and understandings. They recognize when and how to respond to individuals and to the group in order to shape and promote interaction. They guide participants along a continuum of learning from awareness of new techniques to adapting and applying such techniques in their own professional settings. And again, they provide verbal immediacy and just-in-time assistance to learners. These latter practices are critical elements in the coherence of online groups, since an online instructor's response time can bridge the virtual distance between the instructor and students or deepen it (Rodriquez, Plax, & Kearney, 1996; Gorham, 1988).

Ability to manage learners. Less structured forms of distance learning, such as Web-based courses or immersive environments, can be extremely difficult for learners who have never been given the independence or flexibility to chart their own learning course, or who come from education systems that are top-down and directive. Distance learners often have difficulty completing their work in such an open environment, particularly when they are not part of a place-bound physical cohort of other learners.

Distance instructors must devote time to assisting such learners by motivating them, counseling them, offering just-in-time support, monitoring their performance, and providing one-on-one and differentiated tutoring. Distance instructors will need to provide the right amount of support and pressure via the technology available (SMS, phone, e-mail) on an ongoing basis. Though this notion of supporting and interacting with distance learners sounds intuitive, it is often not the norm in many established distance learning environments, in which learners are expected to go it alone and support for, management of, and

276 Research (Chang & Ley, 2006) suggests links between online reading and increasing learners' "cognitive load"—especially hyperlinked reading as is found on many websites.

monitoring of learners is not built into the distance education system. In such environments, instructors function as resource people or tutors, interacting with learners only when prompted by their e-mail requests.

Studies of teacher preparation in the United States provide additional information on what online instructors say they need to be successful in an online environment: instruction and professional development that starts early, is substantial, ongoing, bite-sized, subject-specific, and fully online and facilitated so that it models what teacher-learners are supposed to be doing. Unfortunately, globally, very few schools of education or teacher training colleges offer courses that teach teachers to teach online, and those that do often do not partner with virtual schools or school-based online programs.

Preparing Online Instructors

As mentioned earlier, many, if not most, distance education instructors across the globe have been given little or no preparation in the distance mode in which they will be teaching— videoconferencing, online professional development, virtual schools, television, and so on. This situation is beginning to change in the area of Web-based learning with the emergence of increasingly exemplary programs that offer intensive and thorough preparation for distance educators. For instance, the UK's Open University provides post-graduate certification in teaching online[277] and Canada's open university, Athabasca University, offers Masters and PhD programs in distance education.[278] The University of Phoenix,[279] a U.S.-based "single mode" or online university, is noted for its very extensive preparation of online instructors, which includes several months of training plus an online mentor who works behind the scenes with the novice online instructor.

Singapore is an example of a nation that uses online instruction to educate all of its teachers how to teach online. England has a national program to train professional development providers, both distance and face-to-face, in state-of-the art and best practices in professional development. In the case of Indonesia's USAID-funded DBE 2 school-based coaching program, online instructors initially participated in online learning over a two-month period as learners and then received a two-week face-to-face orientation in online instruction. Online instructors worked as partners, supporting one another, and were mentored by experienced EDC staff. Also within Indonesia, several faculty from teacher training colleges developed the expertise needed to teach online by participating in EDC's ETLO program, which prepares educators to teach online and to design online courses.

Online instructor preparation via partnerships; face-to-face orientations; or, best of all, instructor formation in the particular distance-education medium in which they will instruct may not always be viable options for distance learning institutions. In such cases there are some websites that prepare instructors

277 See http://www3.open.ac.uk/study/postgraduate/qualification/f10.htm

278 See http://calendar.athabascau.ca/grad/distance_03.php

279 See http://www.phoenix.edu/

to teach online at no cost. One is WizIQ.[280] Another is Penn State University's Faculty Development 101.[281] The University of New South Wales's Learning to Teach Online[282] program is a free online professional development program that helps instructors in any discipline learn a range of online instructional pedagogies. EDC's EdTech Leaders Online[283] program and Harvard University's WorldWideLearn[284] also provide a variety of programs to prepare faculty for online instruction; however, these programs are fee-based.

Preparing to Teach in Virtual Schools

The proliferation of *virtual* (online) primary and secondary schools in the United States has resulted in an increased focus on preparing instructors to teach in such environments. While most U.S. states do not require a separate credential for online teachers, virtual schools often make professional development for online teaching mandatory. For example, incoming teachers at the Georgia Virtual School[285] must now take and pass a yearlong course in online instruction that includes completion of a virtual field experience (Quillen & Davis, 2010). The state of Idaho offers extensive instruction to prepare its teachers to teach in its online high schools, academies. and supplemental programs.

The Texas Virtual School Network,[286] created in January 2009, must employ only teachers who are Texas-certified and have completed an online professional development program accepted by the network. Idaho, mentioned above, is finalizing work on a two-tiered certification: one for instructors who teach "blended" face-to-face and online classes, which every Idaho pre-service teacher would earn, and one for fully online instructors, to be earned by in-service teachers (Quillen & Davis, 2010).

ETLO provides online professional development to help educators learn how to teach in and design instructional activities for an online environment. ETLO's 8- and 10-week online courses respectively prepare potential online instructors and potential online course developers in the very medium in which they will be teaching. ETLO's preparation of virtual-school instructors is even more systematic. It helps key virtual-school decision-makers successfully plan and implement a local virtual-school program. Additionally, it prepares faculty to effectively mentor and support virtual-school students, prepares students to become successful virtual-school learners, and provides ongoing online professional development opportunities for all faculty.

280 See http://www.wiziq.com/

281 See http://www.worldcampus.psu.edu/AboutUs_FacultyDev101.shtml

282 See http://online.cofa.unsw.edu.au/

283 See http://edtechleaders.org

284 See http://www.worldwidelearn.com/

285 See http://www.gavirtualschool.org/

286 See http://www.txvsn.org/

In addition to ETLO, Boise State University,[287] Florida Virtual School[288] and Iowa Learning Online[289] (all U.S. institutions) offer professional development for instructors teaching in online learning programs or in virtual or cyber schools. Florida Virtual School (FLVS) has been lauded for its preparation of online instructors. It has contracted with Florida universities to provide instruction in online learning to potential FLVS instructors and to supervise FLVS instructors as they complete an internship teaching their first online class.

Chapter 5 discussed Louisiana's Virtual Algebra I program, an online algebra class for students in rural areas.[290] The state education agency of Louisiana provides professional development to both the online instructor and the in-class teacher. The online instructor is prepared to teach online, while the in-class teacher receives pedagogy training and mentoring that helps build his or her capacity for high-quality instruction. The in-class instructor and online instructor meet for two days in the summer in a face-to-face workshop to plan out communication, materials, and instruction. Throughout the school year, the two teachers communicate daily via e-mail and phone calls.

Some online programs forgo extensive online instructor training in difficult areas such as online inquiry, collaboration, and discussion in favor of providing instructors with scripts and prompts that attempt to compensate for their lack of skills or to supplement existing skills in these areas. This is particularly the case in online learning courses that are specifically text-based. Examples of these scripts and prompts include *prompt-based, content-specific scripts* that focus on teaching content to online learners, *interaction-oriented scripts* to promote learner reflection, *prompt-based, content-specific scripts* to support the learners' identification of relevant information, and *prompt-based, interaction-oriented scripts* to encourage learners to assume specific inquiry-related tasks and roles (Clark, Weinberger, Jucks, Spitulnik, & Wallace, 2003: 61). It is not clear what, if any, research or results exist regarding the quality or feasibility of such a scripted approach.

One aspect of distance learning for which we have been unable to find substantive examples of preparation for distance instructors is in the area of videoconferencing. This is indeed unfortunate as teaching face-to-face and via videoconferencing are quite different undertakings. It is often assumed that one can use the same skill set in a video environment as in a face-to-face setting. However, this is not the case, particularly given the issues around broadband availability and the constraints of teaching and learning in any technology-mediated learning environment, especially in parallel modes of video-based learning. This lack of understanding of the differences between video-based and face-to-face learning environments, models of video-based instruction, and the failure to prepare professional development providers to teach in a video-enabled environment may account for the poor quality of instruction that still characterizes much video-based distance education.

287 See edtech.boisestate.edu/

288 See http://www.flvs.net

289 See http://www.iowalearningonline.org/

290 The online class is facilitated by an online instructor (certified to teach algebra) and an in-class instructor (not certified in algebra). The online instructor provides the initial lesson, and the classroom teacher works with students to complete activities that reinforce the concepts.

Conclusion

In order for distance education programs to prepare or upgrade the knowledge and skills of learners successfully, distance instructors need rigorous professional development in the distance education medium in which they will be teaching.

Distance learning institutions should develop, or adopt, standards for teaching in an online environment (see figure 14.1). Web-based instructors must exhibit qualifications that conform to these standards. They should possess *technology skills*, including the ability to use synchronous and asynchronous tools such as discussion boards, chat tools, and digital whiteboards; be able to *promote interaction between instructors and learners*; demonstrate strategies to encourage *active learning*, interaction, participation, and collaboration in the online environment; provide *regular feedback*, prompt responses, and clear expectations to learners; and be able to *implement and deliver online assessments* that are both valid and reliable, but also complex enough to test student knowledge beyond a multiple-choice exam (iNACOL, 2010). Similarly, administrators of distance learning programs also need professional development and support so that they are cognizant of the instructional changes and requisite resources and supports to fully sustain any distance education system.

Underlying all of this process—and this is the challenge—is the need to develop a new paradigm of what distance learning involves, one that moves away from the passive model of distance education in which materials are placed online and learners fend for themselves. Rather, distance education must embrace the paradigm outlined in figure 8.1 of this guide (pp. 123–124), in which instructors and learners together interact with regard to a set of shared materials and experiences and the instructor guides, assesses, and is responsible for the successful preparation of teacher-learners.

Chapter 15: Preparing Distance Learners

Best Practice: ***Successful distance education programs prepare learners to take part in learning within a distance environment.***

Overview

For many prospective and current teachers, their first experience as distance learners may occur in their very first distance learning program. For highly structured, technically simple, and classroom-based distance programs such as IRI, IAI, interactive television, or GTLS, a lack of preparation in these modes of distance education can make learning and implementation of learning difficult. But for less structured, highly technical, and non-classroom-based modes of distance education—immersive environments, Web-based learning, and virtual schools—lack of preparation in the intended mode of distance learning may make learning impossible.

Distance learning courses suffer from high attrition rates, with an overall dropout rate of 40 percent (Potashnik & Capper, 1998). In many Asian open universities the rate is much higher, reaching 90 percent (Latchem & Jung, 2010). This high attrition rate is due to a number of factors: the very open and distant nature of distance learning (Perraton, Creed, & Robinson, 2002), lack of support (Perraton, 1993; Nielsen, & Tatto, 1993), and unfamiliarity with learning in a distance environment (Latchem & Jung, 2010; Center for Children and Technology, 2008). As difficult as it is for instructors to *teach* successfully in a distance environment, it is equally difficult for students to be successful distance learners, especially if they are experiencing new modes of instruction and new uses or types of technology. Therefore, just as successful distance learning programs prepare their instructors to teach in a distance environment, successful distance programs also prepare *learners* to succeed in a distance environment.

What Qualities Define Successful Distance Learners?

Three primary sets of intersecting characteristics distinguish "successful" from "unsuccessful" distance learners, that is, those who don't drop out versus those who do (Bandura, 1986). The first are *personal characteristics* such as autonomy, responsibility, curiosity, self-efficacy (Keegan, 1996), and "an internal locus of control"[291] (Rotter, 1989), which leads the learner to persist in educational endeavors (Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004: 7).

The second set is *environmental variables* such as study environment, access to technology, access to support and materials, the learner's role identification, and sense of connection or isolation. Isolation of the student from the teacher, the institution, and the learning group can be exacerbated by the differentiated staffing models that are often used to implement distance education (Kember, 1995).

Third are *learning characteristics*. These include expectations for the course, experience with computer-delivered instruction, self-regulation, time management, and management of information.

291 This is when an individual feels that control of the self rests in his or her own hands.

E-Readiness

For the sake of simplicity, these three sets of variables may be collapsed under the term "e-readiness"[292] (Center for Children and Technology, 2008); taken together, they profoundly impact whether distance learners stay or go, succeed or fail. In many parts of the world pre- and in-service teachers may enter a distance learning environment, particularly an online learning environment, with little or no e-readiness. They may have little or no experience with distance learning in general and online learning in particular. They may not know what an online discussion is, why it is essential to the course, how to compose the types of thoughtful responses that provoke and sustain discussion, or how to respond to a colleague's posts—especially if they disagree with the content (Center for Children and Technology, 2008; Burns, 2010b). They may lack familiarity with conventions of online communication. They may have no knowledge of "netiquette"—using appropriate subject lines, addressing the individual or group, and using techniques to extend the online discussion—seemingly minor points that cumulatively can derail communication and learning in an online environment. More critically, learners may not understand the value of interacting with a likeminded community of professionals or see themselves as part of a broader network (Burns, 2010b). Without a skilled facilitator and an active online community, they may see themselves as alone. This lack of familiarity with conventions of online learning and sense of isolation, coupled with technical or learning challenges, prompts many learners, either officially or unofficially,[293] to drop out of their online learning program. This high rate of attrition undermines the quality, effectiveness, validity, and cost-effectiveness of distance education. In a word, this attrition undermines the very rationale for distance learning and calls into question whether it is worth the investment.

Preparing Teachers to Be Distance Learners

For these reasons, distance learning programs must prepare students to become successful distance learners. By "successful," we mean that students do not drop out, that they complete their distance course. Distance programs can undertake this preparation in a number of ways:

- **Diagnostically assess a learner's "readiness" to participate in a distance course.** Research on successful distance learners demonstrates that they are highly motivated, self-directed, and comfortable with technology and have good time-management skills. While these are clearly the types of learners that distance programs should attempt to reach, these findings do not mean that students who lack all of these skills should be screened out of distance education opportunities, since research also demonstrates that these skills can be cultivated in an online learning environment. Rather, it means that distance programs must diagnostically assess a student's readiness to participate fully in online courses via learning skills and interest inventories or "mini-courses" that give learners a taste of learning in an online world. Further, as will be discussed in "Chapter 17: Supporting Distance Learners," it means that distance providers must provide ongoing support to such learners.

292 E-readiness in this sense encompasses the whole process of online learning—access to available technologies; technology *skills and literacy*, a *disposition* toward technology and learning from a community of peers mediated by technology, and *awareness* and *appreciation* that technology affords and requires participation in a virtual community of likeminded learners.

293 This "unofficial" attrition is evident in many open universities that have low rates of graduation and students who linger in the system well beyond the allotted time to complete a course of study.

- **Offer a face-to-face orientation (especially for new distance learning models).** This approach allows instructors and learners to examine the syllabus; learn how to use technology, materials, and procedures; ask questions; and get to know their colleagues and instructor. Such orientations have proved to be an effective strategy for learner completion of online learning experiences (Center for Children and Technology, 2008). EDC's Indonesian school-based coaching/one-computer pilot program (a component of the USAID-funded DBE 2 project) offered a one-week face-to-face orientation to 60 Indonesian educators studying online to be coaches. In follow-up questionnaires, many of the 78 percent of coaches who successfully completed their online course of study cited this orientation as one of the factors contributing to their success as online learners (Ho & Burns, 2010). Other distance programs with high completion rates, such as IRI and IAI, also provide some form of orientation to teachers.
- **Offer orientation in the distance mode in which learners will participate.** Numerous online learning programs, including ETLO, offer an *online* orientation for online learning. This is obviously a more relevant and appropriate strategy where technology literacy is high. Such online orientations allow teachers to participate as much or as little as needed and focus only on areas where they need help. Such orientations are often held both synchronously and asynchronously, using video, audio, chat, and Web-based platforms to provide help as needed.

  SEDL[294] and the 2001 Teachers' Telecollaborative Network professional development program at the University of Texas's College of Education,[295] which used videoconferencing as the main instructional mode, provided a two-hour videoconferencing orientation for teacher-learners. This orientation focused on synchronous, video-based collaboration with remote groups; participation in video-based discussions, and videoconferencing etiquette—extremely important in videoconferencing, where off-site learners are often "ignored"—within one's local group and between remote groups.
- **Organize learners into learning teams, cohorts, or a community.** Distance learners need access to peers. A number of successful online learning programs, such as ETLO and Indonesia's DBE 2 school-based coaching program, organize learners into larger cohorts—for example, ETLO cohorts include 20 to 25 teachers—or learning teams—DBE 2's school-based coaching program organized online learners into four-member, cross-provincial learning teams. As mentioned earlier, the completion rate for online learners was 78 percent, and ETLO's completion rate typically ranges from 78 to 87 percent. ETLO's own research indicates that this learning community/cohort approach is a major factor in teacher completion of the course.[296]
- **Help learners develop self-study and time-management habits.** A number of successful online learning programs do this in their orientations (ETLO and Indonesia's DBE 2 online coaching programs are but two). In contrast, online programs with high attrition rates do little to help online learners develop schedules, techniques for completing work, and skills needed for successful completion of an online course of study. Potential and first-time online learners should be helped to manage their time, develop a study schedule, and set up routines and procedures by which to accomplish their online work.

294 See http://www.sedl.org

295 See http://www.edb.utexas.edu/education/

296 E-mail communication. B. Treacy, December 2, 2008.

To reduce the amount of up-front and ongoing support and guidance learners may demand of their instructors, distance study programs can employ a couple of strategies. First, they can work to help learners become successful distance-based students, helping them to cultivate independent study strategies and skills. These include time management and print and electronic resources retrieval; self-study strategies, so that they are not overwhelmed by course requirements; evaluation and problem-solving skills (McGhee, 2003); and, where needed, enhanced reading comprehension, writing, and technology skills. Distance education programs should also follow up with teachers to make sure that they are adhering to their schedule and plan.

» **Help learners with writing.** Web-based learning is still a read-and-write medium. Many learners have problems with the rhetorical, grammatical, and mechanical conventions associated with writing. The DBE 2 school-based coaching program in Indonesia devoted two days of its face-to-face orientation to helping online learners (coaches) develop writing skills. Learners examined the structure and characteristics of good written posts (anchors). They practiced writing online posts alone and with their coaching partner, practiced responding to discussion questions using Google Docs,[297] provided one another with feedback, and revised their posts. Finally, learners helped to develop indicators for rubrics so that they understood the assessment criteria for their own written work. DBE 2 also provided other opportunities for communication, such as voice tools within an online course, so that online learners who had undiagnosed disabilities or were simply poor writers could still participate in online communication.

» **Help learners develop good reading skills.** Many teacher-learners are not readers. They may not like to read or be unable to read well or at all in the national language (e.g., French, Spanish, Arabic, Hindi, and English). They may come from oral cultures in which text-based information is not the norm for information transmission. Or they may read well in the national language but be unfamiliar with the more academic language of online courses.

A number of reading techniques for adults can help in such a case. One is the College Board's SQ3R adult reading technique,[298] which can be used to help online learners better comprehend written text. This technique comprises five-steps: (1) *scanning* the text to get a general overview of content; (2) *questioning*, noting any questions one has about the text as a whole or about particular vocabulary; (3) *active reading*, carefully reading the text and making written notations; (4) *reciting*, mentally reciting and summarizing the main points of that section after reading it; and (5) *reviewing*, in this case with a partner, the main points of the text. The point is not to emphasize one approach over another, but to recognize that in a distance learning medium, teachers, like students, may need an array of remedial supports to complete a course of study successfully.

» **Provide some level of technology training.** One area in which potential distance learners often do receive preparation for distance learning is technology. Many times, though, the technology instruction is both overly expansive and decontextualized from the learning experience as a whole. While potential learners need instruction in the technology they will use, it should be just enough, just in time, and job-embedded (see figure 15.1).

297 See http://docs.google.com

298 See http://www.collegeboard.com/student/plan/college-success/26666.html

- **Provide structure for distance learners.** It is important to set aside a learning space, establish dedicated times when learners can use computers or access television broadcasts, and provide live technical support and a support person who at specific times can help learners with difficulties they may have with content, directions, an assignment, or technology.
- **Educate potential learners and instructors about the "spirit" of distance learning.** Beyond following the "letter" of distance education, learners must really understand and believe in the "spirit" of distance learning. They must be educated to realize that distance education, particularly online learning, requires a high degree of individual and collaborative involvement. Without the discussion and collaboration that fuel the engine of online learning, learning grinds to a halt.
- **Offer blended learning opportunities.** Some may feel that this approach defeats the purpose of a distance program; however, combining distance learning with a significant portion of face-to-face assistance offers greater opportunity for successful completion of a distance education program, since blended learning offers several advantages. First, it offers personalized and individualized just-in-time teaching, learning, and support (this topic is discussed at greater length in "Chapter 17: Supporting Distance Learners").

  Second, blended learning opportunities bridge the psychological, conceptual, and programmatic distances between instructor and learner, between the distance program and the learner, and between the distance program and schools. In studies of distance learning programs for students in remote regions of Western Australia, Bond (2002: 5) reports an increased negative effect on *student*[299] performance in terms of quality, engagement, skills, and knowledge correlated with greater physical distance between instructor and learner—a finding corroborated by other research (Cavanaugh et al., 2004: 5). Though they are speaking about primary-grade students in the United States, Conzemius & Sandrock's observation that, "optimal learning situations still involve the physical presence of a teacher," (2003: 47) holds true for many adult distance learners throughout the globe.

  Third, there is evidence that highly technical subjects, such as music, mathematics, and pedagogy, may simply be more difficult to learn at a distance and thus require learning opportunities or technologies (such as videoconferencing for learning a musical instrument) (Bond, 2002: 8) that provide a more blended experience.

299 These studies look at secondary-level (versus tertiary-level) students. However, this information is considered relevant for distance education planners, since in many nations, pre-service teacher-candidates would be at or around the same age as these secondary school students.

Conclusion

Distance learning programs must take care to focus as much on human beings as on technology (Haavind, 2006) and help both learners and their instructors develop the knowledge, skills, readiness, and dispositions to be active and successful members of an online community of learners and practitioners. In addition to the strategies mentioned above, distance learning programs can employ three precourse and ongoing strategies to enhance learners' readiness.

Figure 15.1: The 5Js of Technology Training (Burns & Dimock, 2007)

The 5Js are a mnemonic that helps educators focus on essential practices to help teachers learn technology:

1. **Job-related:** Focus on the core competencies of the classroom, not just on the technology.
2. **Just enough:** Emphasize increased comfort, not proficiency, with computers.
3. **Just in time:** Provide teachers with technology training as and when needed.
4. **Just in case:** Encourage teachers to plan for contingencies in case the technology fails.
5. **Just try it:** Apply enough pressure and support to compel teachers to use what they've learned about technology.

First, they can administer a self-assessment tool that allows the learner to measure his or her readiness for taking a distance learning course (Rowntree, 1995). Surprisingly, most distance learning providers do not use self-assessment data to screen for course registration. Such self-assessment tools can focus on a series of learner behaviors, attributes, or competencies such as computer skills, literacy/discussion skills, time-management skills, and interactive skills. Some self-assessment tools include a sum score that indicates whether or not the learner will be successful in the course.[300]

Next, distance learning institutions can help potential learners understand the importance of both community formation and the Internet as a *vehicle* for community formation. Learners should see the Web not just as a collection of resources but as a "place" with likeminded "neighbors," a collection of human collaborative efforts. Technology can be a medium for both communication and collaboration, through which teachers can create and become part of evolving and multiple networks of colleagues, some of whom they know and more of whom they have not yet met.

Finally, community formation is an essential ingredient of successful distance education programs and will be discussed at greater length in chapter 16. This discussion will be followed in chapter 17 by the third strategy for helping distance learners to be successful: ongoing support.

300 One such resource is from Marylhurst College (U.S.): Is Online Learning Right for You? At http://www.marylhurst.edu/centerlearningtechnology/futurestudents-rightforyou.php

Chapter 16: Building Community

Best Practice: ***Successful distance education programs are characterized by a strong sense of community.***

Overview

There are numerous models of distance-based instruction and professional development. But teachers or teacher-candidates who wish to acquire new knowledge, learn new skills, and adapt their practice are best served through a community approach that encourages learners to view model practices (in person or via video), practice using new approaches in their particular classroom setting, reflect upon their experience, and engage in discussions and activities with peers and mentors (Kleiman, 2004).

In studies of professional development in the United States, teachers consistently report that the most valuable benefits of online learning are those that relate to the social context of learning: "sharing information and knowledge" and "interacting with colleagues." The majority of teachers indicate that the support they receive from other teachers in online discussions is very important to them (Zibit, 2004). The prominence of collegiality and community is not confined to online modes of distance education. In print- and radio-based distance education programs in Zimbabwe and Sri Lanka, teachers cited the centrality of study groups, learning circles, and contact sessions when discussing their feelings of satisfaction and success with the programs (Perraton, 1993). And in face-to-face professional development settings, particularly those involving learning technology, teachers consistently report the presence of a community of peers as critical to satisfaction with professional development (UNESCO, 2008; SAIDE, 2005).

Being part of an online community is linked to teacher satisfaction with distance learning courses—and being part of a school-based community of teachers is linked to school change. This chapter discusses the importance and formation of on- and offline communities as part of any distance learning program.

Communities of Practice

With the above research in mind, distance education programs should develop communities of practice among teachers and teacher-candidates (Zhao, Lei, Lai, & Tan, 2005; Robinson & Latchem, 1997; Barab, Thomas, & Merrill, 2001; Commonwealth of Learning, 2008). Barab et al., (2001) define a community of practice as a "persistent, sustaining social network of people who share and develop an overlapping knowledge base, set of beliefs, values, history, and experiences focused on a common practice or multiple enterprises." Wenger & Lave (1998) define communities of practice as organized around three dimensions:

» **Joint enterprise**—an agreed-upon, negotiated purpose or goal with mutual accountability
» **Shared repertoire**—distinctive discourse framing a shared understanding of concepts, tools, resources of practice
» **Mutual engagement**—common activity of participants playing distinctive roles in this joint work

Burns & Dimock (2007) suggest that communities of practice share several tangible attributes that have a direct impact on teacher education programs (both distance and face-to-face):

- They reinforce many of the skills, concepts, and strategies promoted in teacher training or professional development sessions.
- By working together with colleagues, teachers can customize, personalize, and adapt new skills and concepts to their particular setting, enlisting colleagues to help them critique and improve implementation of a particular idea or strategy.
- They nurture a public repertoire of agreed-upon best practice at a particular school or set of schools.
- They may increase the "social capital" of a school, that is, the school as a whole may function better because the collective ties of its members lead to an improvement in the "common good" of the school.
- Creating supportive environments for teacher collaboration encourages teachers to engage in informal leadership roles, thus creating "a pipeline for future teacher leaders" (Teacher Leadership Consortium, 2010: 30).
- Within a community of practice, isolation is replaced by an ethos of collegiality, sharing, and collaboration—all of which make teachers feel more successful, both individually and collectively.
- Communities of practice sustain the types of changes promoted by teacher training and professional development efforts (Hord et al., 2006; Dimock et al., 2001; Fulton et al., 2005; Zhao et al., 2005; Burns & Dimock, 2007).
- In the United States, primary and secondary school teachers with a history of sharing, or university faculty who have collaborated on articles and projects, are more comfortable engaging in the sorts of practices that promote community and school improvement, such as on- and offline collaboration and sharing resources and ideas with teachers, both in and out of their grade levels and content areas (Riverin & Stacey, 2008).

Developing Communities of Practice

Distance education programs can help to foster these communities of practice by employing the following structures and strategies:

1. Understand the distinctions among communities and help learners through the stages of community formation. Three misconceptions persist in relation to the idea of community formation among teachers. First, community of any sort does not develop *ex nihilo*—it must be carefully cultivated. Next, in much of the literature on community formation, terms such as "community," "professional learning communities," "communities of learners," and "communities of practice" remain ill defined and are often erroneously conflated. Third, in the research on teacher change and teacher professionalism (Hord et al., 2006), "community" is often defined as an end in and of itself. Yet not all communities are similar nor are they equal, as figure 16.1 demonstrates.

Broadly and briefly, communities begin as collections of individuals who come together around a *shared interest*. If support, time, resources, frequent opportunities for learning, and emphasis on continuing and outside-the-course learning are built into the distance learning program, these communities of interest can become *communities of learning*. If learners are encouraged to work together to implement a new idea in their classroom or in micro-teaching; if they are given time, resources, and the support of a skilled facilitator to begin putting into practice what they have learned; and if they are assessed—not for the purposes of judging or evaluating their initial efforts but for the purpose of improving and reinforcing their efforts—learners can move toward formation of a *community of practice*. It is important to understand these distinctions so that teacher training programs can move teachers through these stages of community formation (Burns & Dimock, 2007).

Figure 16.1: Types of Communities and Their Characteristics (Burns & Dimock, 2007)

Dimension	Community of Interest	Community of Learning	Community of Practice
Formation	▪ Initial stage of community formation ▪ Loosely formed; little internal coherence ▪ May be formed with support of external actors (principal or professional development providers)	▪ More developed stage of community formation ▪ Greater internal coherence ▪ May be formed with support of external actors (principal or professional development providers), but impetus sustained by activities and motivations of group members	▪ Most developed stage of community formation ▪ High degree of internal coherence ▪ May be formed with support of external actors (principal or professional development providers), but impetus replaced and driven by motivation of group members
Purpose	▪ To connect learners with one another via a shared professional interest	▪ To have learners come together around a "joint enterprise"—to learn about a particular concept, skill, or tool	▪ To have learners come together around a "joint enterprise"—to plan and implement a particular concept, skill, or tool
Goal orientation	▪ May not be goal-oriented	▪ Goal-oriented	▪ Goal-oriented
Focus	▪ On the interest or innovation itself ▪ Emphasis on gathering information, making connections for the purposes of self-knowledge, or to share with colleagues	▪ On teachers' learning (application of learning may be understood or expected but is not the central focus) ▪ Explicit emphasis on learning (situated and otherwise), knowledge construction, and metacognition	▪ On practice and application of learning (while learning is a focus, application of learning is the real, explicit focus) ▪ Explicit emphasis on learning into practice, on doing, and shared action

Dimension	Community of Interest	Community of Learning	Community of Practice
Interaction	▪ May or may not meet on a regular basis ▪ Characterized by loose-to-moderate ties among group members ▪ Characterized along a continuum of interactions from communication to cooperation to collegiality ▪ May be little or no sharing of resources or experiences ▪ May be some degree of mutuality and reciprocity	▪ Highly formed; may meet on regular basis for purposes of mutual learning ▪ Characterized by moderate-to-strong ties among group members ▪ Characterized along a continuum of interactions from cooperation to collegiality to collaboration ▪ Sharing resources/ experiences and individual practice ▪ Higher degree of mutuality and reciprocity	▪ Highly formed; meets regularly or frequently for purposes of collaboration ▪ Characterized by strong ties among group members ▪ Characterized by ongoing collaboration ▪ Sharing resources and experiences and shared practice ▪ Highest degree of mutuality and reciprocity
Primary activities	▪ Investigation and exploration of skill, concept, or tool	▪ Deeper investigation of skill, concept, or tool, with the understood goal of application	▪ Deeper investigation and application of skill, concept, or tool ▪ May involve parallel teaching, co-teaching, or peer observation and feedback
Duration	▪ May be short-lived or dormant, recurring as new information about a particular interest emerges or as a new innovation is presented	▪ Sustained over life span of professional development or course of instruction ▪ May continue beyond the life of the course of instruction but often requires external or sustained intervention	▪ Has the greatest chance of continuing beyond the life of the course of instruction if collaboration becomes the norm ▪ Duration possibly linked to sustained or external intervention

Communities can certainly come together virtually, but some form of face-to-face interaction is necessary for groups to really cohere. This is particularly true for individuals who have not before been part of a professional community and who are new to the whole experience of online learning, especially when working with peers in different locations.

2. Organize learners into cohorts, and where possible build in opportunities for face-to-face meetings. As mentioned in chapter 8, the most successful distance education models have moved from the model of the solo learner to one based on learners as part of a community. In their study of online learning in Asia, Dhanarajan (2005) and Leung (2007) note that teachers report that peer-based online learning is "deeper and more meaningful" than non-peer-based online learning experiences.

Frequent study groups, get-togethers, co-planning, or observation sessions have been features of successful print- and audio-based distance education courses such as Guinea's Fundamental Quality and Equity Levels program and Brazil's Logos Program (Perraton, 1993). Though there is no research on their community-building aspect per se, such strategies have lowered attrition rates and increased teacher satisfaction rates (Perraton, 1993; Robinson & Latchem, 1997; Dimock et al., 2001; Perraton, Creed, & Robinson, 2002; Burns & Dimock, 2007).

3. Pay special attention to the composition of these cohorts. It is important to have a strategy for grouping a certain cohort of teachers. For instance, teachers may be organized *homogeneously*, sharing a particular set of characteristics or abilities—geographic proximity, similar grade level, or shared novice status in technology use—or *heterogeneously*—representing diversity in all of the above characteristics.[301] There are advantages and disadvantages of each grouping strategy. Much of the research appears to argue for organizing teacher-learners as *mixed-ability* groups with a range of abilities in a particular area, for example, content knowledge. Jackson & Bruegmann (2009), in their study of "knowledge spillovers" among teachers, report that new teachers benefit most from exposure to high-ability peers. Kandel & Lazear (1992) suggest that teachers with higher-performing peers can be pushed toward improved performance.

4. Focus on communication, cooperation, collaboration, and community as part of course design. Collaboration has to be learned, particularly if teachers operate in school environments that emphasize hierarchy, conformity, and individuality. In their design, distance education programs can foster a sense of collaboration and community by doing the following (Barab et al., 2002; Rogoff, 1993; Schneiderman, cited in Zhao, 2007; Commonwealth of Learning, 2008):

» Making collective learning and the attainment of common, versus individual, goals a central feature of their teacher education and upgrading program
» Soliciting learner input in the design of distance education courses and programs (Haavind, 2006)
» Allowing groups to develop their own guidelines for group interaction (Commonwealth of Learning, 2008)
» Ensuring that instruction is learner-centered (Commonwealth of Learning, 2008)

301 These are not the only two models of placing learners in cohorts. For instance, they can be assigned *randomly*, particularly if the distance education program is being researched.

- Integrating collaboration into course standards, activities, assignments, and assessment so that students share and leverage knowledge to achieve learning goals (Rogoff, 1993; Haavind, 2006)
- Explicitly scaffolding for learners how to collaborate (Haavind, 2006)
- Providing time, structure, and supports among distance education learners and their instructors and among distance education learners
- Promoting genuine and meaningful discussions that promote and respect honesty and openness in online, video, audio, or face-to-face modes
- Allowing as much time as possible for groups to share information that may not appear immediately related to the tasks at hand
- Incentivizing collaboration and communication via grading, additional points, praise and recognition for teacher-learners, special designations, or funding for teams of teacher-learners to present at a conference or to school leaders
- Being prepared to de-emphasize the product in favor of developing collaborative skills to permit group members to invest thoroughly in collaborative activities (Commonwealth of Learning, 2008).

5. Choose technology that fosters communication and collaboration. Human interaction is the key to community formation. The technology tools provided to learners must support a range of communication types and styles. Two-way audio and interactive video can bring teachers together around a common pursuit. In non-interactive forms of distance education, for example, broadcast radio or television, or print-based learning—cell phones, which allow for low-cost, text-based (SMS) and voice communication, are a successful technology tool used to foster the communication that is the lifeblood of a community.

Within a Web-based environment, learning that is organized around collaborative teams (versus self-study) can foster synchronous and asynchronous communication and multiple forms of interaction. The use of social networking tools, for example, EdModo,[302] in concert with collaboration tools such as Dabbleboard[303] and communication tools such as Skype or chat, can amplify personalized interaction and creative collaboration among learners. Wikis, blogs, micro-blogs and social bookmarking/collaborative tagging/ folksonomy sites make it possible for teachers to share ideas, strategies, and resources and co-create lessons and activities.

Research (comSCORE, 2010) indicates that globally, women demonstrate higher levels of engagement than men with applications that promote collaboration (social networking sites). In all regions of the world, women outnumber men in their engagement with, level of, use of, and amount of time spent on social networking sites. Though women account for 48 percent of total unique visitors to social networking sites, they spend significantly more time on these sites than men, averaging 5.5 hours per month compared with four hours for men. Globally, teaching, at least at the primary school level, is becoming an increasingly

302 See http://www.edmodo.com/

303 See http://www.dabbleboard.com/

feminized profession.[304] As such, designers of distance education programs must keep their audience and this gendered use of social networking tools in mind as they design distance learning experiences for teachers.

Community formation can be further enhanced and expanded through participation in Web-based experiences such as telecollaborative projects, ongoing webinars, WebQuests, and online or virtual teaching and learning conferences. Research on online conferences, mentioned in chapter 5, suggests that these "intensive network-mediated interactions" can create shared knowledge through personal, organizational, and community learning and develop social networks that can later be used to create valued collegial relationships and extend learning beyond the conference (Anderson & Christiansen, 2002).

Conclusion

Communities of practice offer several benefits to distance learning programs in general and to teachers in particular. First, they furnish the emotional, logistical, and procedural supports for their members in the pursuit of common interests and goals, transforming an undertaking from the individual to the shared realm. Second, they can result in a purposeful educational network of professionals formed around a "joint enterprise" (Wenger, 1998) that serves a larger public good. Third, they make possible goal-oriented knowledge generation and shared learning lubricated by the trust, mutual support, and open communication that form the basis of a community. These essential ingredients of community can be facilitated by technology-based opportunities to talk, write, videoconference and co-create knowledge and ideas. Finally, communities of practice make public the private, embedded, and tacit professional knowledge of individuals within a group, so that knowledge generation is transformed into informed practice that can result in improved instructional change among teachers and within classrooms (Burns & Bodrogini, 2011; Burns & Dimock, 2007).

304 In all 28 OECD countries, the rate of female primary school teachers exceeds 60 percent. In some OECD nations, for example Italy and the Slovak Republic, the figure is above 90 percent and at 90 percent, respectively. These figures drop for secondary school, though in all OECD countries (with the exception of México, Switzerland, Luxembourg, and Japan) the average rate of female secondary school teachers is at or above 60 percent (OECD, 2005: 57).

Chapter 17: Supporting Distance Learners

Best Practice: ***Successful distance education programs provide ongoing support for learners.***

Overview

It is no secret that for many, a prime attraction of distance learning for teacher education is that it is viewed as demanding *less* versus *more* human interaction with and support of teachers. Yet distance learning programs ask pre-service and in-service teachers to perform two difficult tasks, either sequentially or simultaneously. They demand that teachers *learn* differently, and they demand that teachers then *teach* differently as a result of what they have learned. And far too often, distance programs demand that teachers undertake both of these tasks alone, with no support.

Distance learning can be a "very lonely" experience (Brown & Early, cited by Prescott & Robinson, 1993). This isolation exacerbates all of the many issues that can occur when learners are separated from their instructor and other learners by distance. Difficulties understanding content, computer problems, uncertainty about how to employ a strategy, and disappointment when a new pedagogical approach fails are all magnified when teachers confront these issues alone. The issue of support in distance courses is linked to teacher completion, satisfaction, and performance. High rates of attrition in distance-based teacher training courses are in large measure due to feelings of isolation and "anonymity" (Potashnik & Capper, 1998; Hope, 2006). High rates of teacher dissatisfaction with distance-based courses occur when teachers lack "support, contact and confidence" (Brown & Early, 1990; Prescott & Robinson, 1993: 306).

For instance, Pakistan's Allama Iqbal Open University's radio-based teacher training program has experienced passing rates of 57 percent (Robinson, 1997). Sulistyo-Basuki (2007) cites a lack of support for low levels of student persistence in courses in Indonesia's Open University. Studies of online learning programs in the United States reveal that when facilitator support is lacking, teachers leave such programs at very high rates, especially when this lack of support is compounded by technical problems (Center for Children and Technology, 2008).

In contrast, where distance education programs enjoy high rates of completion, these programs have been characterized by ongoing support. This situation generally holds true for all types of professional development programs for teachers—whether face-to-face, distance, or hybrid—and is *particularly* true for all types of distance education programs. The success of Britain's Open University, where completion rates generally reach 70 percent, is due in part to its vast network of face-to-face support through regional study centers staffed with tutors. The American online teacher-upgrading program, eMINTS, enjoys a 95 percent

Figure 17.1: ***American Idol's*** **decision to provide ongoing support to contestants**

"They just can't be told, 'Sing better.' Someone has to work with them every week on performance, on style . . . on originality."

Jimmy Iovine, Chairman of Interscope Geffen A&M Records, discussing American Idol's decision to provide contestants with coaches and mentors.

completion rate, due in large measure to the 100 hours per year of contact provided between instructors and tutors.[305] And in contrast to their radio counterparts cited above, 95 percent of teachers in Pakistan's Allama Iqbal Open University's face-to-face component passed the course (Robinson, 1997).

As decision-makers in other industries know, those learning or attempting to improve their craft, like teachers, cannot simply be told to get better (see figure 17.1). They need ongoing support and help. This chapter discusses why this is so, the types of support teachers need during and after distance learning programs, and programmatic and school-based strategies to increase completion rates and successful classroom implementation of strategies and ideas learned via distance learning programs.

Why Do Teachers Need Support? Understanding Change

Instruction and professional development are about *change*—changes in teachers' knowledge, skills, attitudes, beliefs, aptitudes, values—or all of these. If we analyze the underlying aims of face-to-face, hybrid, and distance-based professional development—especially in-service professional development, we see that they are often extraordinarily complex. Professional development asks teachers to change the way they teach, and the way they themselves were taught. It may ask them to use new technologies to support new modes of instruction, assessment, and classroom organization. It often asks them to teach with a new curriculum, to learn new content, and to do it via an unfamiliar tool (computers) or via a mode of learning—the Web, radio, television, or print—in which they are separated from their instructor and perhaps their colleagues. Such complex and ambitious goals require constant and various modes of support, both in the distance learning program itself and in schools where teachers will be implementing what they have learned.

Research on change (Rogers, 1995) states that those going through any sort of innovation approach the change process in different ways. This finding also holds true for teachers. As figure 17.2 outlines, a small percentage of people are *innovators* who will eagerly embrace any innovation. *Early adopters* will also embrace an innovation, although not as quickly or as eagerly as innovators. A slightly larger group (*resistors*) will simply refuse to embrace whatever change is being promoted. Most people fall between these two positions as *early majority* and *late majority* types.

Such classifications are not fixed in stone. Individuals can fall into different categories, depending on the innovation. For example, a teacher may be an *early adopter* of using radio in the classroom but a *resistor* when it comes to using computers. The rate of change is influenced by the complexity of the innovation, the pressure to implement the innovation, and the supports available to use it (Hord et al., 2006).

305 Personal communication, Monica Beglau, December 1, 2008. In eMINTS, professional development is largely face-to-face, while support is provided via online technologies.

Figure 17.2: Diffusions of Innovation and Change Types(Rogers, 1995)

Change Type	Description	Percentage of Total Group of Teachers
Innovators	These are the people who by nature always want to try new things. They like to be at the front of the process. They are always are up for something new.	**Innovators** are a small percentage of any group—about 2.5%.
Early adopters	These are people who are typically opinion leaders. They have the respect of their colleagues and other teachers. These influential people are not as adventurous as innovators, but will typically keep track of new things to see what might be worthwhile trying. If they decide to try an innovation or new approach, their opinions and actions will influence others around them.	Though not as small in number as innovators, **early adopters** are also a small percentage of any group—typically 13.5%.
Early majority	These people are a bit more conservative than the early adopters. They are "deliberate." They adopt new ideas just before the average member of any group does, but don't tend to keep track of things that might be new and exciting.	**Early majority** comprise a significant portion of any group—about 34%.
Late majority	These people go along with a change, not out of belief, but out of necessity, or because they see the change as inevitable. They are concerned about doing a good job according to existing standards and methods, so they are slow to take the risk of a new approach.	**Late majority** represent a significant portion of any group—also about 34%.
Resistors	Resistors are highly resistant to change and often never accept change, preferring the status quo. A program may not be able to impact such people or may impact a small percentage of them and then only in a marginal way.	**Resistors** are a small, but significant, percentage of any group—usually about 16%.

Innovators, and even many early adopters, may need limited support in their distance learning programs. They may even need limited support integrating and implementing their new knowledge and skills into their classrooms. However, innovators and early adopters comprise only about 16 percent of all teachers participating in an innovation. Furthermore, innovators and early adopters, who often tend to be "champion" teachers, are typically *not* the focus of many distance education programs. Rather, many distance education initiatives focus on upgrading the knowledge and skills of at-risk teachers—those who are new to teaching, who teach out of their content area, who lack a certain set of skills, or who are technically unqualified, according to whatever basis on which such a designation is made. Many of the remaining 84 percent of teachers are spread among the early majority, late majority, and resistors.

Unlike innovators and even early adopters, this large majority exhibit more pronounced degrees of resistance toward change or reluctance in adopting or implementing new ideas. To be successful, teachers in these early- and late-majority and resistor categories will need support, persuasion, practice, and handholding beyond what is offered in initial professional development and instruction. They will likely need this support to succeed in the distance course itself, as well as to implement what they have learned in their schools. It is with this population of teachers that support is critical. A support person, such as a coach or lead teacher, can work with varying degrees of intensity to help those who could not get through a distance course on their own or could not or would not implement an innovation independently in their classrooms.

In addition to change types or personalities, research on change (Hord et al., 2006) reveals that as teachers go through the change process—as they try to implement a new reading program or use computers for instruction—they approach this innovation with a number of "concerns." These concerns vary in stages from how something (e.g., the computer) affects them (*self-concern*) to how they can use it (*management*) to how it fits with their teaching (*adaptation*). Figure 17.3 outlines these "stages of concern."

Figure 17.3: Concerns-based Adoption Model (Hord et al., 2006: 31)

Stage of Concern	Definition: *The Teacher (Is) . . .*	Example of a Statement Expressing This Concern
0. Awareness	Aware that an innovation is being introduced but not really interested or concerned with it	"I'm not really concerned about it."
1. Informational	Interested in some information about the change	"I would like to know more about it."
2. Personal	Wants to know the personal impact of the change	"How will using it affect me?"
3. Management	Concerned about how the change will be managed in practice	"I seem to be spending all my time getting materials ready."

Stage of Concern	Definition: *The Teacher (Is) . . .*	Example of a Statement Expressing This Concern
4. Consequences	Interested in the impact on students or the school	"How is my use affecting students?" "How can I refine it to have more impact?"
5. Collaboration	Interested in working with colleagues to make the change effective	"How can I do this with other teachers?"
6. Refocusing	Begins refining the innovation to improve student learning results	"I have some ideas about this that would make it work better."

While figure 17.2 illustrates that teacher responses to change are highly personal, figure 17.3 demonstrates that teacher responses to change are also highly procedural, professionally oriented and multilayered. A teacher's stage of concern will vary according to each new innovation or each incremental change in innovation. From a distance learning design perspective, understanding issues surrounding change types and teachers' stages of concern is important for several reasons:

The "innovation" drives expectations and support: First, the more dramatic the expected change, and the more intense the teacher concerns, the more help teachers will need. Their concerns about an innovation and willingness to use it (or not) depend upon a number of *external* factors:

- **Complexity.** Teachers may feel more anxious about teaching with a computer, which is a complex tool, versus using IRI—a simpler tool—in their class.
- **Support.** Teachers' ability to implement an innovation depends upon the amount of available support.
- **Expectations.** The higher the expectations of principals or school district officials, the more support teachers will need.

The above factors suggest that innovations that are complex—for example, having teachers use a new curriculum, adopt a new instructional method, or implement new literacy strategies—increase the expectations of all involved—school leaders, teachers, ministry officials—that such complex programs will yield more ambitious results. This combination of complexity and increased expectations puts further stress on teachers. Therefore, the types and length of in-school assistance teachers receive must be commensurate with the complexity of and expectations regarding an innovation.

Professional development and support should be measured in years, not months. Change can take between five and seven years to take hold, according to Hord et al., (2006). Early concerns about information, how the innovation affects the teacher personally, and management issues often take at least three years to be resolved (Hord et al., 2006). Management concerns about a new curriculum, for example, can take at a least a year to resolve as teachers become familiar with it, try and fail with a particular instructional method, and reconcile how to use higher-order thinking strategies in an educational system that measures rote knowledge. Thus, models of professional development and support must be designed to endure over several years.

The content and sequence of professional development or coursework must be driven by teachers' stages of concern. The model of stages of concern emphasizes the importance of meeting teachers where they are conceptually and logistically and addressing their questions as they are asking them. For instance, teachers cannot be pushed to *collaborate* (stage 5) when they are still focused on how to *manage* the innovation (stage 3). The types and content of professional development opportunities can be informed by ongoing monitoring of teachers' concerns.

A teacher's stage of concern is directly related to his or her level of use and requires differentiated support. A teacher's attitude toward or concern about a proposed innovation obviously determines how he or she uses it. These behaviors, or levels of use with regard to the innovation are outlined in figure 17.4.

Figure 17.4: Levels of Use of the Innovation: Behaviors (Hord et al., 2006: 55)

Levels of Use	Behavioral Indicators of Level of Use *The Teacher . . .*	Verbal Indicators of Level of Use *What the teacher might say . . .*
0. Non-use	. . . has no interest, is taking no action	"I don't know anything about it." "I am doing nothing toward becoming involved."
1. Orientation	. . . is taking the initiative to learn more about the innovation	"I'd like to learn more." "How do I learn about this?"
2. Preparation	. . . has definite plans to begin using the innovation	"I'm getting ready to use this for the first time." "I'm thinking about how to use this."
3. Mechanical	. . . is making changes to better organize use of the innovation	"Right now, my focus is on how to use this software." "I'm learning how to use this new science kit." "I'm spending all my time learning how to do this."

Levels of Use	Behavioral Indicators of Level of Use *The Teacher . . .*	Verbal Indicators of Level of Use *What the teacher might say . . .*
4A. Routine	. . . is making few or no changes and has an established pattern of use	"I feel comfortable using the computer for brainstorming. However, I'm not really focused on setting up my students in groups." "I can use the new questioning techniques I learned in my online course."
4B. Refinement	. . . is making changes to increase outcomes	"I'm varying the way I do reading activities in my classroom." "I've made a few modifications in the IRI lesson."
5. Integration	. . . is making deliberate efforts to coordinate with others in using the innovation	"I'm combining the way my colleague uses PowerPoint with my own ideas for using it." "I've incorporated some new grouping techniques into the way I do active learning."
6. Renewal	. . . is seeking more effective alternatives to the established use of the innovation	"I'm looking at new ways to use formative assessment in my classroom." "I am planning on designing a curriculum unit that uses active learning in my geography class."

Knowing a teacher's stage of concern can help a support person figure out the motivation behind a teacher's level of use of an innovation, say, a science kit, and gauge how much and what kind of help to provide for this teacher. A teacher who uses the new science kit in a step-by-step, *mechanical* fashion (see figure 17.4) most likely has "management" concerns (see figure 17.3) such as figuring out how to employ something new without disruptions in learning, in the lesson, and by students. A teacher who is in the *refocusing* stage of concern (figure 17.3) may need help coming up with more innovative ways to use the science kit ("Renewal" in figure 17.4). The link between a teacher's stages of concern and levels of use argues for highly differentiated and high-frequency support, grounded in an understanding of how teacher concerns impact teacher behavior.

Diagnostic and formative assessment and ongoing monitoring must be part of any type of support system for teachers. As mentioned previously, distance education programs, especially those with a classroom focus, need to address a teacher's stages of concern before the teacher can move on to the next stage. Thus, distance learning designers should embed within coursework the kinds of initial diagnostic and ongoing formative teacher assessments discussed in "Chapter 13: Assessing Distance Learners."

Defining Support

"Support" is one of the more common, yet poorly defined, terms in teacher professional development. The notion of support has multiple meanings for teachers and encompasses numerous dimensions, as figure 17.5 demonstrates.

Figure 17.5: Types of Supports Needed by Teachers

Support is not simply one type of assistance, but rather a multilayered array of different types of "infrastructure" that help teachers successfully carry out their professional responsibilities. For teachers, support often includes the following:

Administrative support. This can mean instructional leadership, compliance monitoring by principals, official recognition, serving as an interlocutor between school and district or school and community, expressions of support for implementation of new innovations, and administrative decisions that provide teachers with time and resources to carry out new instructional practices.

Instructional support. Typically, this means the distance learning instructor, coach, mentor, or in-class support person who models, guides, co-implements, or helps the teacher with content, instruction, assessment, classroom management, and the conceptual and logistical issues arising from change.

School-based community. A community of colleagues also undergoing the same professional development is a significant source of support. This valuing of another teacher's perspective is a key component of constructivist learning theory.

Technical support. This includes help on how to use a particular application, troubleshooting help, and the availability of someone on site to fix computers when they break down (as they inevitably will).

Community and/or family support. Formal and informal recognition and approval by parents of teachers' efforts can manifest itself in terms of resources or materials for the classroom.

Teaching and Learning Materials. Teachers need this most basic level of support to gain access to authentic resources or to purchase or create curriculum-specific teaching and learning materials.

Time. Release time for teachers to meet in-class support people is critical, as is dedicated time during the school day or week to engage in the extensive planning that is a requirement for learner-centered instruction. "Time" is also invoked by teachers who feel unsure of how to embark on change.

The fact that teachers demand support is often treated as a problem, though it is in fact a sign of progress—it means that change or the potential for change is under way. For instance, as teachers begin to learn and practice new instructional methods, they often realize that their current textbook is inadequate to the task of helping students learn in more interactive ways. As a consequence, they may begin to agitate for new teaching and learning materials and instructional resources. As teachers learn new instructional or assessment strategies, they may realize that the current classroom scheduling system of 40 minutes or the scope and sequence of their curriculum do not provide the necessary time to do authentic assessment or project-based learning.

The most important supports for teachers, however, come in the form of personal assistance: a technical support person who can help a teacher log in to her online course; a principal who provides teachers with time to plan a project for their distance courses or who actively encourages the teacher to try a learner-centered activity and ignores the chaos and noise that may ensue the first time the teacher undertakes such a task; a community of colleagues that offer moral support, since they are all undergoing the same intervention together; and an instructional support person who can help the teacher translate, practice, and refine in her classroom a new teaching strategy that she learned via audio broadcast.

Strategies for Support

As seen from these examples, distance learning programs should essentially offer two levels of support for teachers. The first level relates to support within the distance learning program itself—supports allowing teacher-learners to complete their distance learning course successfully. The second level concerns support in schools, enabling teachers to implement successfully what they have learned in distance-based courses. We examine each in turn in the following sections.

Programmatic Supports

The extent and types of support pre-service and in-service teachers need are determined by a number of factors: the level of self-efficacy and self-directedness of learners; the degree and skill of the facilitator (particularly in the case of online courses); the complexity of learning material, design, and technology; the particular learning goals for teacher-learners; and the degree of structure offered by the distance-based course. In online learning experiences, which are typically not time- or place-based, teacher-learners often need additional support because they are being asked for the first time to assume responsibility for their own learning (Commonwealth of Learning, 2008). Some provisions for offering support, such as preparing learners to succeed in a distance environment and explicitly designing for communities of practice, are discussed in chapters 15 and 16. Other strategies are discussed here.

1. Ensure that the distance-based course is integrated into the overall teacher training program. Williams (1999) charges that for dual-mode teacher education institutions, distance education learners are often not viewed as clients or customers. As a result, the courses, supports, range of services, and instructional quality are not as good for distance learners as they are for on-campus or face-to-face learners (Hope, 2006).

Distance education programs must be well integrated within the whole structure of teacher education and not serve simply as an adjunct or supplement to a face-to-face teacher training program (Perraton, Creed, & Robinson, 2002). By integrating distance education programs into an overall university-based teacher-training system or an overall national teacher-upgrading system, policymakers can work to foster parity in quality, delivery, resources, and supports between the two modes of teacher education.

To ensure that a distance education program is well integrated into the overall teacher education program, policymakers and designers should develop appropriate academic provisions and guidelines for all learners in every course and program (Hope, 2006). Hope (2006) suggests that these provisions include the following criteria:

- Ensure that the quality of outcomes of the educational experience is consistent between modes.
- Effective student support in the form of systematic interaction between teacher and learner should be a requirement of all courses and should be built in to the design of course materials.
- Feedback on assessment should be provided to all learners on a timely basis so as to inform their ongoing learning.
- Provide access for distance learners to the physical facilities (libraries, study space) and equipment that are necessary for their successful learning, and offer appropriate training in their use.
- Provide opportunities for peer interaction at both the course and institutional level to promote a sense of belonging and encourage the development of learning and social communities within and across modes.
- Ensure that all learners have access to academic counseling before and during their course or program.
- Make precise, accurate, and current information readily available for each course and program, well publicized to all students, concerning learning outcomes, program structures and requirements, cost and financial support, admission criteria, assessment requirements and processes, rules and regulations, and appeals procedures.
- Systematically collect and analyze student feedback as a core component of academic quality assurance mechanisms (Hope, 2006: 18).

In Australia, where dual-mode universities have operated successfully since the 1970s, these issues of equity have been addressed by developing an integrated structure in which courses are planned, developed, and taught by the same faculty so that learners can receive an identical qualification whether they are located on or off campus. Special resources are provided for distance study, and systematic forms of support are provided for all aspects of the distance student's engagement with the institution. In such a system, students are able to move between study modes at their convenience (Hope, 2006).

2. Develop blended distance courses. Some aspects of teacher education need closer interaction with tutors or instructors (e.g., micro-teaching), while others do not. But helping teachers integrate new ideas and strategies in their classrooms requires the presence of an actual, in-person supervisor. For these reasons, distance programs that combine face-to-face instruction, supervision, tutoring, and modeling have a greater chance of success than those that use a single approach (Perraton, Creed, & Robinson, 2002).

Figure 17.6: Support for Distance Learners at the University of Queensland (Smith, 2006:170)

Institutions that are commended for the quality of their distance education programs, such as the University of Queensland (USQ) in Australia, offer extensive student supports, for example, toll-free numbers, help desks, and support personnel who respond to student queries via e-mail and a website (USQ Connect). USQ's e-customer relationship management software has enabled the use of a single toll-free number, integrated with an e-mail–based enquiry tracking system, to enhance communication and manage information. Using structured, intelligent databases, the knowledge generated by solving student problems and enquiries is stored progressively and made available so that, wherever possible, students with equivalent or similar problems can have their enquiries dealt with immediately through the self-help, automated response capacity of the USQAssist system, thereby facilitating effective resolution at the first point of contact.

Studies of professional development around the globe—in the United States, in Asia, in the Caribbean, in Africa—all demonstrate the superiority of blended versus purely distance approaches in terms of both learner success and the success of the program itself (Perraton, Creed, & Robinson, 2002; Perraton, 1993; Robinson, 1997; Potashnik & Capper, 1998; Wang, 2000; Center for Children and Technology, 2008; UNESCO Bangkok, 2007; Commonwealth of Learning, 2008). This finding holds true particularly in areas where there is a vast geographical distance between learners and instructor, where modes of distance education are less interactive—for example, print, audio, or television—and where sufficient communications infrastructure and material support are lacking. Africa is a case in point. In an attempt to mitigate the impact of these conditions on its distance-based teacher training program, the Africa Virtual University (AVU) has established 30 learning centers through partnerships with higher education institutions in 11 countries. These centers offer face-to-face courses complementing AVU's distance-based upgrading program for primary school teachers (Farrell & Isaacs, 2007).

However, even when the above conditions are *not* true—where distances are not so great, where the mode of distance education is more interactive (Web-based learning or audio or videoconferencing), and where sufficient communications infrastructure is in place—designers of distance-based courses recognize that face-to-face interactions and the personal connections that can develop between instructors and learners are a vital part of the learning experience. For example, the U.S. state of Alabama's virtual school requires in-class face time between learners and their instructors two days per week so that instructors can tutor, meet with, and provide additional support and instruction to learners.[306]

306 Personal communication: Earlene Patton, July 2, 2008.

3. If offering hybrid courses is not an option, partner with existing local agencies to provide face-to-face support and interaction with teachers. In cases where geography, political disturbances, cultural norms, expense, or logistics prevent instructors from traveling to meet teachers, distance program designers can explore other human network support options. Global distance education programs provide an array of models. First, they can investigate where there are *people and institutions* who can help manage and supervise classroom practice, as occurred in Brazil's distance teacher–upgrading program, *Logos II* (Oliveira & Orivel, 1993). Guinea's Fundamental Quality in Education Level IRI program (1998–2005) developed monthly *cercles de renseignement* (teaching circles) between teachers receiving IRI in their classroom and used local circuit inspectors provided with print-based manuals and audiotapes to provide face-to-face instruction and time for teacher discussion to supplement IRI-based instruction (Burns, 2010a).

Next, many teacher training programs—China's Educational TV program and the United Kingdom's Open University are but two—have at various points established *regional study centers*, where teachers can meet with a staff member or tutor who, though not the instructor, has some level of expertise in the subjects teachers are studying. In China these study centers are widely established and offer face-to-face and media supports for teachers. Centers are also used to fulfill course completion requirements—for example, viewing educational programs, teacher self-study via CAI, participating in a Web-based course, conducting research, and so on.

Third, they can build on existing teacher support centers, such as Indonesia's network of Cluster Resource Centers, and offer drop-in hours where teachers stop by to get additional help from a master teacher, distance education program person, or certified teacher. This approach has been taken throughout the globe—from Educational Service Centers in Texas to Teaching and Learning Centers (TLCs) in Namibia. Where these centers contain technology and Internet access, teachers use them to improve their productivity as well as to participate in their Web-based courses—as in the case of Namibian teachers' participation in Harvard University's online program WIDEWorld. In the author's experience, these centers have greater value if staff can go to teachers in their schools (in which case money for transportation should be allotted) and when centers offer regularly scheduled courses or activities that are highly valuable to teachers, such as computer training, and unavailable elsewhere. Otherwise, these centers are often underused.

Finally, distance-based courses could formalize the voluntary drop-in approaches just mentioned by scheduling a time, day, and space for learners to fulfill their distance learning course requirements. Though this system negates the "any time, any place, any pace" learning associated with online distance learning, it does provide the structure and ongoing array of supports—access to an instructor, colleagues, computers, the Internet, technical support, and just-in-time assistance—that is so needed by so many teachers in their first distance learning endeavor. As an example, an EDC study of a U.S. online program for early childhood educators found that the only site of five with a high course completion rate was the one that offered weekly scheduled computer lab sessions where educators came at a scheduled time to do their online course work (Center for Children and Technology, 2008).

4. If support is going to be an issue, select distance education interventions that are highly structured and by their very nature offer-in class supports. Research on teacher learning and teacher change reports that ongoing, face-to-face support is essential (Hord et al., 2006; Sparks, 2002; NSDC, 2002). If professional development and teacher education programs cannot offer structured supports for teachers in the distance education process, they should at least consider highly structured in-class types of training or professional development such as dual-audience IRI, instructional television, two-way audio, virtual classes, or two-way audio conferencing. Or they should offer the types of distance instruction that approximate a sense of immediate connection or "presence," such as webinars, videoconferencing, and phone conferencing.

Such distance education modes don't offer the simplicity of print-based instruction or the multimodal learning potential of online professional development, but they do offer real-time, interactive, just-in-time, classroom-based, curriculum-supported, and highly structured support that at-risk teachers—untrained teachers, struggling teachers, teachers teaching outside their content area, and teachers teaching a new grade or subject for the first time—may find most beneficial.

5. Provide mentors and partners to first-time or incoming learners. Research demonstrates that distance learners need active guidance and supervision. South Korea's KNOU assigns mentors to its incoming online learners, a system it began in 2009 that has resulted in some decrease in attrition rate, though cause and effect have not been established. Mentors are final-year students who are about to successfully complete their online learning course of study. They are responsible for helping mentees navigate the KNOU system, develop good study habits, and learn the ropes of Web-based learning. They communicate with their mentees via Web-based communications, cell phones, and if possible face-to-face.[307] The DBE 2 Indonesia project's online coaching program organized coaches and learners into small virtual learning teams with required periodic interaction and group assignments requiring mutual support and feedback. The coaches' online instructors, who had matriculated from the same coaching program a year earlier, also served as new coaching candidates' mentors.

6. Offer more, and varied types of teacher professional development as part of the distance learning program or as a supplement to the distance learning program. Teachers need more, and more varied, types of professional development. The most pervasive professional development format, either on- or offline, is the workshop, or training. While workshops are a good one-to-many means of exposing teachers to new ideas and practices, there are other forms of professional development that by their very nature offer ongoing supports, along with instruction that can help deepen teachers' knowledge and skills and complement and refine what has been communicated in online or offline workshops.

For instance, in *open lessons*, a form of school-based professional development used in Russia and Azerbaijan (also known as "open classrooms" in China), teachers create lessons and invite colleagues, and in some cases parents and teachers from other schools, to observe the lesson and provide structured feedback in a post-observation session with colleagues. The teacher typically incorporates feedback into a future lesson.

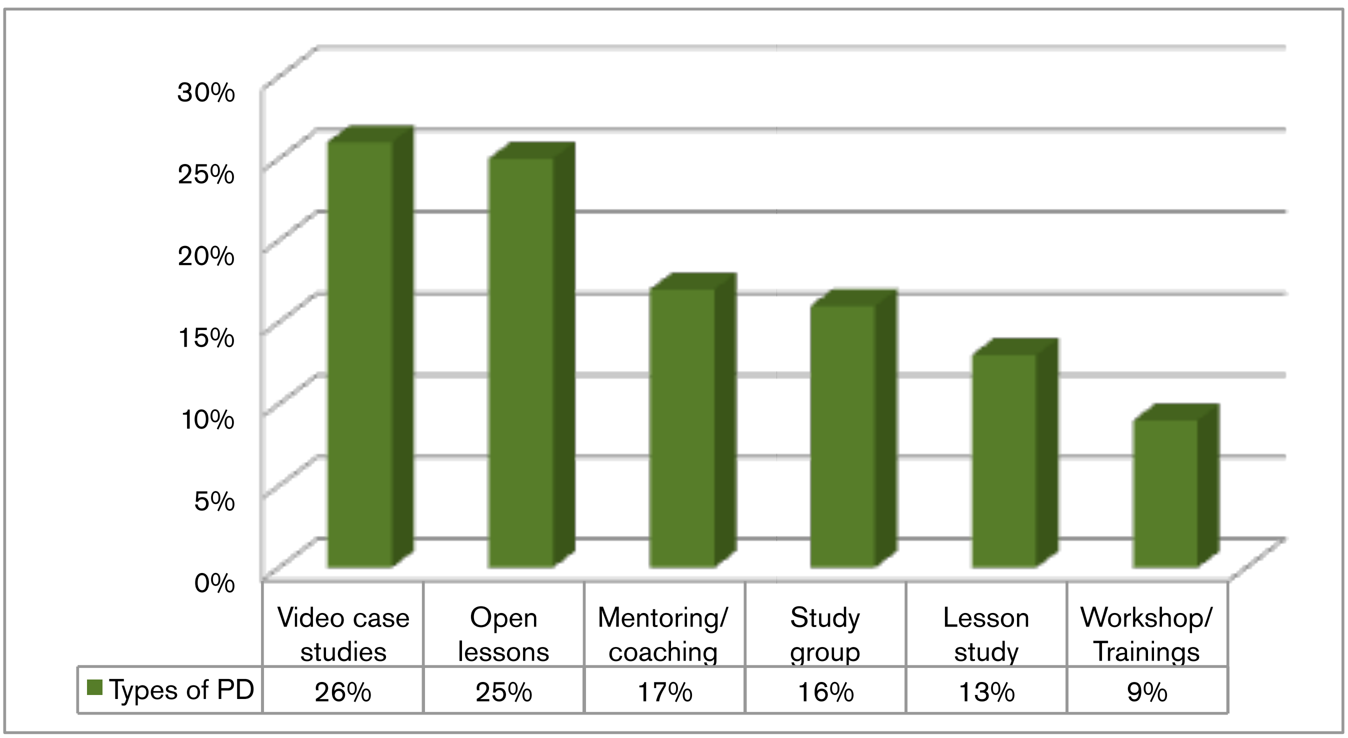
307 Personal communication, T.R. Lee, January 14, 2010.

In *lesson study*, teachers collaboratively plan, develop, or improve a lesson; field-test the lesson in a classroom; observe it; make changes; and collect data to see the impact of the lesson on student learning. This process usually takes several months. In contrast to open lessons, where the focus is on teacher action, the lesson study approach focuses on *student* actions. Lesson study, which is used commonly in Japan, has been shown to enhance teachers' design and instructional skills (Sigler & Hiebert, 1999).

Within *study groups*, teachers collaborate, either as a single large group or in smaller teams, to study a particular issue, with the goal of solving a common problem or creating and implementing a plan to attain a common goal. The key component, study, comprises reading, discussion, writing, and reflection, often led by a skilled facilitator. During the process teachers may use print-based resources, classroom materials (such as work created by students), and their experiences as part of their approach to the problem at hand.

These forms of professional development do not just depend on a high level of support; they actually offer the types of professional development that many teachers value. In 2007, in EDC's discussions with teachers across five Indian states, they listed the types of professional development that would best help them change classroom practice. As figure 17.7 shows, they stated a need for professional development that by its nature was more collaborative and support-based than workshops and that provided *models* of the types of practices they were supposed to implement, assistance in *lesson design* and in-class *observation and mentoring*, to ensure they were correctly implementing new lessons and new instructional approaches.

Figure 17.7: Potentially Helpful Teacher Professional Development Models (Burns, 2007a) (N=300)



Differentiated professional development based on a high level of support is increasingly common in many parts of the globe. In the United States, teachers take part in a variety of professional development activities such as study groups and lesson study, often in the school where they teach, during common planning time. In England, where teachers participate in a large amount of annual professional development, teacher support is infused throughout the professional development system through a variety of offerings. For example, teachers participate in formal professional development networks, individual and collaborative research, mentoring and peer tutoring, and study groups (OECD, 2008: 72). Also in England and Wales, the Return to Teach Programme[308] offers highly varied professional development to teachers who have returned to the profession. Returning teachers can take weeklong mini-courses, access help lines, spend time in classroom observations, and subscribe to a magazine that updates them on recent developments, trends, and policies in education. Again, these forms of professional development may be offered as school-based supports that complement the distance-based programs—or they may be offered via certain modes of distance education (videoconferencing, two-way audio, phone conferencing, or online learning).

7. Strengthen the role and responsibilities of the instructor to include more ongoing support. Studies of successful distance learning programs cite the importance of a sense of instructor "presence" for learners. Rourke, Anderson, Garrison, & Archer (2001) define presence as having three dimensions: *cognitive* (discussions of knowledge and procedures), *social* (emotional engagement among learners), and *instructional* (modeling effective pedagogical practices).

This sense of presence, or lack thereof, can make or break a distance learning course. In a study of Australian students learning German in an online environment (Barty, 1999), the presence of the online instructor was directly linked to students' perceptions of the complexity of the material. Although they were interacting with rich technology supports, students often reported not understanding the material and being "overwhelmed" and "uncertain" without the presence of the instructor. As soon as they began interacting with their online instructor, the same language material was suddenly "not difficult" (Barty, 1999: 30).

Distance programs should help instructors develop this sense of presence by intensively preparing them to teach in a distance environment (See "Chapter 14: Preparing Distance Instructors") and by also structuring the distance course to allow for frequent and meaningful interactions between instructor and learners. Such techniques can include the following:

- Capping the number of learners in a course to a manageable size (for example, 20)
- Mandating brief weekly chat sessions between the instructor and students
- Requiring that instructors respond to student e-mails within 24 hours
- Offering as-needed instructor tutoring sessions
- Scheduling one or more face-to-face meetings between the instructor and students in a term
- Holding weekly online "office hours" during which individual learners can pose questions and share concerns with the instructor
- Scheduling regular phone calls and/or site visits by the instructor to teachers' schools

308 See http://www.tda.gov.uk/teacher/returning-to-teaching/routes-to-returning/registration.aspx?sc_lang=en-GB

Figure 17.8: Online Support for Teachers: Quora

Quora (http://www.quora.com) is a website where users can ask a question and receive answers from other community members. It is a cross between Linked In "Answers" (http://www.linkedin.com/answers/), *Wikipedia*, and Facebook, in that it posts answers to questions and documents this knowledge, gives users an easy way to find information and edit it, and provides users with a platform to collaborate on the quality of the accumulated knowledge.

Quora has generated much excitement as a natural-language way of accessing Web-based information. Time will tell if Quora emerges as a model of how distance learning entities may try to generate, personalize, and organize information and support for distance learners.

While necessary, providing instructor support—which may also include coaching, mentoring, and school-based support and supervision—taxes the distance education system. Where e-learning has been introduced in both face-to-face and distance education institutions, it has been found to greatly increase staff workload. Institutions must either employ additional staff and increase costs, or find other ways of limiting the demands on distance instructors' time so that they can carry out these important support functions.

8. Use digital supports. There is no technological substitute for quality, in-person, face-to-face support. But to supplement and lessen the frequency of face-to-face supports, contact strategies—the time spent in synchronous and asynchronous communication between instructor and learner in distance education programs—can and should employ interactive, communication-based technology.

The use of technology for teacher support can be ambitious. The government of Egypt, for example, offers a seven-channel, satellite-based network of centers in schools and administrative centers that provide ongoing support to teachers and students in remote primary and secondary schools (Farrell & Isaacs, 2007).

On the other hand, technology efforts can also be more modest. Telephone, instant messaging, e-mail, videoconferencing, and Web-based voice tools all facilitate synchronous communication between instructors and learners. The use of Web 2.0 applications (discussed below) can provide additional academic support for students, including synchronous and asynchronous office hours. Online tutoring services such as Tutor.com, EduFire, Your Tutor, InTuitionIndia.com, coupled with the increasing use of online avatars, can provide teachers with one-to-one tutoring and extra help.[309] Providing teachers with phone cards can prompt teachers to call or text their instructor when they have a question. To supplement face-to-face interactions, distance-based course designers can use online meeting applications such as Elluminate or Camtasia, which creates audio and video narration, real media, and podcasts, to help participants negotiate particularly nettlesome points in a course's trajectory. Finally, VBIE technologies—a Bluetooth-enabled earphone used with a webcam—can provide teachers with real-time in-class coaching from a remote instructor, virtual coach, or mentor (see "Chapter 3: Televisually-based Distance Education" for information on VBIE technology).

309 Since it is a profitable and growing sector, with organizations that differ in quality and variable results, many nations regulate online tutoring companies. See for example the Australian Tutoring Association: http://www.ata.edu.au/content/view/1/2.

This use of synchronous and visually based technologies can serve to personalize interactions. By providing the verbal immediacy and just-in-time assistance so critical to participants' satisfaction with distance-based learning. particularly online learning, these technologies can do much to mitigate the anonymity, mystery, and impersonal context of an online environment. They enable participants to communicate in a familiar way: talking to someone, in particular someone they can *see*. And they lessen the emphasis of Web-based teacher training courses on reading and writing, which is so often an impediment to learner success and so often exacerbates communication challenges (Center for Children and Technology, 2008).

9. Capitalize on social media to simulate face-to-face interaction and build personal learning networks. Even in online environments, teachers still need and benefit from face-to-face interaction with colleagues. This interaction can be carried out via the use of Web 2.0 tools such as VoiceThread, where teachers can have real-time discussions about a learning artifact; Skype, the free Internet telephony application through which small and large groups of teachers can have video-based phone calls; DimDim, for periodic small- and large-group discussions and reflections during which they can see one another; or social networking sites like Path,[310] through which teacher-learners can engage asynchronously or in real time in professional and personal sharing of experiences, photos, learning, and collaboration. This virtual face-to-face interaction may strengthen teachers' feelings of belonging to a larger, likeminded community of learners, while also providing channels for giving and receiving ongoing support from colleagues. Other, non-face-based but real-time Web 2.0 tools—collaborationware, micro-blogging tools, and social media sharing sites—allow teacher-learners to share information, co-construct activities and lesson plans, examine artifacts of student work, and furnish teachers with virtual colleagues whose help and support can transcend time, place, and space. The use of these various forms of social media as part of a structured learning experience can help teachers interact more frequently, build more diverse networks, and diminish the isolation and alienation online learners often feel—while enhancing the quantity, quality, support, and reciprocity of personal learning networks.

10. Build in opportunities for face-to-face interactions among participants. The above paragraphs discuss virtualized face-to-face interactions, but distance learners also benefit from physical face-to-face interaction. As much as possible, distance learning designers should integrate opportunities for face-to-face interaction in order to develop a sense of community in online learning. This objective can be achieved by arranging face-to-face retreats and by organizing teachers into pairs so that each has a "buddy" with whom he or she studies and works on projects, e-portfolios, and school-based activities. For instance, the DBE 2 Indonesia online coaching program implemented by EDC organized coach-learners into pairs who worked together in all aspects of coaching. This way, every coach had a work and study partner and an automatic support person.

310 See http://www.path.com/

School-based Supports

Support for teacher-learners should not end upon the conclusion of a distance learning program or course. In fact, it is often upon the conclusion of a course or workshop that teachers' real questions, and real need for support, begin in earnest. Below are some school-based support strategies that distance-based education planners can employ to ensure an instructional return on the investment:

1. Secure principal involvement. Leadership is a critical ingredient in school-based change. School leaders or principals establish the school-based climate and make decisions about the values and infrastructure of the school. They may be the head and heart of the school, and they are certainly its face and voice. The connection between supportive and facilitative leadership and teacher development is well established in educational research (McCann, Johannessen, & Ricca, 2005).

Globally, it is widely recognized that principals must shift from administrators to instructional leaders, a role for which most principals are ill prepared and ill equipped. Distance learning programs focused on classroom practice should include principals undertaking the same types of professional development as teachers as well as pursuing their own particular professional development, induction, and support to help them institutionalize school-based changes. (Principals are often included in the face-to-face support sessions that accompany many IRI programs.) By integrating principals into professional development, both as participants and as advocates, distance education initiatives ensure that the objectives of the professional development program are also the principal's objectives and priorities. They ensure that the principal understands the new practices from a student and teacher perspective and that he or she is equipped with additional skills to carry out, support, monitor, and evaluate such changes. Including principals in teacher improvement efforts, holding professional development sessions for principals, mentoring new principals, and establishing induction programs for new principals (mandatory in New Zealand) are increasingly common global trends.

Further, including principals in professional learning opportunities, particularly if larger macro-level system changes are implemented, increases the likelihood that principals will secure adequate resources and materials to enable teachers to do their jobs, particularly if principals feel a sense of ownership and accountability with regard to the initiative. This in turn may foster other principal-directed support efforts, such as pairing novice teachers with trained, experienced mentors or coaches; providing teachers with the time and impetus to promote positive collegial interaction and support; and giving teachers the time to meet, discuss, and plan. Most important, involving principals intimately in new initiatives and furnishing them with the knowledge and skills to manage such initiatives can help these school leaders set the tone and establish an instructional culture in which students, and the techniques that best help them learn, are at the core.

2. Involve a critical mass of teachers in the professional development. Professional development, whether face-based or distance-based, succeeds if it is an overall part of school improvement. Without a critical mass of teachers in a school undergoing the same type of professional development, with no supportive leadership or supportive colleagues who are themselves undergoing a common professional development transformation, teachers lack a "collective moral purpose" (Fullan, 2005: 68). In such an environment it is simply too easy for the one or two teachers enrolled in the distance learning initiative to backslide into less than optimal instructional practices, and an innovative instructional climate cannot then take hold.

Distance learning initiatives that aim for serious teacher change and school reform must therefore target a critical mass of teachers at each school—enough teachers so that the intervention becomes self-sustaining, carried forward by its own momentum and teachers' sense of ownership, belief, and success in implementing—versus being driven by external mandates.

Creating a critical mass of teachers at the same school undergoing the same professional development can cultivate a school-based community of learners and practitioners (see chapter 16). By working together with colleagues, teachers can customize, personalize, and adapt new skills and concepts to their particular setting. They can enlist colleagues to help them critique and improve implementation of a particular idea or strategy, and they can nurture a public repertoire of agreed-upon best practice at a particular school or set of schools.

In Japan, as mentioned earlier in this guide, all teachers at a school undergo intensive lesson study together. This method has the effect of building strong support networks and communities of practice at the school level, provides teachers with a mechanism to focus on continual self-improvement and school betterment, and results in consistency and depth in the teaching of content topics.

3. Offer school-based coaching as part of the distance learning program. No matter what the focus of the distance learning program, teachers will need instructional support to transfer learning from coursework to their classrooms. Instructional coaching, if carried out by well-trained and skilled coaches, is of enormous benefit to teachers.[311] Indeed, in many measures of teacher professional development, research suggests that coaching can be more effective than coursework in improving the structural characteristics in classrooms (Neuman & Wright, 2010: 63, 83). Since the structural characteristics of the classroom—for example, the classroom environment—have been strongly linked to quality practices and child outcomes in previous research (Dickinson & Caswell, 2007), the evidence suggests that coaching can be a particularly powerful mode of professional development for teachers (Neuman & Wright, 2010: 83). The greatest benefit of coaching is that well-trained coaches can offer the kind of ongoing, in-class, practical, differentiated and personalized instruction discussed in the previous section on change. Research also makes clear that teachers, especially new teachers, who receive coaching and mentoring (discussed later in this chapter) are less likely to leave teaching (OECD, 2008; Darling-Hammond & Bransford, 2005).

The majority of U.S. states now have some sort of coaching system in place to help teachers as part of formal professional development or district-based strategies for school improvement. These can be *data* coaches, who help teachers use data to inform instruction; *instructional* coaches, who help teachers with content-focused pedagogical approaches; *content* coaches, who help teachers with subject matter; *literacy* coaches, who help teachers implement evidence-based literacy strategies; and *turnaround* coaches, whose job is to help teachers and the principal with an array of approaches to help turn failing schools around. Though not coaches, in many U.K. schools teaching assistants are deployed to deal with infrastructure and

311 Similarly, when coaches or support staff are poorly trained, they may do teachers more harm than good.

administrative issues— such as photocopying, filling in for absent teachers, ordering supplies, and doing paperwork—thus freeing up the teacher for more instructionally focused and support-intensive tasks with students.

EDC's own evaluation of school-based coaching reflects the positive benefits of coaching on teacher practice. In two pilot programs involving approximately 300 teachers across six Indonesian provinces, 98 percent of teachers implemented at least one technology-based, learner-centered activity. In addition to attaining higher degrees of confidence and self-efficacy, 100 percent of teachers reported gains in their knowledge of new instructional practices and use of technology to support student collaboration (Ho & Burns, 2010).

The same evaluation suggests that face-to-face coaching is more effective than online or distance-based coaching. In all measures, teachers who received face-to-face coaching demonstrated more interactive uses of technology, more frequent learner-centered practices, better classroom management and organizational techniques, and greater confidence in teaching with technology, letting students use technology, and designing lessons around technology than did teachers who were coached via TeamViewer, DimDim and Skype (Ho & Burns, 2010). This finding was particularly noteworthy, since the teachers who received face-to-face coaching came from provinces where teacher quality is typically regarded as poor, while those receiving online coaching were based in provinces where teacher quality is considered high.[312]

Supporting New Teachers

The supports mentioned throughout this guide are important for all teachers, but they are most critical for novice teachers entering the classroom for the first time. Though many nations do not keep track of teacher attrition rates, there is sufficient evidence to suggest that teacher attrition is a serious global problem, especially among new teachers. Attrition may be formally noted or not, and it takes numerous forms. In many nations teachers simply fail to show up for work or do so irregularly. In other countries teachers leave government schools for the improved pay and, often, higher perceived quality and status of private schools. In Pacific Rim countries new teachers are five times more likely to quit teaching than their more experienced colleagues, and 25 percent drop out before their second year of teaching (Stephens & Moscowitz, 1997). Attrition rates are even higher for para-teachers.

Within the United States, 50 percent of new teachers leave teaching within their first five years (National Commission on Teaching and America's Future, 2003) and one of the major reasons cited for this attrition is "isolation" (NCTAF, 2003). Unlike their more experienced colleagues, new teachers do not have an established professional network. They cannot draw on a reservoir of experience and accumulated knowledge to guide them when times get tough. They often lack the confidence of their more experienced colleagues. And in cultures that value age, hierarchy, and problem avoidance, they may not have the respect of their older administrators, nor feel comfortable asking their principal for help.

312 This perception is often made based on the socioeconomics and levels of education within these provinces. It is not clear whether such perceptions are based on examination of a particular set of data.

Teacher Induction

New teachers, that is, those graduating from teacher training programs and beginning their first year of teaching, often require a suite of supports that differ from those needed by more experienced colleagues. Teacher induction programs, particularly those that include a mentoring component, have been shown to be highly effective in improving the quality of new teachers and addressing attrition issues (Stansbury & Zimmerman, 2000; Fulton et al., 2005; Breaux & Wong, 2003). In fact, benefits of strong teacher induction programs include attraction of better teacher-candidates, reduced attrition, improved job satisfaction, enhanced professional development, and improved teaching and learning.

Teacher induction is a comprehensive program that acculturates or "inducts" new teachers into the teaching profession. It often includes formal orientation sessions, mentoring, common planning time and collaboration, ongoing professional development, access to experts, reduced teaching load, and/or participation in an external network of teachers (Breaux & Wong, 2003). Induction programs may be formal or informal and "low intensity" or "high intensity" (Stansbury & Zimmerman, 2000). Low-intensity programs include orientation activities, opportunities for collaboration, matching new teachers with veterans, and adjusting working conditions. Brunei and Papua New Guinea, for example, generally[313] offer low-intensity induction programs that include orientations, meetings, and inspections of new teachers (Stephens & Moscowitz, 1997). While low-intensity induction programs are helpful for teacher retention, they do little to develop teacher effectiveness.

High-intensity programs include mini-courses for new teachers, networking opportunities, mentoring, release time, university credit for professional development, observation and assessment by an expert peer, and opportunities to observe an expert peer (Stansbury & Zimmerman, 2000). Many U.S. states, the Canadian provinces of Quebec and Ontario, Denmark, the Netherlands, and Sweden use high-intensity induction programs, which have been shown to improve the overall effectiveness of new teachers (Stansbury & Zimmerman, 2000; OECD, 2005; Ingersoll & Strong, 2011).

Figure 17.9: Characteristics of the Most Effective Global Induction Programs (Howe, 2006)

A review of induction programs in Australia, Britain, Canada, France, Germany, Japan, New Zealand, and the United States suggests that the most effective induction approaches are based on six elements:

1. Individualized induction plans
2. Mentor training
3. Development of partner schools for more extended periods of induction—mixed between universities and schools in the teacher's first year, followed by more intensive, school-based elements in the second year
4. Reduction in responsibilities, in addition to reduction in teaching workload and time for reflection and self-assessment
5. Development of an organizational culture in which there is collaborative exchange involving a range of professionals aimed at supporting newly qualified teachers
6. Separation of the support and assessment functions of induction

313 "Generally" is used here since certain schools, such as private or independent schools, may have more formalized and high-intensity induction programs. Additionally, the information presented here, while the most recent found, is from 1997.

Internationally, there are a number of recognized high-intensity induction programs for new teachers. Scotland, for instance, guarantees a one-year teaching post to any eligible student-teacher who has graduated with a teaching qualification from a Scottish institution of higher education. The Department of Education sets a maximum teaching load of 70 percent, with the rest of the time set aside for personal development. Indeed, Scotland's induction program is considered to be one of the world's best (OECD, 2007).

In Greece teachers appointed to their first post in government schools must undergo 100 hours of theoretical and practical professional development in didactical methodologies, educational administration and organization, teaching practices, evaluation methods, practical teaching, and evaluation and planning (OECD, 2005: 119). France has begun to steer its recently graduated teachers away from the more difficult school environments of the *zones d'éducation prioritaires* (priority education zones) toward "group" teaching posts in designated schools where new teachers can focus on the art and craft of teaching rather than discipline issues (OECD, 2005: 50). In South Korea new teachers undertake two weeks of pre-employment training, focusing on field-related cases and practical tasks such as classroom management skills and developing basic teacher capacities. This period is followed by a six-month field training led by the principal, vice principal, and advisory teachers in the school, concentrating on instructional guidance and evaluation, classroom supervision, student assessment, and assistance with administrative tasks. Finally, new teachers undergo a period of reflection and discussion with other beginning teachers and teacher-educators (OECD, 2005: 119).

Induction programs vary along numerous dimensions. They can be *mandatory* or *voluntary*. For example, England, Northern Ireland, Wales, France, Greece, Israel, Italy, Japan, South Korea, Switzerland, and some U.S. and Australian states have mandatory induction programs for new teachers. In Scotland participation in induction is at the discretion of individual teachers, while in Quebec, Denmark, the Netherlands, and Sweden, induction is offered at the discretion of the school (OECD, 2005: 119).

Induction programs also vary in their *duration*. They range from seven or eight months in South Korea and Greece respectively to two years in Quebec, Switzerland, and parts of the United States. Mentor-teachers, often in cooperation with school management, are in charge of providing teacher induction (OECD, 2005: 121).

They also vary by *type*. For example, while Germany does not offer a formal induction program, many German *länder* (states) offer new teachers a two-year apprenticeship. This apprenticeship coincides with teachers' pre-service training for one of the three forms of secondary schools: *Hauptschule* (practical vocational schools), *Realschule* (technical vocational schools) or *Gymnasia* (academic schools) (Howe, 2006: 291). Taiwan also offers new teachers internships or apprenticeships.

In many states in the United States, *professional development schools* bridge a teacher's pre-service and in-service experiences. Within a professional development school, pre-service teachers can conduct their teaching practica, and upon graduation from a teacher education program they can return to the same school. Professional development schools then provide the new teacher with a mentor, reduced teaching loads, and ongoing professional coursework. In the world of U.S. online education, programs such as the Florida Virtual School provide its online teachers with an online mentor with whom the new teacher co-teaches a class during his or her first year. The U.S. city of Cincinnati blends some of the German apprenticeship model with the concept of professional development schools. The city's school district has lowered its new teacher attrition rate to 3 percent annually, in part because of a stepwise system in which new teachers are recruited as interns in their second year of university to work at a "professional practice school." They then ascend the teaching ladder from interns to "apprentices" (first-year teachers) to "advanced" and then "accomplished" teachers, all levels of which have peer-assistance programs.

Finally, induction programs vary by those *responsible* for the induction. In Israel, Japan, Northern Ireland, and Switzerland, teacher induction is organized in collaboration with teacher education institutions and schools. In Norway teacher induction is coordinated by the state. In the United States induction programs may be carried out by schools, state departments of education, district education offices, unions, universities, external agencies, consortia, or private consultants in face-to-face settings, online settings, or both.

In response to issues of new teacher attrition and quality, pre-service education programs across the globe are revamping how they themselves teach prospective teachers. Teacher education in Sweden now includes a 20- to 30-week program in which a student-teacher works with a team of teachers within a school on a wide range of professional skills and pursues a research project linked to his or her academic program. Student-teachers then stay in touch with their school throughout the duration of their teacher education program. In Ireland, pre-service teachers undergo block placements at a local school where, with a cooperating teacher who volunteers his or her services, they teach a number of courses over the three years of their bachelor of education program, receiving feedback from the cooperating teacher and university supervisor. In Israel, practical field experiences for teacher candidates now account for 15 percent of the total program time.

Mentoring

Mentoring is often a major component of high-intensity induction programs, and indeed, mentoring of new teachers by a veteran teacher is often the key component of induction. Mentoring refers to one-on-one assistance and support from an experienced professional to a novice. (A full definition can be found on page 73 of this guide.) Teachers who participate in online learning combined with in-class mentoring show greater improvements in teaching than teachers who participate only in online learning (Landry, Anthony, Swank, & Monseque-Bailey, 2009). A three-year comparative evaluation study of England's Early Professional Development pilot scheme, a mentoring program for new teachers, reported that mentoring at an early career stage had a positive impact on mentees' teaching practice, career development, and commitment to teaching as well as on student achievement (Moor, Halsey, Jones, Martin, Stott, Brown, & Harland, 2005).

Mentoring has also been shown to aid in teacher retention and improve the professional skills of mentor-teachers (Ingersoll & Strong, 2011) especially mid-career teachers, who have been shown to gain a number of new skills and reinforce certain competencies as a result of the mentoring process. However, research also makes very clear the importance of careful selection and preparation of school-based mentors. Effective mentors must possess strong subject knowledge, deep awareness of instructional practice, good interpersonal skills, and the ability to support "mentees' critical interrogation of practice" (Smith & Ingersoll, 2004). Mentors also must be furnished with time and resources to work with their mentee.

Norway's induction system focuses on mentoring new teachers. The Ministry of Education provides resources to different projects mandated to test different methods of mentoring and guidance of new teachers. School principals assign an experienced staff member who is "well fit" to guide new teachers. The new teachers take part in local support sessions and in gatherings with new teachers from the other schools involved in the program. The out-of-school program and gatherings are seen as useful in dealing with potentially difficult issues for new teachers, such as student behavior (OECD, 2005).

One variation of mentoring has been initiated in Singapore. Through the Singapore Teachers Academy, master teachers in each content area and grade level design courses and offer ongoing courses and professional development sessions for their colleagues.

Building the Capacity of Support Providers

Coaching, mentoring and face-to-face and online support may not come easily to a distance-based instructor. Research from the UWIDEC teacher training program indicates that instructors need additional professional development and instruction when attempting to provide either instruction or support through asynchronous tools (Abrioux, 2006; Brennan, & Shah, 2000). Instructional coaches or mentor-teachers rarely have any special training or qualifications, though that is beginning to change as many locales include instruction in "mentorship" for prospective mentor-teachers. The U.S. state of North Carolina, for example, requires mentor-teachers to hold a mentoring license. In Norway, teacher education institutions train prospective mentors in how to guide new teachers and also offer in-school guidance for mentors. Preparing mentors and carefully matching them with teachers is critical. Improvements in new teachers' abilities have been linked to training of mentors, matches between mentors and mentees in content area or grade level, and frequency of mentor-mentee interactions (Ingersoll & Strong, 2011).

In Indonesia, mindful that their teacher trainers had little or no idea about what face-to-face support, coaching, and mentoring of teachers actually constituted, EDC designed an online course to help these teacher trainers learn techniques of coaching, holding productive teachers' meetings, facilitating discussions, observing and providing feedback, and co-teaching. These may not be skills that come naturally to instructors, but if they are to mentor and coach their learners to become successful teachers, they will first need to be taught how to be successful teacher trainers.

Though almost every school system across the globe has some sort of nominal teacher-support personnel—from content supervisors to block-group supervisors to circuit inspectors—many of these support staff function in bureaucratic or administrative roles rather than instructional ones. They often evaluate teachers and monitor compliance rather than working with and supporting them directly. Such staff may be unable to serve in a support and instruction capacity because they themselves were trained and acculturated in a system that promotes traditional instruction and unequal relationships with teachers. Similarly, they may have little opportunity to visit classrooms and little practical experience of actually working with teachers because of other work-related duties.

To support teachers to implement in their classroom what they have learned in distance-based courses, educational entities must build a functioning system of teacher-support personnel, starting with standards for coaches, mentors, and teacher-leaders. One example of such standards, the Teacher Leader Model Standards,[314] contains a series of broadly stated expectations or domains that define critical dimensions of teacher leadership, helping to identify the full range of competencies teacher-leaders will need to work with formal school leaders to guide, mentor, and assist teachers in implementing exemplary professional practices that lead to improvements in student learning. Such a support system has to operate concurrently with any type of teacher professional development program, regardless of its mode of instruction and focus. These standards can then frame the type of instruction and preparation system for mentors to allow them to work effectively with, support, and nurture new teachers.

Conclusion

People and organizations tend to resist change or embrace it slowly. This tension between the rapid change demanded by innovations and the resistance to change on the part of individuals and organizations means that change is often fraught with upheaval and uncertainty. But change is necessary for growth and for improvement. It can be highly beneficial if teachers are provided with an array of ongoing supports, but it can be counterproductive and futile if they are not. Without ongoing classroom-based support to help teachers internalize what they have learned in their distance courses, they will either fail to implement or abandon new instructional methods, particularly in the face of difficulties such as a lack of resources, an examination system misaligned with instructional practices, or lack of support from the principal or colleagues.

The changes wrought by distance-based professional development programs demand the presence of a school-based support person or “change agent” to strike a balance between competing goals and to move change forward in a thoughtful, pragmatic, holistic way. For pre-service teacher-candidates attempting to successfully fulfill course requirements for a distance-based teacher training course and for in-service teachers hoping to upgrade content or instructional skills, distance education programs that offer a range of human supports can help teachers with the conceptual, behavioral, attitudinal, and logistical challenges that accompany new learning or change.

Many distance learning programs have not considered the length, duration, and complexity of the change process in teacher education. Once policymakers and designers are more cognizant of these issues in relation to teacher change, they will, it is hoped, make more informed decisions about how best to support teachers in ways that will improve the programs’ effectiveness, make the teachers successful distance learners, and enable them to implement new ideas and skills successfully.

314 See http://www.teacherleaderstandards.org/

Chapter 18: Developing Content

Best Practice: *Successful distance learning programs make careful decisions about content development.*

Overview

Chapter 11 discussed the importance of instructional design in distance learning programs. In addition to instruction, distance education content and activities are the central link between theory and practice (Commonwealth of Learning, 2008). Indeed, it has been argued (Robinson & Latchem, 1997) that because self-study predominates in distance education, learning materials play a more central role in a distance-based, versus face-to-face, learning environment.

In many distance education programs, however, more effort is often focused on assuring high-speed Internet access or overseeing the distribution of radios than on developing high-quality learning materials. The technical reality for many nations is that bandwidth dictates the types of content selected. Therefore, because of low-bandwidth issues, many distance education programs simply scan paper-based content and place it online.

Content and curriculum development should be as much a focus for distance education programs as technology has been. As mentioned in chapter 11, poorly produced materials burden distance education courses; they confuse students, require more facilitator time and support, and thus increase the cost and diminish the effectiveness of distance education. Because attrition rates for distance learning courses are high, materials must be well developed, developmentally appropriate to the learner, accurate, stimulating, and positioned to take advantage of whatever particular technology medium is used. Where a choice of programs exists, those programs known for poor quality will drive their potential customers elsewhere.

"Content" in this chapter refers to text-based and digitally based information and materials within an overall course of study (the curriculum) developed for a specific educational endeavor or context. Content can include text, multimedia, simulations, animations, lectures, presentations, tutorials, collections, resources, subject- and task-specific cognitive tools, references, assessments (quizzes/tests/exams), and readings. Two types of content are typically found in distance education courses: educational and non-educational. This chapter focuses on educational content.

Constraints Associated with Developing Distance Learning Content

Securing accessible, relevant, high-quality content that addresses local education needs and is available in local or national languages presents serious challenges to distance education systems. Sophisticated distance education content and materials that promote higher-order thinking and critical reflection using rich multimedia—such as video, audio, and Web interactivity—also require more time, labor, and technical effort to develop (Moon, Leach, & Stevens, 2005). For example, Britain's Open University spent two and a half years developing its Education Enhancement program for primary school teachers. In Egypt a similar program took one year to develop (Moon, Leach & Stevens, 2005).[315] Moon, Leach, and Stevens (2005) estimate that developing 50 pages of text with minimal diagrams and illustrations and no editorial support takes four to eight weeks.

A well-known, though probably dated and certainly broad, estimate of the *time* needed to develop distance-based content by media types is provided by Swift (1996). Figure 18.1 documents his estimates of the time necessary to design materials for one "notional" hour of student learning time.

Figure 18.1: Time Needed to Design One Notional Hour of Student Learning Time (Swift, 1996)

Medium	Estimated Number of Development Hours
Print	20–100
Audio	20–100
Video	50–200
Computer-based instruction	20–300
Experiments	20–300

There is no fixed estimate of how much it costs to develop content for distance learning. Much depends on the salaries of designers, cost of materials, and type of content.

In another probably dated approximation, Huberman (2000) estimates the *cost* of distance learning materials per learning hour and compares this with the cost of developing print materials. This information is estimated in figure 18.2. Though the costs per hour are assuredly different now (possibly cheaper in some cases) than they were in 1998, the ratios are quite possibly still relatively fixed.

Figure 18.2: Cost of Distance Learning Materials in Relationship to Print (Per Student Learning Hour) (Huberman, 2000)

Medium	Cost per Student Learning Hour in USD (1998)	Ratio to Print Cost
Print	$825	1:1
Radio	$24,750 to $44,550	1:50
Television	$148,500 to $206,250	1:180–250

315 Moon, Leach, & Stevens do not mention this, but the difference in time between the two countries may be the result of different materials (e.g., more text in Egypt, perhaps) and possibly different levels of complexity.

Medium	Cost per Student Learning Hour in USD (1998)	Ratio to Print Cost
Audio	$28,050	1:35
Video	$29,700 to $138,600	1:35–1:170
CD-ROM	$33,000	1:40

As figures 18.1 and 18.2 show, print is obviously the least expensive medium in terms of development costs and time. An hour of audio is about 35 times more expensive than an hour of print. An hour of television may cost up to 250 times as much per hour of student learning as print. As figure 18.2 demonstrates, there is still a strong financial imperative to use print-based distance education.

Though print remains an attractive option for distance education providers, many distance and traditional programs alike are turning toward digital content, such as digital textbooks. Many U.S. states, for example, are selecting digital textbooks over paper-based text, in particular for tablet platforms. Globally, educational publishers are rapidly making the transition to curriculum distribution via the World Wide Web, while textbook publishers such as McGraw-Hill and Prentice Hall have introduced e-textbooks for new platforms such as e-readers and the iPad. It is not uncommon now for textbook purchases to be augmented by online materials such as additional problems, three-dimensional environments, collaboration tools, augmented reality, multimedia, virtual worlds, applets, quizzes, tests and review materials, and special projects and lab work. Increasingly, textbooks contain QR codes that, when scanned, allow learners to view additional Web-based, multimedia content augmenting and vivifying textbook information.

Digital content suffers from a number of issues, among them the large capital costs associated with digital textbooks and interoperability issues between one platform and another or between one LMS and another. Digital reading can be hard on the eyes, and it may be difficult to highlight text and freely move from one section to another, even on user-friendly e-readers and tablets. Much digital content suffers from the "old wine in new skins" syndrome—traditional text in an expensive digital wrapper. In spite of these limitations, however, digital content offers several long-term benefits for learners:

» **Interactivity.** Unlike text, which has a flat structure, digital content can foster engaging, immersive, and interactive learning experiences. Text can be supported by audio, video, and animation and can link to Web-based content to provide a richer and multilayered learning experience for learners.
» **Flexibility.** Technology-based materials can be connected to current research and thinking and updated and disseminated more easily and inexpensively than is the case with textbooks.
» **Customizability.** Especially when combined with diagnostic assessment tools, digital content can provide a suite of personalized content for students to address particular areas of learner weakness or "hard spots" faced by learners and instructors alike. For instance, instructional designers can use speech-to-text (and text-to-speech) software to help learners who may have reading and writing difficulties, thus providing automatic scaffolds and supports. Ongoing formative assessment data

can allow for further customization of content based on learner needs. Similarly, content can be easily updated to reflect changes in national curricula and standards. Web cookies can track a learner's browsing preferences, determining patterns of use so that content providers can then tailor content offerings to particular students.

- **Multiple formats.** Digital content, indeed the same textbook, can be published in multiple formats: online, as an e-book to read on a tablet device or e-reader, or as a PDF that can be read on a computer screen. And it can still be printed in black and white or color, to be read as a traditional, paper-based book.[316]
- **Connected learning.** Digital textbooks enable several components of teaching and learning to converge. For instance, particular content topics can be directly linked to national syllabi, video examples of the particular curriculum concept in action, teaching guides, or a supplementary audio lecture. Digital textbooks, if connected to a cellular network or the Internet, allow learners to communicate in real time about end-of-chapter discussion questions or curriculum topics. Study units can be self-contained, blending content with self-directed or collaborative instructional activities and assessment.
- **Price.** At economies of scale, digital texts can be less expensive than paper-based text and curriculum supplements. As such, numerous school districts in the United States, Canada, Britain, and Australia are switching from paper-based to digital textbook formats.

Given the appearance of iPads in education and the desire among educators to test-drive them as vehicles for content delivery and personalized instructional tools, we will undoubtedly see numerous digital-content initiatives in the next several years, as well as the continued migration of content from print to digital formats.

Strategies for Developing Distance Learning Content

Besides money, course content development requires significant levels of academic, professional, editorial, design, media, and technology expertise (Prescott & Robinson, cited in Perraton, 1993), as well as rigorous mechanisms for quality assurance. Distance education entities may address content development in several ways, for example:

- Develop distance-based course content within the distance education entity itself.
- Form partnerships with *local* entities to develop or share locally appropriate content.
- Form partnerships or consortia with external but similarly focused entities to share, modify, and develop content.
- Purchase or contract course content from commercial or external providers,
- "Broker" materials and content from other distance education providers,
- Re-use materials from face-to-face programs,
- Promote peer production of materials, self-publishing, and remixing of materials.
- Use and modify open content.

316 Printing e-books or e-magazines directly from websites often eliminates much of the formatting.

Each of these strategies will be discussed briefly. Open content and courseware, though a part of many of these content development strategies, as well as its own unique strategy, will be discussed in a separate section later in this chapter.

1. In-house development of course content. Many national open and distance education programs, such as open universities in Indonesia, Hong Kong, the United Kingdom, India, and Pakistan, develop their own content. They do so in a number of ways. For instance, many open universities such as the Bangladesh Open University, the Open University of Israel, UT (Indonesia), KNOU, and the Open University of Sri Lanka follow the U.K. Open University practice of using course development teams comprising subject specialists, instructional designers, and educational technologists (Latchem & Jung, 2010).

Other institutions may have a course author and editor working with an educational adviser. Some programs or institutions pay stipends to current faculty for course development. Others use a blended model of hiring existing faculty and outside course development experts. Still others use part-time curriculum developers to develop distance-based materials (Neely & Tucker, 2010). Others take print-based content and simply place it online. And many distance education institutions use all or a combination of these approaches.

2. Form partnerships with local entities to develop or share locally appropriate content. Some distance learning programs, such as Britain's Open University, are recognized for the excellent quality of their materials and media (Prescott & Robinson, 1993). Other national or regional entities may have no such content development capacity or may lack the level of expertise needed to produce high-quality materials, and as such they may turn to a variety of local education actors for content development or provision. A few of these entity types and relationships are noted here:

- **National pedagogical institutes.** Russia's state pedagogical institutes (e.g., Moscow and Krasnoyarsk) helped to develop content-based pedagogical strategies for Russia's E-learning Support Program.
- **Universities and teacher training colleges.** The University of the West Indies develops content for its Distance Education Centre. The University of Cape Coast develops all print-based content for Ghana's Untrained Teachers' Diploma in Basic Education program.
- **Implementing agencies.** USAID-funded and EDC-implemented DBE 2's (Indonesia) online course content was developed by EDC.
- **National educational agencies (such as ministries of education).** México's Secretaría de Educación Pública helps to develop content for the *Telesecundaría* program.
- **Internal institutional partnerships.** Albania's National Pedagogical Institute and University of Tirana co-develop content and materials for Albania's distance education program. In Costa Rica the Omar Dengo Foundation (a private nonprofit educational organization) works with the Ministry of Education to develop materials and content for online learning programs. And in Guinea, EDC worked with *l'Institut National de Recherche et Action Pédagogique* to develop content for the IRI program, *Sous le Fromager*.
- **Public-private partnerships.** The best-known of these is Intel Teach, which provides content, materials, and instruction to help teachers use computers to improve instruction for its face-to-

face and online programs.[317] Another is the Jordan Education Initiative, in which the government of Jordan bid the creation of an e-curriculum—e-math, e-Arabic—to private and public entities.

» **Media partnerships.** E-Learning for Educators is a consortium of nine U.S. states that partners each participating state's department of education with a local public (educational) television station. Through its ETLO program, EDC supports this initiative by establishing a cadre of online professional development instructors and course developers in each of the nine states who in turn create an online professional development program for their state's teachers. The public television stations furnish digital content (video, captioned video, Flash interactives, digital learning objects, and so forth) to support each state's online professional development efforts. In South Africa the South African Broadcasting Corporation is a major content developer for OLSET's *English in Action*.

3. Form partnerships or consortia with external but similarly focused entities to share, modify, and develop content. This is a common strategy among distance education institutions that serve small populations or that are under-resourced but share some cultural or geographic similarity or historical connection that makes such cooperation beneficial. For example, the Staff Improvement in Distance Education for Caribbean, African and Pacific universities initiative is part of the European Union's Cooperation Programme in Higher Education (EDULINK). Together, five universities—the United Kingdom's Open University, University of the Highlands and Islands Millennium Institute,[318] University of Mauritius,[319] University of the West Indies,[320] and the University of the South Pacific[321]—work together to repurpose existing Open Content teaching material and adapt it to local contexts using appropriate technologies.

The AVU[322] has used a collaborative approach to develop 73 modules (math, chemistry, biology, physics, ICT, and teacher education). Module authors and peer reviewers were selected from 12 universities in the countries that participate in the AVU.[323] All modules have now been published using a Creative Commons license, meaning that they can be used, modified, and resubmitted to AVU for further sharing.[324]

317 Though Intel is a multinational corporation whose headquarters are in the United States, it has so many local subsidiary, national, and regional offices with local staff that it is included here as a "local" entity.

318 This university serves northern Scotland, the Hebrides, and the Orkney and Shetland Islands. See http://www.uhi.ac.uk/home

319 See http://www.uom.ac.mu/

320 See http://www.uwi.edu/default.aspx

321 See http://www.usp.ac.fj

322 See http://www.avu.org

323 These countries are Kenya, Senegal, Mauritania, Mali, and Cote d'Ivoire

324 E-mail communications, Bakary Diallo, African Virtual University, October 26, 29, 2010.

Finally, a consortium of 15 open African universities,[325] the BBC, the Open University of the United Kingdom, and the Commonwealth of Learning[326] has developed another consortium—the TESSA[327] program. TESSA aims to develop open educational resources for teacher education to be shared throughout the African continent. Content has been developed in five subject areas: literacy, numeracy, social studies and the arts, life skills, and science. Content is primarily text-based, though there are accompanying audio files for some modules.

4. Using course content from external or commercial providers. Because they lack content development expertise—or want to avail themselves of an innovation considered somewhat "proprietary" or specialized (such as backward design, Singapore math, or cognitive coaching)—many distance education entities turn to either external or commercial providers to supply both content and instruction. For instance, Namibia's Pre-STEP at one point contracted with the Harvard Graduate School of Education's WIDE World to provide Web-based instruction for pre-service teachers in Perkins's Teaching for Understanding framework. Others may go for large-scale "superstar" content. For example, Namibia's National Institute for Educational Development contracted with the Discovery Channel to provide in-class instruction for teachers and students via on-demand DVDs. Many U.S. school districts use content developed by PBS TeacherLine or the commercial provider Teachscape, or from educational nonprofits such as TERC.[328] Some Asian open universities have contracted with Kaplan to help students with Teaching of English as a Foreign Language (TOEFL) test preparation skills (Latchem & Jung, 2010). In Malaysia, KDEB Anzagain and E-Learn-Dot.com provide multimedia and online resources for K–12 schools. And many distance education programs avail themselves of free content and materials made available by the corporate social responsibility efforts of multinational technology companies like Cisco or Microsoft.

Increasingly, and controversially, many universities contract creation of online course content and instruction out to private, for-profit companies in exchange for some percentage of student tuition (Parry, 2010). Content brokering has become easier with place-shifting technologies, which enable users in one location to stream live or prerecorded content from another location via phones, tablets, and laptops. However, many entities—for example, universities or academic departments within universities—may resist adaptation of proven foreign models (but may also lack the capacity to build their own quality program).

Contracting with external or commercial providers is certainly a way to get ready-made content to distance courses, though it is not for all modes of distance education. It buys time and enhances local instructors' and designers' skills and knowledge. But it is not without its drawbacks in teaching and learning. Benkler

325 These universities are the African Virtual University; Egerton University, Kenya; Kigali Institute of education, Rwanda; Kyambogo university, Uganda; Makerere University, Uganda; National Teachers' Institute, Nigeria; the Open University of Sudan; the Open University of Tanzania; University of Cape Coast, Ghana; University of Education (Winneba), Ghana; University of Fort Hare, South Africa; University of Pretoria, South Africa; University of South Africa; University of Zambia; and the South African Institute for Distance Education.

326 See http://www.col.org

327 See http://www.tessafrica.net/

328 See http://www.terc.edu/

(2008) indicts the failure of "market-based strategies to get materials in local languages to developing countries." When economies of industrial production require high up-front costs and low marginal costs, distance education producers—much like textbook producers in the United States—must focus on developing a few "superstars" and ensuring that everyone uses them regardless of their relevance and appropriateness to local contexts (Benkler, 2008).

Often, content packages—activities, supporting materials, and training—use an undifferentiated one-size-fits-all approach. External (and commercially) developed distance education packages have been accused of "contaminating cultures and values" (McGhee, 2003; Moon, Leach, & Stevens, 2005) in both design of knowledge and content and learning styles. Since this accusation is increasingly common with regard to the globalization of distance education delivery, we'll examine this charge here.

Within distance education literature, growing advocacy favors course content development, design, and delivery that are culturally sensitive and grounded in the five cultural dimensions identified by Geert Hofstede (1997). These five dimensions, explained in figure 18.3, suggest how Web-based information should be presented, how interfaces should be designed, and how activities and learning experiences should be organized (Marcus & Gould, 2000; McGhee, 2003).

Figure 18.3: Design and Organization of Distance-based Content Based on Hofstede's Five Cultural Dimensions (Hofstede, 1997; Marcus & Gould, 2000; McGhee, 2003)

Cultural Dimension	Description	Example of Impact: Organizing Course Content
Power distance	This refers to the extent to which less powerful members expect and accept unequal power distribution within a culture.	▪ **High power-distance cultures:** Experts present structured and hierarchical information presentation (big to small, etc.) ▪ **Low power-distance cultures:** Information is more free-flowing and less hierarchical; experience and knowledge of nonexperts are valued.
Collectivism versus individualism	This dimension measures the degree to which an individual relates to society or values his or her own achievement and status. In general, members of collectivist cultures are more intrinsically motivated.	▪ **Collectivist cultures:** More generalized, less personalized information is presented. Activities and discussion should focus on the group. ▪ **Individualistic cultures:** More specific information is presented, focusing on individual feelings and accomplishments.

Cultural Dimension	Description	Example of Impact: Organizing Course Content
Masculine versus feminine	In general, feminine cultures tend to allow cross-gender behaviors, while masculine cultures are more likely to maintain strictly defined gender roles.	▪ **Masculine cultures:** Males and females are portrayed in culturally fixed roles. ▪ **Feminine cultures:** Males and females are portrayed in a variety of roles.
Uncertainty avoidance	Cultures vary in their avoidance of uncertainty. High uncertainty–avoidance cultures resist innovation; low uncertainty–avoidance ones are less resistant.	▪ **High uncertainty–avoidance cultures:** Concise information is given, with minimal choices (e.g., regarding website or multimedia navigation). ▪ **Low uncertainty–avoidance cultures:** There is more choice, and information is presented elaborately
Long-term orientation	Cultures vary in their orientation toward time and punctuality.	▪ **Long-term orientation:** Relationships are ordered by status; information is presented over and over again to emphasize points. ▪ **Short-term orientation:** The focus is on reciprocity, with emphasis on stability.

First, a few words about the information in figure 18.3: though Marcus & Gould's analysis is limited in its scope, it does reveal inherently different ways of valuing, processing, and presenting information. This approach may create some degree of dissonance between distance education providers and instructors and learners as they wrestle with such culturally constructed concepts as "learner-centered instruction" and "critical thinking."

Next, it is apparent that many distance education entities that might seek the services of external or international content providers occupy one cultural dimension, while their potential provider resides in the other. If Hofstede is taken at face value, there may be at best an uneasy, and at worst an ill-fitting, overlay of providers' values atop those of the intended teacher audience. McGhee (2003) urges consideration of these latent preferences and of the entering cultural beliefs and entry-level skills of learners to reduce cognitive load and stress for the learner and contribute to a positive course outcome.

5. Brokering content from other open universities or distance education entities. Where local content development skills, technology infrastructure, or financial or human resources may be lacking, a distance education entity may choose to broker content from other distance education providers.

As one example, the Virtual University for Small States of the Commonwealth is a network initiated by and built on the support of ministers of education of developing small states. It shares the content it develops with all network members.

Another is Syria's Virtual University, which serves as a vehicle to broadcast distance-based courses from the United Kingdom's EDEXCEL, Ohio University, Heidelberg University, and the United Kingdom's Open University (Latchem & Jung, 2010: 86). Such a practice allows a distance education entity to offer a greater variety of vetted and, presumably, quality content and again buys the institution time until it develops in-house course design teams. The potential drawbacks, however, are a lack of localized and locally generated content and the time and resources necessary for translation and localization.

6. Repurposing content from face-to-face courses. A sixth option for content development for distance education involves the repurposing of face-to-face materials for distance education courses. This is an extremely common source of content for distance learning courses.

Much face-to-face content can be transferred to distance-based courses, but not all can or should be. As mentioned in the section on instructional design, this practice is one of the cardinal sins of designing for distance courses; yet it is still endemic. Many online professional development programs, for example, are so text-focused that they become merely expensive books, with learners completely missing out on the multimodal and interactive potential of the Web. This "old wine in new skins" practice persists when content and course developers fail to design specifically for the distance environment; fail to address learners' multiple intelligences through little, poor, or no use of multimedia; and fail to make multimedia as interactive and multichannel as possible.

Figure 18.4: Learning Objects (Wiley, 2008:3)

Learning objects are "digital entities delivered over the Internet or via computer so any number of people can use them simultaneously. They can be reused and repurposed. Learning objects are different from traditional instructional media in that they can be broken into constituent elements (e.g., picture) and reassembled. Learning objects have multiple variations. They can be knowledge objects, components of instruction, pedagogical objects and educational software."

7. Self-publish and remix materials. Another possibility for content development is for distance education bodies to encourage both self-publishing and peer development (i.e., by teacher-candidates, teachers, and instructors) of content materials by developing their own content or remixing existing content types to create new forms of digital content ("mash ups"). NHK, Japan's national television station, runs "Creative Library,"[329] a free web service that encourages students and teachers to use and remix video, audio, and multimedia for educational purposes.

329 See http://www.nhk.or.jp/creative/

The confluence of Web 2.0 tools allow easy and collaborative content creation using, for example, Glogster,[330] Lulu,[331] Prezi,[332] Mindomo,[333] and so on. Platforms such as DrupalGardens and UCoz[334] provide a simple, collaborative space where users can aggregate, manipulate, and mash up content from around the Web. Interest-based and local "micro-communities" can publish content that can be printed and distributed via various methods. Individuals can publish and distribute their own content and groups can focus on niche issues, pulling content from existing blogs and disseminating it through PDF magazines or social media publishing sites like Scribd.[335] Many distance programs encourage this creativity and see it as a valuable source of content development.

Free online tools such as data dashboards, print casting,[336] and self-publishing platforms have made content creation and dissemination much easier. Tools like YahooPipes[337] allow users to reorganize Web-based materials by grabbing them from the Web and customizing and repurposing them so that they can be displayed visually. Finally, more robust tools, content management systems such as Drupal[338] and SPIP,[339] facilitate the creation, management, display, and administration of Web-based content.

Helping teachers and instructors become content developers (and instructional designers) is certainly desirable, but it involves creating its own separate instruction, ongoing professional development, and support for those with little or no prior experience in content development. Instructors and learners must be aware of what, if any, standards govern content development for their particular distance technology mode. They must also know how to link those broad standards, and more discrete benchmarks, to the development of materials and learning experiences—particularly if instruction is to be learner-centered and focus on developing higher-order thinking skills. They must be aware of such curriculum and instructional design strategies as *backward design* curriculum mapping and must know, for example, when to use a *project-based* versus a *problem-based* instructional approach. Quality control standards and mechanisms must be established to assure the authenticity, veracity, and quality of documents—and learners' understanding of content must then be assessed. Those who develop, repurpose, and adapt existing content for distance-based courses must be familiar with and abide by copyright, Creative Commons, and fair use designations (see figure 18.5). Designing the types of flexible assessments mentioned in chapter 13 adds more complexity to this task.

330 See http://www.glogster.com

331 See http://www.lulu.com

332 See http://www.prezi.com

333 See http://www.mindomo.com

334 See http://www.ucoz.com/

335 See http://www.scribd.com

336 See http://www.printcasting.com/

337 See http://pipes.yahoo.com/pipes/

338 See http://drupal.org/

339 See http://www.spip.net

Further, if instructors and learners are to develop content for distance-based courses, they must have the skills to develop content—and instructional activities to promote understanding of content—within a particular mode of distance education. EDC's ETLO is one of the few professional development programs that offers instruction in developing online content and designing courses for Web-based professional development and virtual schools.

The final option for developing content for distance learning programs, discussed in the following section, is to repurpose open content and open courseware for distance-based courses.

Open Educational Resources

A final way to create content for distance-based courses is through open educational resources (OERs). OERs include open source software (OSS), OpenCourseWare (OCW), and open content, which includes all forms of digital and text-based "learning objects" (see figure 18.4 for an explanation of learning objects).

Open content is content that is created and licensed under a Creative Commons[340] or other "open" license allowing for free use as well as distribution, re-use, and adaptation. As of September 2010, there were estimated to be 20,000 open K–12[341] educational resources on the World Wide Web. These include videos, worksheets, lesson plans, learning objects, and so on—essentially anything that can be used as an object of study. The Open Educational Resources Commons[342] serves as a clearinghouse for this content.

OCW[343] is open, modular, and flexible electronic course content, typically developed by universities for their students and freely available through the World Wide Web. Materials in OCW collections are not simply freely available—their re-use and adaptation are also encouraged. Many of these resources are licensed under a Creative Commons license allowing for distribution, remix, and re-use of materials (see figure 18.5).

OSS is software whose code is freely available so that other programmers can modify and customize it. It is identified by the type of license under which it is released. These licenses include the Apache 2.0 license, the Microsoft Public License, and the GNU[344] General Public License. Essentially, open source licensing, like all open content and courseware, encourages a shared community approach to the development, extension, and patching of OSS. A common misconception[345] is that all OSS (indeed all open content) is free. While

340 Creative Commons is not simply one license but a range of licenses depending on how content will be used and the levels of attributions desired by the original author. For more information on Creative Commons, see the glossary of this guide as well as http://creativecommons.org

341 K–12 is kindergarten until 12th grade—the last year of secondary school.

342 See http://www.oercommons.org/

343 For more information on open courseware, see the Open Courseware Consortium at http://www.ocwconsortium.org/

344 The GNU General Public License (GNU GPL) is the most widely used free software license.

345 Another common misconception about open source technology is that it is completely open, can be freely read, and write any data format. This is not so. Formula specifications, data models, and procedures that establish interoperability among programs and devices are called "open specifications" (PNG, RSS, and HTML are examples of open specifications).

this is usually true, it is not always the case. Hence the designation FLOSS—Free/Libre Open Source Software.

OSS marked the earliest front in the open source movement and has become a jeremiad in and of itself, spawning heated rhetorical battles between OSS proponents and proprietary software developers. Wrangling has been particularly heated in southern Africa, with teachers and schools sometimes caught in the crossfire. These conflicts notwithstanding, OSS has moved from the fringes to the mainstream. Online courses are held in the OSS LMS, Moodle. Teachers browse the Internet using Firefox and Chrome and send in course assignments using Open Office. However, the influence of OSS has not been felt in the area of educational software, most likely because formidable development costs; production skills; and the combination of educational, storytelling, and technical know-how may limit such efforts to commercial vendors.

OERs are popular among distance education institutions for a number of reasons. They can allow distance courses to add to limited resources. They enable institutions to substitute expensive textbooks with free or low-cost content, thus reducing the cost of the course (since content development is a major expense). They provide a stream of ready-made content to institutions with no content or content development expertise. They can also offer an attractive view of content—not as some externally developed masterpiece but as a creation that can be disaggregated into the parts of its sum and developed not by "experts," but by ordinary teachers and students. Finally, OERs may confer a certain cachet—that the institution is plugged into current educational trends or that it is using international content.

Figure 18.5: Creative Commons Versus Fair Use (Caswell, 2008)

Creative Commons is much more education-friendly than the "fair use" doctrine that governs copyrighted content used for noncommercial educational purposes. Fair use can apply when copyrighted content is provided only to enrolled students under controlled conditions (such as user authentication). When that same course is shared openly online, however, fair use ceases to apply and all content must then be cleared for copyright violations.

Open content and OCW have become fairly mainstream, and everyone seems to be getting in on the act. Britain's Open University encourages users to remix content available on their site. The University of Nottingham's Open Nottingham[346] program makes available free and repurposeable tools[347] so users can integrate into their own courses. The Center for Open and Sustainable Learning[348] and the Connexions project at Rice University[349] have developed technologies that leverage open licenses and encourage users to build and share custom collections of open materials. The materials produced for OCW collections are meant to be used and re-used by self-learners, students, and faculty alike (Caswell, Henson, Jensen,

346 See http://unow.nottingham.ac.uk/

347 See http://www.nottingham.ac.uk/xpert/attribution/

348 See http://cosl.usu.edu

349 See http://cnx.org/

& Wiley, 2008). The Carnegie Mellon Open Learning Initiative[350] offers free online courses to learners anywhere. The U.S. Department of Education has proposed investing $50 million over 10 years to create an Open Skills Lab to develop exemplary next-generation instructional materials for use or adaptation with the least restrictive Creative Commons license. Even Microsoft, which has famously resisted the open source movement, now hosts a platform for open source projects[351] and the central Chinese government initiated the open source program Red Flag Linux.[352]

The open content movement is derived from a number of motivations. Primarily, a large group of content and software developers passionately believes that information—and the tools to develop and share information—should be free and open to all. This movement has spawned the open source operating system Linux;[353] open source browsers such as Firefox; open content management systems such as Drupal;[354] open social networking sites like Elgg;[355] open educational repositories such as Curriki; open content sites, where users are encouraged to create information, such as *Wikipedia*; open media sites such as WikiMedia[356] and "open universities" such as Wikiversity.[357] The proliferation of app development software and collaborative authoring Web 2.0 applications (such as slideshow sharing sites like Slideshare) or Google Earth,[358] where free geospatial data and images can be "mashed up" with text, images, and video and then freely distributed via .kml files) fuels the open and collaborative content creation movement.

Other open content providers have fewer ideological and more practical reasons for embracing open content—they may wish to give away content but sell related services, a practice known as "cross-subsidizing" (Anderson, 2009). For others, it is "freemium," availing users of some "free" content as a hook to interest them in paying for "premium" content (Anderson, 2009). Whatever the motivations, open content is a growing force, particularly in a Web 2.0 era, and must at the very least be explored by "start-up" distance education entities.

Open content and OER are currently used in distance education programs throughout the globe. WikiEducator[359] has a Creative Commons license that enables materials to be readily adapted to specific content in each country and are used by institutions in Botswana, the Comoros, Gambia, Sierra Leone,

350 See http://oli.web.cmu.edu/openlearning/

351 See http://www.codeplex.com/

352 See http://www.redflag-linux.com/en/

353 See http://www.ubuntu.com

354 See http://drupal.org/

355 See http://elgg.org/

356 See http://www.wikimedia.org

357 See http://www.wikiversity.org/

358 See http://earth.google.com

359 See http://www.wikieducator.org/

Lesotho, Seychelles, Swaziland, and Namibia (Farrell & Isaacs, 2007). The Khan Academy's[360] free library of math and science instructional videos and online exercises is used in English-speaking classrooms across the globe. And though designed for formal education or distance education per se, Mozilla's Drumbeat[361] project brings together interested parties across the globe to create online projects or products in whatever domain they so choose.

In addition to OCW, there are a number of efforts to create open textbooks. Creative Commons has launched an open textbook initiative, and Flat World Knowledge makes available open textbooks and content on its searchable website.[362] Although instructors choose the textbook, students choose the format, and it can be read free online and purchased in hard-copy format for a negotiated affordable price. In May 2009 the U.S. state of California launched the first-in-the-nation free digital textbook initiative to help ensure that California's students have access to high-quality, cost-effective instructional materials. The initiative reviews existing free digital textbooks against California's academic standards to identify which free textbooks are standards-aligned and may be used in California's classrooms.[363]

Besides California's initiative, a number of additional open textbook initiatives have emerged. For example, Free High School Texts[364] was developed in 2002 by PhD candidates at the University of Cape Town to distribute open content to students anywhere. Also in South Africa, the Shuttleworth Foundation[365] is working to distribute free science and math textbooks to students in grades 10–12. Some services, such as Textbook Revolt,[366] make rented textbooks available to students for much lower prices than purchased textbooks. A related initiative, the Digital Marketplace, a partnership between the California State University system and five major academic publishers (Bedford, Freeman, Worth; Cengage Learning; McGraw-Hill; Pearson; and John Wiley and Sons) seeks to distribute low-cost and no-cost digital book licenses, e-textbooks, and e-chapters.[367]

The above initiatives notwithstanding, efforts to apply the *Wikipedia* approach (large numbers of contributions in small quantities) to textbook production have been more modest. In 2005, two years after Wikibooks was launched, it had 10,000 modules of textbooks versus 200,000 articles for *Wikipedia* after two years. It appears that at this point in the open source movement, learning objects that are sufficiently modular, extensible, and capable of incremental, small-scale improvement are more successful than textbooks, which tend not to be modular; are less "repurposable;" and, because of the nature of the textbook development process, still benefit from economies of scale (Caswell et al., 2008). Since textbooks are fundamental to distance-based courses, Caswell et al. (2008) suggest that OCW and open

360 See http://www.khanacademy.org/

361 See https://www.drumbeat.org/

362 See http://www.flatworldknowledge.com/

363 See http://www.clrn.org

364 See http://www.fhsst.org/

365 See http://www.shuttleworthfoundation.org/projects/free-high-school-science-texts/

366 See http://www.textbookrevolt.com/

367 See http://www.dmproject.org/solutions/discover.html

content developers create kits showing how to make open textbooks, so that development of content can be repurposed and open licensing can allow for free, unambiguous translation and distribution. In the United States, the William and Flora Hewlett Foundation has awarded funding to the Community College Open Textbook Project to centralize information on open textbooks and document a workflow model for developing open textbooks (Caswell et al., 2008).[368]

The popularity and desirability of OERs is growing. UNESCO has developed MetaOER Project: Open Repository on Open Educational Resources,[369] which uses Web 2.0 collaborative tools such as del.icio.us[370] to allow users, in the words of its website, to "locate, tag, and share the original location of existing OER documents available all over the Web facilitating the process of evaluating and adding them to the Open Repository, so they could be always available in the same place to the OER community, teachers, and everyone interested."

However, the open content movement—content, educational resources, software, and textbooks—is not without its limitations. These, along with its advantages, are outlined in figure 18.6.

368 The William and Flora Hewlett Foundation has financed a number of OERs. For more information on the William and Flora Hewlett Foundation and these initiatives, see http://www.hewlett.org

369 See http://unescochair-elearning.uoc.edu/blog/2010/08/06/metaoer-project-open-repository-on-open-educational-resources-on-open-educational-resources/

370 See http://del.icio.us

Figure 18.6: Benefits and Drawbacks of Open Education Resources (Benkler, 2008; Commonwealth of Learning, 2008; Caswell et al., 2008)

Advantages	Drawbacks
▪ It is far less expensive to produce and distribute than proprietary materials. ▪ Source code and materials can be modified, so it is readily available and usable. ▪ Equity of access is assured. There is no restriction of software to any type of technology or user interface, so it may be distributed via means other than the Internet. ▪ Poorer countries may benefit from an influx of creative and knowledgeable producers who don't focus efforts on markets and don't require exclusivity in outputs. ▪ It can tap more contributors. ▪ It avoids pitfalls of trying to please large education districts with one standard product. ▪ It is capable of providing narrowly tailored, high-end learning objects that can be integrated differently by different teachers and learners depending on needs, styles, and emphases. ▪ MERLOT, MIT's OCW Initiative, the U.K. Open University's Open Content Initiative, and other open course content such as *Wikipedia* have made their way into all educational programs. ▪ It can be freely shared among institutions, regions, and nations, avoiding the need to "re-invent the wheel." ▪ Use of Web 2.0 tools—collaborationware—allows users to tailor, localize, and remix free content and disseminate for teaching and learning purposes.	▪ Distance education entities may lack capacity for quality monitoring and assurance. ▪ Open content taken from elsewhere may mean that content does not conform to local standards. ▪ Most content is in English. ▪ There is abundant open content for some forms of distance education (like online learning) and little to nothing for others (such as television). ▪ "Tragedy of the commons" phenomenon means there are issues of updating, maintenance, and improvement of resources if they're owned by all. ▪ Poorer countries may lack capacity to develop high-quality open education resources or maintain and update such resources. ▪ It works better in collaborative environments and open systems of greater instructor-learner autonomy versus more tightly controlled educational environments where materials must be on a large scale with a predefined framework set by someone other than developers or teachers and learners. ▪ It is difficult to generate peer-produced materials: there's a commitment to a certain way of working, writing, and collaborative authorship. ▪ There is no shared, national model for university open textbook use. ▪ Gap between university faculty's willingness to use and ability to use OER may be high ▪ Because OER is free, "you get what you pay for"—quality and accuracy may be poor. ▪ It may lack metadata, so the provenance of content (by whom, for whom, why, and how it was developed) may be lacking.

Before unconditionally embracing the open source movement, it is important to note that there are concerns that the beginning of the end of the free and open content movement may be upon us. As the "digital frontier" (Hirschorn, 2010: 77) continues to shift dramatically from the openness of the Web, where the browser reigns supreme, toward the closed and commercial platform of cell phones and tablets, open and free content development may diminish in favor of commercial phone- and tablet-based apps curated by a small number of online media stores (Hirschorn, 2010: 77). This trend threatens to disable the open content movement and shift control of educational content to the limited number of cell phone providers and media companies that create apps. Media companies may in fact begin to save their best content for phones and tablets, or shift away from Web-based content altogether, knowing that consumers will pay for content (Hirschorn, 2010: 80).

Considerations

Whichever of the above approaches, or combinations of approaches, are used, distance education entities should bear in mind the following considerations as they investigate and develop distance-based content:

- Materials created must be guided by availability of other resources (e.g., assignments that require learners to use library reference materials are no good if there is no library).
- Digital content must be SCORM-compliant so they can be shared across LMSs and platforms.
- The complexity of content (and their digital formats) may be influenced by the purpose of teacher-education programs. Pre-service courses and initial training and upgrading courses may require more involved and complex content than a program that focuses on continuing education or enrichment for teachers (South Africa Institute on Distance Education, 2005).
- All materials should be visually appealing and of high quality. Print materials should employ visuals, bullets, lists, and suggested activities to stimulate thinking (Commonwealth of Learning, 2008).
- As mentioned in chapter 11, as much as possible, content should be in multimedia format to account for learners' cognitive differences and learning preferences (Lane, n.d., Mayer, 2001; Gardner, 1983).
- Course designers should be trained to recognize different learning styles and adapt them to learners (Commonwealth of Learning, 2008).
- There has to be ongoing support for using materials. Programs with large amounts of student support may not need to develop as large a range of self-study resources as programs with lower levels of support. One common mistake in the design stage of program development is giving attention to materials development at the expense of well-thought-out strategies for support, assessment, and quality assurance (Naidoo & Ramzy, 2004; South Africa Institute on Distance Education, 2005; Commonwealth of Learning, 2008; Reddi & Mishra, 2005).
- There should also be reliable and sustainable strategies for making an ongoing investment in course materials design and development (SAIDE, 2005).
- Distance education entities should dedicate organizational resources and establish procedures related to content development, use, and revision, for example: developing or adapting established

content standards,[371] setting up student and instructor review and feedback on content, facilitating and managing online interactivity related to learning objectives, establishing a user guide and list of acceptable metadata or tags for digital library content, etc. (Commonwealth of Learning, 2008).

Finally, whether institutions create or purchase content for distance learning courses, these materials still must be evaluated for quality, fitness, usability, and appropriateness with regard to the curriculum. Evaluating instructional digital materials can be a challenging task, since choices are often endless, interoperability issues still abound, and products are constantly evolving. There may be no standards against which to evaluate content, the process may be new, and it may be difficult to find materials that match curriculum frameworks and local teacher training curricula. To address these issues, numerous educational entities have employed the following content development or purchase strategies:

» Develop checklists and rubrics to assess content for quality, rigor, and fitness.[372]
» Use international checklists to assess digital materials,[373] particularly to ensure they are SCORM[374] -compliant. This way, if distance learner providers move from one LMS to another or one platform to another, content will work across platforms and systems.
» In the content selection process, encourage users (teachers and students) as well as administrators and procurement personnel to participate actively in the selection and testing of materials. In so doing, distance providers can ensure that the materials meet educational needs while also fitting within the local budget and infrastructure.
» If local standards for content are unavailable, compare content against international standards for content, such as iNACOL's standards for online content.[375]

371 See the next chapter concerning national bodies that establish content standards (e.g., National Geographic Society geography standards; National Council of Teachers of Mathematics math standards, etc.)

372 See, for example, the state of Massachusetts (U.S.) rubrics for assessing math content: http://www.doe.mass.edu/frameworks/math/2000/append2.html and science content: http://www.doe.mass.edu/frameworks/scitech/2001/Appendices/ap7.html

373 See checklists developed by the Southern Regional Education Board: http://publications.sreb.org/2007/07T05_Checklist_Eval_SREB-SCORE.pdf

374 **SCORM (Sharable Content Object Reference Model)** A set of technical standards for e-learning software products. SCORM defines how to create "sharable content objects" (SCOs) that can be re-used in different systems and contexts and governs how online learning content and LMSs communicate with each other. For more information, see http://www.adlnet.gov/Technologies/scorm/SCORMSDocuments/2004%204th%20Edition/Documentation.aspx

375 See http://www.inacol.org/research/nationalstandards/NACOL%20Standards%20Quality%20Online%20Courses%202007.pdf

Conclusion

The type of content and materials needed for a particular distance education program is driven by the type of technology delivery system.[376] But all effective distance learning content materials—both digital and text-based—must be developed by people with successful school experience. These developers must not only understand how people learn and how the design of content contributes to learning but must also be aware of the skills, abilities, and culture of the pre-service and in-service teachers for whom they are producing the content. The materials must be of high quality and must be sufficiently engaging to advance the diverse aims of various courses by supporting instructional efforts to model good teaching and learning. These efforts require focusing on classroom and school; integrating theory and practice; linking to specific teacher assessment outcomes; explaining and modeling subject-specific pedagogy; and inculcating declarative, procedural, and conceptual knowledge about a particular subject area (Commonwealth of Learning, 2008).

376 For example, Web-based content and materials might include course development tools, quiz and survey tools, a grading book, course syllabus development tools, and administrative tools for LMSs such as Moodle.

Chapter 19: Assuring Quality

Best Practice: *"Quality matters"—distance education programs must be committed to maintaining academic and instructional quality regardless of the mode of delivery.*

Overview

Without a strong base in research and theory, distance education has struggled for recognition by the traditional academic community. Without rigorous standards to assure the quality of distance-based teaching and materials development, distance education has battled perceptions of inferior quality. And without much in the way of longitudinal and comparative evaluation data, many types of distance education, such as two-way audio or online learning, have struggled with perceptions of impact and effectiveness (Moon, Leach, & Stevens, 2005; iNACOL, 2008).

Because teaching and learning in a distance environment occur in the ether or across airwaves and not within the four walls of a classroom, distance learning has often escaped the scrutiny that may accompany face-to-face professional development. (This situation is ironic, since distance learning actually leaves more of a digital data and information trail than face-to-face instruction.) Instructional delivery systems, the mechanics of learning, and the location of learning in distance environments often differ from those in brick-and-mortar settings. Therefore, distance learning programs may escape quality and accountability provisions, because quality assurance and accreditation systems may lack the personnel, instruments, and protocols to assess and measure quality in a distance environment, and they may offer few or no ideas or guidance concerning how to adapt face-to-face mechanisms and procedures to distance-based learning (Hassell & Terrell, 2004).

"Quality" in this chapter means adherence to a set of standards of content, design, and instruction; proof that learners emerge with a set of useful and usable knowledge and skills; and verification of both by an external, impartial accrediting agency. Despite this definition, "quality" is a relative term. Students, teachers, employers, teaching assistants, university rectors, funding agencies, national ministry of education officials, accreditors, assessors, and external providers may all have individual and competing notions of quality. This reality, coupled with competing priorities and, in many regions, a desire to get as many teachers in and out of the distance education system as quickly as possible, means that "quality" often remains ill defined and elusive.

Quality distance education is a product of planning, monitoring, control, and coordination (Robinson, 1993: 77). In spite of the difficulties outlined above, successful distance education programs should take to heart Perraton's (1993) admonition that "quality matters." These distance learning programs build quality, quality assurance, monitoring, and compliance into the design and delivery of distance learning opportunities for teachers.

Developing and Maintaining a System of Quality Assurance

Harman (2000, cited in Belawati & Zuhairi, 2007) defines quality assurance as the "systematic management and assessment procedures adopted in order to monitor performance against objectives and to ensure the achievement of quality outputs and quality improvements." In their 2007 World Bank study of ICT in 53 African countries, Farrell and Isaacs advocate a system of quality assurance that envelops program design, approval, and review; management of program delivery; student learning and support; student communication and representation; and student assessment.

Norman (1984) and Robinson (1993), cited in Binns and Otto (2006), suggest that the following four aspects of quality assurance deserve particular attention:

- **Products.** These include courses, materials, and graduates.
- **Processes.** These include the functions of distance education: registering students, tutoring, and assessment
- **Production and delivery systems.** A major part of these is course development.
- **General philosophy of quality assurance.** This is evidenced by individual roles and responsibilities, mission statements, and accountability.

These four aspects, components of each, and examples of mechanisms for assuring quality compliance in each are outlined in figure 19.1.

Figure 19.1: Four Aspects of Quality Assurance (Adapted from Norman [1984] cited in Binns & Otto, 2006: 36–38; Robinson, 1993)

Aspect	Examples	Mechanisms
Products	Courses and materials	▪ Content adheres to international or nationally based content standards. ▪ Writers and designers are trained to an agreed-upon level. ▪ Qualitative editing and review validates content, language, and design. ▪ Students and instructors pilot materials, and revisions are based on their feedback. ▪ Content goes through quality assurance with final revisions. ▪ Further revisions are made after first course.
	Number of graduates	▪ Appropriate selection process is implemented. ▪ Diagnostic assessment determines a student's "readiness" to be a distance learner. ▪ Formative assessment uncovers learner difficulties and offers assistance or remediation ▪ Mentoring, coaching, and support services serve distance learners ▪ Tutoring system is in place to help struggling learners. ▪ Alternative forms of instruction and summative assessment address learning styles and learner aptitudes and provide a reliable form of assessment of learner's full range of skills.

Aspect	Examples	Mechanisms
Processes	Tutoring, assessing written work and providing feedback, monitoring instructors and tutors, training group leaders	▪ Continual professional development takes place for instructors, tutors, mentors, coaches, course designers, and student support staff. ▪ Audio, video, and instructional scripts are sampled to test quality and are revised and eventually validated. ▪ Instructors are trained in the distance education medium they will use. ▪ Instructors have participated, as learners, in the distance education medium in which they will be teaching.
	Application, registration, and examination	▪ Procedures for registration and examination are simple and in multiple formats (electronic and paper-based). ▪ Distance education program is a central component of teacher training program and not seen as “inferior” or ancillary. ▪ Multiple assessment types and formats (performance-based, Web-based, portfolio-based, etc.) promote movement away from sit-down examinations focusing on declarative knowledge.
	Record keeping	▪ Basic databases, or an Educational Management Information System (EMIS), are used. ▪ Learners are trained how to use and maintain database/EMIS. ▪ Database/EMIS information is constantly maintained. ▪ Relevant information is accessible to those who need it. ▪ Additional mechanisms (e-mail, SMS, texting, automated calling, etc.) push out information from EMIS to learners.
	Student supports	▪ The student is explicitly treated as the client. ▪ Institutional policies provide mentoring to first-time distance learners. ▪ Online and (if possible) face-to-face tutoring and guidance take place. ▪ Remediation and accelerated courses for learners are provided.

Aspect	Examples	Mechanisms
Production and delivery systems	Course production	▪ E-learning delivery standards are adhered to. ▪ National curriculum standards are adhered to. ▪ Materials and courses are field-tested. ▪ Quality control and assurance measures are in place and are enforced. ▪ Materials are visually appealing and follow good design and layout principles.
	Selection of appropriate technologies	▪ Learning objectives and content are designed first; technology is selected afterwards. ▪ Technology selected is appropriate to a particular context (e.g., if no electricity is available, select battery-operated or windup radio versus desktop computers). ▪ Technology chosen is best means of delivering content and instruction for that particular teacher-learner audience. ▪ Teacher-learners know how to use the technology selected (radio, CD players, laptops, MP3 players, etc.). Teacher-learners receive orientation in learning with and through the technology (beyond simple technical operations). ▪ Additional supports are provided to make sure technology keeps working: on-site/nearby tech support, solar panels, Uninterruptible Power Supply (UPS) to provide emergency power when electrical supply fails, generators, surge protectors, etc. ▪ Instructional back-up plans are in place for when technology fails.
	Materials delivery	▪ Someone or some entity is in charge—and held accountable—for distribution of learning materials. ▪ Distribution and delivery of materials are monitored and supervised. ▪ All materials, equipment, etc. are ready and available or delivered to learners right before distance learning courses begin. ▪ If teacher-learners must purchase materials, materials are free or low cost.

Aspect	Examples	Mechanisms
General philosophy	Policy statements	▪ Educational institution's written policies support importance of distance education programs. ▪ Vision statement and learning objectives are developed by institution and provide foundation for distance learning program. ▪ Policies are supported by procedures (training, support, materials, resources, technology) to ensure that distance learning programs attain quality. ▪ Measures of quality are written down and widely disseminated.
	Culture of total quality management	▪ All levels of educational institution promote a culture of continual improvement in the effectiveness and efficiency of all elements of distance learning. ▪ Problems are not hidden or avoided but addressed and remedied. ▪ There are transparent, documented sets of procedures and control of process. ▪ Top management are involved in and committed to distance learning program in general and quality distance education procedures in particular.

Many of the above components of quality assurance have been discussed throughout this guide. Additionally, numerous distance learning programs provide guidance on how to adhere to the four aspects of quality assurance described in figure 19.1. These examples are discussed below.

Products. Quality assurance of teaching and learning materials and instruction is especially important for educational organizations embarking for the first time on open and distance learning programs. The time-, labor- and resource-intensiveness of developing distance courses for teacher-candidates and teachers can be formidable and overwhelming, particularly if local expertise in design and instruction is not widely available.

The Open University of Israel is one example of an institution that adheres to rigorous design and technical conventions for its final course products. Each course takes between three and five years to develop, with most time devoted to writing, rewriting, and revising course materials (which sometimes exceed 1,000 pages). Course development involves a team of professionally trained developers and costs over $250,000[377] (Guri-Rosenblit, 1997: 5–10).

Each course undergoes a quality assurance procedure that examines the accuracy and currency of content, clarity of explanations, adherence to standards of self-study, and visual appeal and stimulation (or

377 1997 value.

lack thereof) of presentations. The quality assurance process also looks for evidence that activities and assignments enhance learning and assist learners in comprehending the main points and critical issues; and it ensures that students can complete the work in 15 to 20 hours, the time allotted for all study units (Guri-Rosenblit, 1997: 5–10).

Processes. In the United States, the state of Colorado's Online Education Division[378] oversees the quality of online courses, monitors reporting by online programs, and mandates professional development where there is evidence of instructor weakness (SETDA, 2008). The Turks and Caicos Islands have established a regulatory framework to govern provision of online courses. No institution can operate as an online education agency unless the quality of content and instruction is certified by the Higher Education Advisory Board in the Ministry of Education. USQ's quality assurance system focuses on implementing standards that blend conventional face-to-face delivery, traditional distance delivery and ICT-enhanced online delivery. USQ's Distance and E-Learning Center is the first distance education facility in the world to receive international quality accreditation to ISO9001[379] (Smith, 2006; USQ website). The Global Alliance for Transnational Education is designed to create global certification and review processes for education delivered across borders.[380] These processes also include reviewing standards for becoming a teacher (see figure 19.2) and making sure that the distance learning entity both helps pre-service teacher-candidates attain these standards and rigorously assesses its teachers on these standards, as discussed in "Chapter 13: Assessing Distance Learners."

Figure 19.2: Performance Standards for Teachers in England and Lithuania (OECD, 2005: 115)

To attain "Qualified Teacher Status," teachers in England must attain the following set of outcome standards:

1. **Professional values and practice:** These outline the attitudes and commitments expected of those wishing to become teachers. These values and practices are derived from the Professional Code of the General Teaching Council.
2. **Knowledge and understanding:** These standards require that teachers are confident and authoritative in the subjects they teach, how pupils should progress in these subjects, and what teachers should expect them to achieve.
3. **Teaching:** These are standards related to planning, monitoring, assessment, instruction, and classroom management.

In Lithuania the Ministry of Education has four tiered designations for teachers: classroom teacher, senior teacher, methodologist, and expert. Each step involves training and instruction, followed by an assessment to make sure the teacher has met those criteria in order to graduate to the next level. Poland has a similar set of designations for teachers.

378 Within the Colorado Department of Education.

379 The ISO 9000 standards were developed by the International Standardization Organization. These are a set of standardized requirements for a quality management system regardless of what the user organization does, its size, or whether it is in the private or public sector (ISO, 2011).

380 For more information on GATE, see: http://www.eunis.org/events/congresses/EUNIS97/papers/031901.html

Course Production and Delivery. Many distance education institutions and programs assure quality course production and delivery by either designing or adopting established content, professional development, and technology standards to frame teaching and learning decisions.

These standards are essential for several reasons. First, they establish the criteria for quality. Next, they frame the parameters of the course, reflecting goals and objectives and clearly specifying the subject matter to be covered, intellectual skills to be acquired, learning methods used, and what and how technology should support learning. Third, standards serve as outcomes by which to gauge program success and the quality of teaching and learning. Finally, standards can serve as yardsticks by which teachers can measure their own self-improvement goals. All of these factors contribute to overall measures of quality.

There are numerous well-respected international standards on which distance education designers and providers can draw. As we have seen in chapter 14, iNACOL has articulated standards for teaching as well as courses and programs for online learning. UNESCO's ICT Competency Framework for Teachers is focused on developing standards to help teachers attain technology literacy and use ICTs to enhance content and create knowledge.[381] The International Society for Technology in Education's National Educational Technology Standards (NETS)[382] provides a road map of best practices for teaching and learning using technology with teachers and students. NETS have been adopted in countries such as the United States, Jordan, Malaysia, Singapore, and South Korea. The National Staff Development Council (NSDC)[383] has developed an extensive and detailed framework governing best practices in all forms of professional development. UNESCO Bangkok (2007) outlines criteria for judging effectiveness of open and distance learning courses in teacher education. Additionally, many distance learning programs adopt the standards of their accrediting agencies, such as those of AdvanceEd, one of the largest worldwide educational accrediting agencies.[384]

In the United States, recognized Web-based online professional development programs for in-service teachers, such as PBS Teacherline,[385] ETLO, The Concord Consortium[386] and eMINTS[387] have designed courses in alignment with national standards developed by leading professional organizations such as the National Council of Teachers of Mathematics,[388] ISTE's NETS, iNACOL, and NSDC.[389]

381 As of this writing, the project to develop these standards is under way. See http://portal.unesco.org/ci/en/ev.php-URL_ID=22997&URL_DO=DO_TOPIC&URL_SECTION=201.html

382 See http://www.iste.org/AM/Template.cfm?Section=NETS

383 NSDC is now called, "Learning Forward." See http://www.nsdc.org

384 See http://www.advanc-ed.org/standards

385 See http://www.pbs.org/teacherline/standards-based/

386 See http://www.concord.org/

387 See http://www.emints.org/

388 See http://www.nctm.org/standards/default.aspx?id=58

389 Though NSDC's new name is Learning Forward, the standards are still known as NSDC standards.

Philosophy. The Open University of Indonesia developed a system of quality assurance that oversees the quality of products, production, processes, instruction, delivery system, and governing philosophy. This quality assurance system—which could be adapted to address *instructional* quality—includes development of a quality assurance manual and training in quality assurance procedures; development of performance standards, expected outputs, and competencies to perform each procedure; establishment of an incentive system tied to performance standards; self-evaluation and external assessments based on performance standards; and continual feedback mechanisms (Belawati & Zuhairi, 2007).

Botswana's College of Distance and Open Learning defines terms such as "quality assurance," "corrective action," and "quality implementation;" has outlined individual roles and responsibilities; and has developed quality control instruments, implemented audits, and created "nonconformity" report forms (Tau & Thutoetsile, 2006: 25).

Many distance education entities (programs, universities, even nations) may be too small and thus unable to develop the mechanisms to ensure quality control in the products, processes, course production, and delivery and overall management philosophy outlined above. This limitation is particularly true in the small island nations of the Caribbean.

The Caribbean Association for Open and Distance Learning and the Caribbean Universities Project for Integrated Distance Education (CUPIDE)[390] are consortia of Caribbean nations and universities respectively. While both consortia were developed to leverage resources, personnel, and content and to create strategic linkages with suppliers, manufacturers, and other universities, both could also develop their own shared quality assurance systems. Such consortia of small states, universities, or distance learning entities could develop clear, specific, realistic, and measurable goals and outcomes that reflect the institutional mission and objectives. These goals and outcomes could be documented and embedded in funding; infrastructure provision; support; course design, development, and review; materials selection; instruction; assessment; and evaluation decisions, thus ensuring a system of quality control.

Figure 19.3: Globalization (Thorbecke, 2007)

"Globalization" is an oft-used but ill-defined term. Globalization means greater integration into the world economy through openness to international trade, international flow of capital and labor migration, technology transfer, and the flow of ideas and information.

Because the Caribbean is a major target of offshore distance education providers, it has been particularly aggressive about establishing mechanisms of quality assurance and accreditation. The Association of Caribbean Tertiary Institutions, with the Caribbean Community (CARICOM), established a regional accreditation system to provide assurance to potential students of offshore distance learning providers' qualifications.

390 See http://www.cupide.org/. CUPIDE receives ongoing support from the Distance Learning Secretariat of the Ministry of Science, Technology and Tertiary Education in Trinidad and Tobago.

Even small distance education providers can assure quality in distance learning courses. They can have students regularly evaluate instructors and course offerings. They can conduct surveys, focus groups and interviews with students. They can track teacher alumnae and interview them as to how effective and useful they found their pre-service or in-service distance experience. Further, distance providers can solicit input from schools about the effectiveness of teacher graduates. Like all forms of quality monitoring, though, this information is useful only if acted upon.

Accreditation

Accreditation is a voluntary method of quality assurance by an external third-party organization, which assures that standards of quality are in place, that they guide all teaching and learning inputs and activities, and that there is a functioning system assuring monitoring and quality compliance. Accreditation is an extensive, lengthy process that occurs every fixed number of years depending on the accrediting agency. Though the monitoring and assessment system varies among accrediting agencies, the process of accreditation typically involves the following:

- **Self-study.** This is a yearlong process in which the distance learning program or institution assesses the degree to which its work is characterized by the practices articulated in the accrediting agency's Standards for Accreditation. The output of the self-study is a School (or program) Improvement Plan.
- **On-site visitation.** This is undertaken by an external team of peer reviewers who determine the extent to which a learning institution or program meets the standards for accreditation by reviewing evidence, interviewing personnel, and conducting observations of distance learning activities. Representatives of the accrediting agency develop a written evaluation report for the school, describing strengths and recommendations for improvement in terms of the standards for accreditation.
- **Plan for improvement.** The distance learning program or learning institution develops this to demonstrate through annual reporting to the accrediting agency that it is addressing identified needs in a timely fashion.

Formal accreditation is valuable for several reasons. First, if taken seriously, the self-study and formal evaluation process can assist in program improvement by equipping school leadership and stakeholders with the ability to identify and address challenges in their learning environments. As a result of the accreditation process, many teacher education programs in Australia, Belgium, and Sweden have substantially altered their programs and structures.

Next, if the quality assurance system in place offers ongoing training, capacity building, and support, then the accreditation process can catalyze improvements in individual capacity and qualifications of distance instructors and leaders of distance programs. Finally, accreditation by a respected accreditation agency—not all accreditation agencies are equal—confers the imprimatur of quality and excellence on a distance learning program.

Conclusion

The globalization of distance education—a constellation of commercial hardware, software, course management systems, and service providers, all of whom lay claim to having quality online programs—may propel universities and teacher training institutions toward embracing distance teaching and learning solutions, freeing them from addressing issues of quality and the multiple inputs that are part of any distance learning program. However, as Jegede, Fraser, & Fischer (1998) exhort, universities and teacher training institutions must be cognizant of their role as degree-granting institutions and adhere to high standards. They must be aware that in economies of scale, large-scale distance education designers can drive out small-scale providers, and poor-quality courses can drive out high-quality courses—with teachers and students suffering as a result.

Chapter 20: Evaluating Distance Programs

Best Practice: ***Successful distance education programs are characterized by continual formative evaluation and rigorous summative evaluation.***

Overview

Evaluation is often one of the weakest areas of any distance education program. For one thing, there may be no standards against which to evaluate. For another, outcomes may not be defined, the purpose may not be determined, and questions about who benefits (teacher-learner, school, or student) may not be developed. Furthermore, the program may have been designed with no stated goals or objectives against which it can be measured, or the evaluation may have been designed after the program began. The capacity and resources to conduct an evaluation may be limited or nonexistent—and worse, high attrition rates may render any evaluation unreliable,[391] invalid[392] and generally meaningless. Combine these issues within the nontraditional setting of distance education, and the design and implementation of rigorous and meaningful evaluations are often severely handicapped.

Evaluations of any educational technology program must confront a number of methodological problems, including the need for measures other than standardized achievement tests, differences among students in opportunity to learn, and differences in starting points and program implementation.

Many distance education programs circumvent these issues by simply failing to evaluate their distance learning or by doing so in the most perfunctory fashion. Many distance education programs, if funded by external aid agencies, may need to concern themselves only with monitoring and evaluation, which traditionally looks at inputs (number of teachers trained) versus outcomes (number of teachers who implement a strategy) or impact (how learner achievement has changed as a result of teachers' professional development).

Figure 20.1: Why Evaluate? (Adapted from Patton, n.d.)

Evaluations typically are undertaken for one of four reasons:

1. To judge the merit or worth of a program or intervention. Examples include accreditation or licensing, accountability, audits, and summative evaluations.
2. To improve the program. Examples include quality enhancement, understanding the process, continual improvement, and formative evaluations.
3. To generate knowledge. Examples include policymaking, determining what works, or theory building.
4. To generalize or predict future behaviors or outcomes in similar situations.This is typically used to scale up interventions.

391 An evaluation instrument is considered reliable if the instrument can be used repeatedly with different groups of similar subjects and yield consistent results.

392 Validity refers to the accuracy of an assessment—whether or not it measures what it is supposed to measure. There are generally (at least) three types of validity. One is *content* validity—the extent to which the content of the test matches the instructional objectives. The second is *construct* validity—the extent to which a test, instrument, or assessment corresponds to other variables, as predicted by some rationale or theory. A third is *criterion* validity—the extent to which scores on the test are in agreement with some externally established criterion/criteria. Evaluators also talk about concurrent validity, predictive validity, and face validity.

Yet continual monitoring and rigorous, well-designed evaluations are critical to the success of any distance education program (iNACOL, 2008). Well-designed and implemented evaluations inform distance education policymakers, planners, funders, and implementers about the strengths and weaknesses of programs and indicate what assumptions, inputs, and activities should change and how. Evaluation results help to improve programs and determine which ones should be maintained, changed, or closed. Simply put, without well-designed and rigorous evaluations, we cannot make claims about the effectiveness or ineffectiveness of a program. Without evaluation, we have no idea whether a distance education program really works. And if a program does fail, a good evaluation can help planners and designers understand and learn from the failure.[393] Because evaluation is so critical to the success of distance education programs, both formative and summative evaluations should be designed along with the course itself so that problems can be fixed and the value and worth of the program determined.

Fixing the distance-based evaluation system demands more space than is possible here. This chapter will suggest several techniques for designing both formative and summative evaluations that evaluate the effectiveness of any distance education system focused on teacher professional development. In contrast to chapter 13, which focuses on *teacher* assessment, this chapter focuses on *program* evaluation, though at times the content of the two chapters may overlap.

Formative Versus Summative Evaluations

Program evaluations are generally characterized as either formative or summative. *Formative evaluations* are ongoing through the life span of a program and are aimed at program improvement. *Summative evaluations* occur at the end of a program and judge its value or worth.

Both formative and summative evaluations should be part of any distance education program. Moon, Leach, & Stevens (2005) suggest early and ongoing formative evaluation during course development, and during the pilot phase, to ensure that courses are effective and achieving their stated objectives. This process might include review of course prototypes by content experts, distance education experts, and instructional design experts; a pilot study tracking student usage, along with instructor and learner surveys and focus groups; interviews and focus groups with learners (teachers and teacher-candidates) on questions of pace, workload, responsiveness of instructor/facilitator/tutor, levels and types of support, student learning, student satisfaction, and ease of technology use; and a final pilot evaluation report. All of this information should then be used to inform future planning, make midcourse corrections and revisions, and curtail any projects that are not working out before more time, energy, and funding are devoted to them (Gaible & Burns, 2007).

Summative evaluations often include either outcome evaluations or impact evaluations. Outcomes may be short-, medium-, or long-term results, whereas impact is generally considered a long-term effect. These types of evaluations use many of the same criteria and techniques mentioned above: interviews, focus groups, observations, and surveys. Suggested criteria might include relevance, utility, effectiveness, and

393 Increasingly, programs and projects are making their failures public in an effort to learn from, and help others learn from, such failures. See, for example: http://www.admittingfailure.com/

transferability of course content, activities, and assignments. Summative evaluations that are quantitative in design—either experimental or quasi-experimental, typically comparing or contrasting two or more groups, particularly a control group that did not receive the distance-based treatment—are considered by many to be the most technically rigorous.

Before embarking on any summative evaluation, distance education program stakeholders should bear a number of considerations in mind. One is the readiness, or maturity of the program. Can it really be evaluated? Are the results *observable* and *measurable*? For instance, if the purpose of a month-long online course is to help teachers empathize with children who have learning disabilities, can their empathy be *reliably evaluated*? Is this *program theory*—that an online course can build empathy—sound enough to be evaluated? Is the program *mature* enough—after only a month's duration— to be evaluated for changes in teacher affect?

Next, the criteria used in evaluation are often not clearly defined. Terms such as "effective," "good," and "qualified" are used and overused, but with no list of clear measurable criteria explaining what they actually mean. Similarly, there are numerous variants of "evaluation," each examining a program in different ways. *Impact evaluations* measure the actual impact of a program: whether or not its beneficiaries experienced positive changes over time. *Outcome evaluations* examine whether the main output of the program was achieved against its stated goals or targets. *Implementation evaluations* investigate whether and how program activities were implemented. Finally, *process evaluations* explore the fidelity and quality of a program's implementation. All of these types of evaluations are very different in terms of questions asked, design framework, and methods of analysis.

Finally, evaluations are too often carried out and never read, a tremendous waste of human and financial resources and a missed opportunity for program improvement. This situation may result when the evaluation is carried out merely to fulfill some contractual obligation, or because it is often undertaken for an undefined or ambiguous entity. This guide strongly suggests that evaluations be "utilization focused" (Patton, 2008), that is, have a "customer" or an "audience" to whom they provide information that is useful and usable, that this "audience" be involved in the planning and performance measurement of the evaluation, and that the audience member(s) be charged with both the responsibility and authority to make or oversee changes in the distance learning program based on the evaluation's findings.

Evaluation Designs

Designing a good evaluation is critical. *Design* here refers to set of specifications about which groups to study, how many units are in a group, by what means units are selected, at what intervals they are studied, and the kinds of comparisons that are planned (Weiss, 1998: 87). Well-designed evaluations with well-designed instruments and valid analyses of data generally provide valid and reliable results. Poorly designed evaluations do not.

Like instructional design, a good evaluation design begins with the end in mind. *Backward mapping evaluation* is a three-step evaluation design technique in which each step is integrated with and builds on the other two steps (Rossi, Lipsey, & Freeman, 2004: 91).

Step 1 (who?). This begins with *audience and purpose*: Who will use this information and for what purpose—not who is *interested* in the findings, but who will actually *use* them? Once this has been determined, evaluators and distance education providers can move on to the second step.

Step 2 (what?). This focuses on question development: What will this audience want to know exactly? Once evaluation questions have been determined, they should be ranked in order of importance.

Step 3 (how?). Once the audience, purpose, and evaluation questions have been developed, distance program stakeholders can determine what information is required to answer these questions, the source of such information (interviews, observations), the method for collecting information, and a plan for collecting and analyzing these data.

As mentioned above, evaluations often begin with a question: What are we doing? How are we doing? Why are we doing what we are doing? How are we accomplishing a task? The type of evaluation essentially depends on the type(s) of evaluation question(s) asked. Straightforward, "what" questions typically lend themselves to *quantitative* designs. Process-based questions such as "how" and "why" lend themselves to *qualitative* designs. Questions that ask for both types of information lend themselves to *mixed-method* designs.

Quantitative Evaluations

Quantitative evaluation designs are often concerned with one fundamental question: Are the resulting changes and outcomes, or lack thereof, the result of the particular intervention? In other words, were the outcomes due to the program, or would they have occurred anyway because of a number of other factors (Weiss, 1998)? One way to attempt to ascertain this answer, that is, to eliminate any rival or confounding explanations,[394] is to create an experimental design. Experimental designs often, though not always, use random or probabilistic sampling. For instance, when evaluating the efficacy of an online professional development program, an evaluator may randomly select one group of teachers to participate in an online program. This is the *treatment* group. Another group of teachers, the *control* group, may be randomly selected to participate in another kind of professional development. The results of each type of professional development are then compared. By choosing a random set of teachers and comparing them with other teachers receiving a particular intervention, an experimental evaluation can answer with reasonable certainty whether the effects are the result of the program or due to some other explanation. This probabilistic sampling can help evaluators generalize and transfer findings from a small, randomly chosen control group to a whole population.

In a quasi-experimental design, treatment teachers are compared with control teachers who match up with the treatment teachers in all major indicators except the treatment. However, quasi-experimental designs cannot rule out rival explanations. Like an experimental evaluation, quasi-experimental designs often, though not always, use probabilistic sampling.

394 Rival explanations may include maturation (for example, a new teachers just gets better because she becomes more experienced), attendance at another type of professional development, or contact with a mentor. Without eliminating such rival explanations, interpretations and explanations become confounded, that is, they are attributed to one cause when in fact they may be the result of several causes.

Qualitative Evaluations

In contrast, evaluation questions that focus on "why?" or "how?" involve a *qualitative* design. Qualitative evaluations typically seek to answer the questions, "How did 'it' happen?" or "Why did 'it' happen?" Qualitative evaluations are narrative, descriptive, and interpretive, focusing on in-depth analysis of an innovation through the use of a *purposive* sample. In contrast to random or probabilistic samples, purposive or purposeful samples are chosen because they promise to provide rich information that can inform the evaluation. Such samples, or cases, can be selected because they are either representative of the group, are atypical of the group (outliers), or represent maximum variation of the group. Every other component of the evaluation (methods, sampling, instruments, measures, analysis) flows from this basic design. However, unlike results from an experimental evaluation, results from a qualitative evaluation are *not* generalizable.

One common approach, and output, of a qualitative evaluation is a case study, a rich descriptive analysis of a particular person, set of persons, or program; these elements are often known as "key informants." Case studies attempt to understand *how* and *why* the program (distance or otherwise) resulted in change, impact, or a set of outcomes. It attempts to do this by mining the experiences of these key informants. Figure 20.2 outlines the main features of a case study.

Figure 20.2: Case Study (Qualitative Method)

Purpose	Appropriateness	Strengths	Weaknesses	Cost Considerations
Target a small set of learners who have performed at various levels as a result of the distance learning program and really study and examine the factors that affected their rates of success.	▪ This method is very useful for gathering rich, in-depth "stories" of the characteristics, enabling factors, and interventions that contribute to change. ▪ It can be a joint enterprise by learners, who generate their own information, and observers	▪ Case studies can employ multiple measures (interviews, surveys, focus groups, observations). This triangulation of data can result in more valid and greater interpretations of information.	▪ Observers need training in face-to-face interviews, classroom observations, focus groups, qualitative analysis and writing (good writing is critical as case studies, except for audio or video case studies, are text-based).	▪ **Medium to high:** Method still involves site selection, sufficient sample size training for observers, and transportation for observers—but at lower cost because of the geographically defined area.

Purpose	Appropriateness	Strengths	Weaknesses	Cost Considerations
	▪ It allows researchers to combine multiple measures (examination of learner work, interviews, classroom observations, surveys) so they see what's going on externally (in terms of performance) and internally (in terms of teacher perceptions, etc.).	▪ "Key informants" often come from a defined geographical area. If so, this cuts down on travel and transportation costs for observers. ▪ It generates very rich narrative data from a small group of learners. ▪ Method is very useful for uncovering embedded "critical elements" that are often overlooked, not factored into program design but essential for program and individual success. ▪ It generates "stories," which are more intuitive than statistical measures.	▪ Many resources are devoted to a limited group of people. ▪ Information is not generalizable to other regions or to the program as a whole. ▪ While useful and informative, there is often a bias about qualitative research. As such, case studies may not pass muster with certain distance program funders. ▪ There is a belief that qualitative research is "easy," but in fact it is difficult to do well.	▪ It also involves costs for joint agreement by observers (filling out one observation protocol between them), as well as transcribing and analyzing qualitative information, quantitative data analysis, and report writing.

Mixed-Method Evaluations

Mixed-method evaluations combine the designs of both quantitative and qualitative evaluations. They combine the "what" and numerical focus of a quantitative evaluation with the "how," "why," and narrative focus of a qualitative evaluation.

There is no one best evaluation method. The type of evaluation design used—quantitative, qualitative, or mixed-method—again depends on what the audience for the evaluation will want to know. It will depend on understanding how, why, when, and where to generalize findings, as well as on available resources and data analysis capacity. Analyzing quantitative data, especially for large data sets, demands statistical analysis software and a deep knowledge of statistics and quantitative methodologies. Analyzing qualitative data involves an understanding of inductive and/or theoretical (deductive) coding, pattern matching, and the use of qualitative analysis software.

All evaluations, whatever their design, need good measures. A *measure* is a source of *information* or data that can be expressed quantitatively to characterize a particular phenomenon. Performance measures may address the type or level of program activities conducted (process), the direct products and services delivered by a program (outputs), and/or the results of those products and services (outcomes). They may include customized program or project-specific assessments. Measures may be poorly understood and therefore incorrectly analyzed, thus resulting in meaningless or misleading evaluation data. Figure 20.3 lists the most common levels of measurement, their definitions and requirements, and the type of data analysis each supports.

Figure 20.3: Levels of Measurement (Weiss, 1998)

Levels of Measurement	Definition	Requirements	Data Analysis
Nominal measure	▪ Numbers assigned to categories (e.g., religion, occupation, gender) ▪ No mathematical meaning	▪ Categories required to be mutually exclusive *(each case must fit into one category)* ▪ Categories required to be exhaustive *(each case must have its place and numeral)*	▪ Frequencies

Levels of Measurement	Definition	Requirements	Data Analysis
Ordinal measure	▪ Represents hierarchical ordering—with higher numbers going to categories that are greater than lower numbers ▪ For example, occupation measured in terms of education level (PhD higher than MA, etc.) ▪ Differences between categories not equal		▪ Frequencies ▪ Cross-tabulations
Interval measure	▪ Has order from more to less ▪ Has equal intervals between categories ▪ Most indices used to measure behavior, beliefs, intelligence, and aptitudes (though this is not always true)		▪ Means ▪ Cross-tabulations
Ratio measurement	▪ Has all the characteristics of nominal, ordinal, and interval measures ▪ Anchored by a true zero point (e.g., number of siblings, etc.)	▪ Statistical analysis more powerful and varied with ratio	▪ Means ▪ Cross-tabulations

All evaluations, regardless of type, also require indicators. An *indicator* is a piece of information that communicates a certain state, trend, or progress to an audience. It defines the data to be collected to measure progress, so that the actual results achieved can be compared with the originally designed results. Kozma and Wagner (2006: 21) note the importance of developing core indicators in evaluations. Core indicators are context-specific ways to understand inputs and outcomes of a program or project that we may or may not be able to observe directly, such as the following:

- » **Input indicators**—for example, the type of ICT equipment and/or software and/or organizational design features of a distance education program
- » **Outcome indicators**—for example, student and teacher impact (affective, cognitive, and behavioral)
- » **National educational and socioeconomic indicators**—for example, enrollment rates, literacy, gender equity, etc.
- » **Cost indicators**—for example, fixed and recurrent costs

Every evaluation is fraught with some level of error, and every instrument has its own set of intrinsic weaknesses. Therefore, all evaluations should use multiple types of *instruments*—surveys, focus groups, interviews, observations, and questionnaires—in order to capture and analyze data from as many different angles as possible to triangulate the data most effectively. This triangulation is critical for arriving at inferences or interpretations that are as valid and accurate as possible. Figures 20.4 and 20.5 present two examples of instruments that can be used for a quantitative and mixed-method evaluation and the strengths, weaknesses, and cost considerations associated with each. Note that the "Purpose" column provides an example, as opposed to a recommendation, of why such an instrument would be used.

Figure 20.4: Questionnaire to a Large Sample Size of Teachers (Quantitative Method)

Purpose	Appropriateness	Strengths	Weaknesses	Cost Considerations
Assess teachers' perceptions of the distance program—its benefits, weaknesses, changes on their practice, and suggested improvements.	▪ Predetermined list of questions can consist of structured or unstructured responses. ▪ Format can be print or electronic. ▪ It can be mailed or "dropped off" to teachers and collected for completion.	▪ Large sample size can be accommodated. ▪ Sample is geographically dispersed. ▪ Sample is useful if people being surveyed have e-mail access and are comfortable with online surveys. ▪ Sample is useful if it is certain to be completed and returned. ▪ It allows for easy data analysis.	▪ It is more difficult to differentiate among levels of response (e.g., on a scale from 1–5, is there an incremental and discernible difference between 3 and 4?). ▪ It generally has a low return rate. ▪ Long delays in completion and return result. ▪ Problems with the Internet, mail delivery system, or transportation can result in lost questionnaires.	**Comparatively low:** They involve printing, mailing (or personal delivery), and collection; data entry (spreadsheet); and data analysis.

Purpose	Appropriateness	Strengths	Weaknesses	Cost Considerations
			▪ Information yielded is more superficial and narrow. ▪ It suffers from "desirability bias." Respondents often check the response they think is most desirable.	

Figure 20.5: Classroom Observations (Quantitative and Qualitative—Mixed Method)*

Purpose	Appropriateness	Strengths	Weaknesses	Cost Considerations
Directly assess the actual classroom practices of teachers. Unlike a survey, which is almost a secondary source of information, this measure would be a primary source—direct and empirical.	▪ Assess evidence of instructional changes, content knowledge, improved professional competencies. ▪ Tool is a classroom observation form that assesses only measurable and visible outcomes. ▪ Teachers can be assessed along a continuum (low to high) or based on a checklist (yes/no). ▪ Tools can be quantitative and qualitative.	▪ Assessor is directly observing practice, so there is no "interference," as with surveys where trainees can hide true opinions. ▪ Performance-based nature makes it more objective, empirical, and valid than other types of measurement tools. ▪ It records a fixed set of teacher behaviors, lending itself (in the best scenario) to focusing on discrete areas of teacher behavior that can be targeted for improvement.	▪ It is surprisingly hard to do good observations—issues of observer bias, observer boredom, Hawthorne effect (people often perform better when being observed), "halo" effect (judging a certain teacher "high" based on prior positive impressions), performance bias (people rehearse for observer), indeterminacy, etc.; therefore, training is a must.	**High:** Site selection, sufficient sample size (for large-scale program this would be in the hundreds), training for observers, transportation for observers, joint agreement by observers (filling out one observation protocol between them), transcribing and analyzing qualitative information, quantitative data analysis, and report writing all add to cost. It demands intensive time and resources.

*For more information about classroom observations, see "Chapter 13: Assessing Distance Learners."

Purpose	Appropriateness	Strengths	Weaknesses	Cost Considerations
			▪ High-inference observation forms demand that an observer be very well trained and able to differentiate among performance levels (using 4- and 5-point scales). ▪ It is quite labor-intensive—to increase reliability, trainees should be observed more than once (three times) over a certain period of time and by two observers (to increase reliability of observation). ▪ One-shot, one-person observations have low reliability—teacher may be having an “off day,” etc.	

Evaluating Professional Development

There are numerous ways to evaluate professional development. Programs can design their own or use previously developed evaluation models. We will briefly discuss three types of evaluation models here.

Fitzpatrick's Four Levels

Internationally, one of the best-known frameworks for evaluating professional development has been Fitzpatrick's model, developed in 1959 to evaluate trainings for Heifer International. This model comprises four levels, each of which builds stepwise on the previous level:

» Level I evaluates teachers' *reactions* to the professional development.
» Level II evaluates teachers' *learning*.
» Level III evaluates teachers' *behavior*.
» Level IV evaluates professional development *results* in the classroom.

Guskey's Five Levels of Evaluating Professional Development

A similar, but more comprehensive professional development evaluation framework is that of Thomas Guskey (2000), whose five-level framework for evaluating professional development is outlined in figure 20.6. These levels range from the lowest level of evaluation—assessing teachers' reactions to the professional development—to the highest—determining whether the professional development for teachers had any impact on *student* learning. As figure 20.6 outlines, multiple types of evaluations can be created to measure different outcomes. Similarly, many levels of the evaluation use many of the same instruments (e.g., interviews and teacher portfolios).

Figure 20.6: Five Levels of Evaluating Professional Development (Guskey, 2000)

Evaluation Level	What Questions Are Addressed?	How Will Information Be Gathered?	What Is Measured or Assessed?	How Will This Information Be Used?
Level 1: Teachers' reactions	▪ Did teachers like it? ▪ Was their time well spent? ▪ Did the materials make sense? ▪ Was the instructor knowledgeable and helpful?	▪ Questionnaires administered at the end of the session	▪ Initial satisfaction with the experience	▪ To improve program design and delivery

Evaluation Level	What Questions Are Addressed?	How Will Information Be Gathered?	What Is Measured or Assessed?	How Will This Information Be Used?
Level 2: Teachers' learning	▪ Did teachers acquire the intended knowledge and skills?	▪ Paper-based/digital instruments ▪ Simulations ▪ Demonstrations ▪ Participant reflection ▪ Participant portfolios	▪ New knowledge and skills of teachers	▪ To improve program content, format, and organization
Level 3: Organization support and change	▪ What was the impact on the organization? ▪ Did it affect organizational climate and procedures? ▪ Was implementation advocated, facilitated, and supported? ▪ Were problems addressed quickly and efficiently?	▪ District and school records ▪ Minutes from follow-up meetings ▪ Questionnaires ▪ Structured interviews with participants or administrators ▪ Participant portfolios	▪ Organization's advocacy, support, accommodation, facilitation, and recognition	▪ To document and improve organizational support ▪ To inform future change efforts

Evaluation Level	What Questions Are Addressed?	How Will Information Be Gathered?	What Is Measured or Assessed?	How Will This Information Be Used?
Level 4: Teachers' use of new knowledge and skills	▪ Did teachers effectively apply new knowledge and skills?	▪ Questionnaires ▪ Structured interviews with teachers and administrators ▪ Teacher portfolios ▪ Teacher reflections ▪ Direct or videotaped classroom observations	▪ Degree and quality of implementation	▪ To document and improve implementation of program content
Level 5: Student learning outcomes	▪ What was the impact on students? ▪ Did it affect student performance/ achievement? ▪ Did it influence students' emotional/physical well-being? ▪ Are students more confident as learners? ▪ Is attendance increasing?	▪ Student records ▪ School records ▪ Questionnaires ▪ Structured interviews with students, teachers, administrators, and parents ▪ Teacher portfolios	▪ Learning outcomes: cognitive, affective, conative, psychomotor	▪ To focus and improve all aspects of program design, implementation, and follow-up ▪ To demonstrate overall impact of professional development

Scriven's Evaluation of Training

A final model is Scriven's Evaluation of Training (2009), a training or professional development evaluation checklist that can be used for formative and summative evaluations, monitoring professional development, and even conducting meta-evaluations (Scriven, 2009: 2). As will be seen, it combines elements of Fitzpatrick's Four Levels and Guskey's Five Levels of evaluating professional development. The checklist consists of 11 questions, listed in figure 20.7.

Figure 20.7: Evaluation of Training Checklist (Scriven, 2009)

No.	Topic	Question
1.	**Need**	▪ Is this professional development the best way to address this particular need?
2.	**Design**	▪ Does the design of the professional development target the particular need defined above? ▪ Does it target teachers' background and current knowledge, skills, attitudes, and values? ▪ Does it take into account existing resources?
3.	**Delivery**	▪ Was the professional development announced, attended, supported, and presented as proposed?
4.	**Reaction**	▪ Was the professional development relevant, comprehensible, and comprehensive?
5.	**Learning**	▪ Did teachers master intended content, acquire intended value, or modify their attitudes as a result of the professional development?
6.	**Retention**	▪ Did teachers retain the learning for appropriate intervals?
7.	**Application**	▪ Did teachers use and appropriately apply what they learned in the professional development?
8.	**Extension**	▪ Did teachers use what they learned at other times, in other sites, or with other subjects?
9.	**Value**	▪ What was the value of the professional development for teachers?
10.	**Alternatives**	▪ What alternative approaches could be used to meet the same needs?
11.	**Return on Investment**	▪ What is the value of the professional development for the students, the school, the district, the region, and the educational environment?

Conclusion

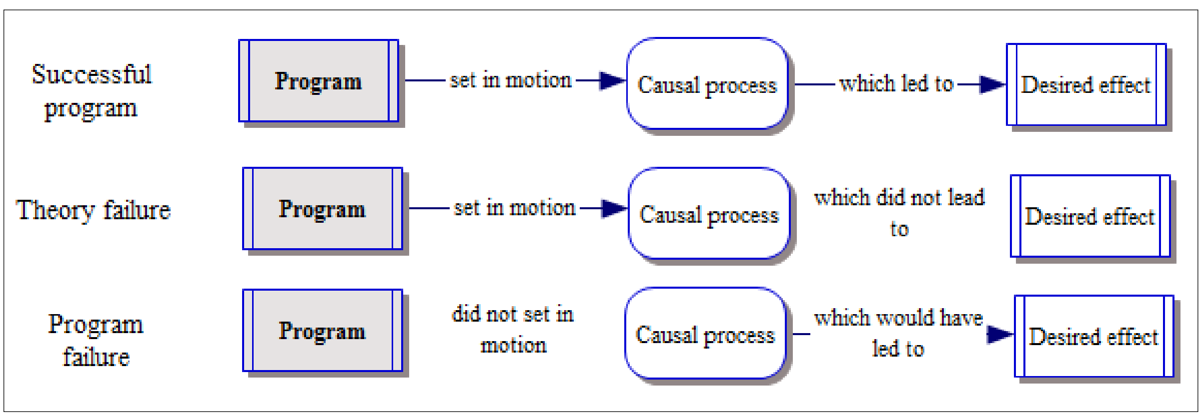
Evaluation is one of the most critical factors in the success of a distance learning program. However, because of its highly technical and political nature, it is one of the field's least understood and least practiced components of distance learning, a reality that effectively and inevitably degrades the quality of any distance education program. The five levels of teacher professional development evaluation outlined in figure 20.6 are a reflection of the complexity of evaluating professional development, but they also serve as a good model for evaluating professional development.

In designing any evaluation, it is critical to keep three core ideas in mind (Guskey, 2000):

1. Evaluation should be co-designed with the professional development program itself. It should begin at the earliest stages of the distance learning planning and continue throughout the life of the program. One of the critical benefits of co-designing the evaluation along with the intervention itself (e.g., an IRI program or an online course) is that distance educators can examine the soundness of their program theory and logic.

As figure 20.8 demonstrates, a successful program is one with a sound theory or logic model and program success, that is, where A → B → C. *Theory failure* means that the theory or logic underlying the program itself would never be able to create the desired effect, so A → B ≠ C. *Program failure* means that the theory underlying the program was sound but that the program itself, for any number of implementation reasons, did not set in motion the desired causes or effects. In other words, A ≠B ≠ C.

Figure 20.8: Example of Program Theory/Program Logic (Weiss, 1998)



By using a series of diagnostic and formative evaluations, evaluators can capture the theory failure and program failure and make suggested remedies or revisions to help address these weaknesses.

2. Evaluation should be systemic. Because teachers operate within an education system comprised of various levels and actors, all components of the system should be evaluated to make sure they are working together to support teacher change.

3. Evaluation should be informed by multiple sources of data. Evaluation serves multiple purposes at multiple levels. For this reason, even modest evaluations should include multiple measures (a variety of sources of information) and multiple methods (both a quantitative and qualitative approach). While clearly articulated goals offer direction in selecting the most important outcomes to measure, evaluators also need to be aware of intended and unintended consequences and find a way to capture these to gain a fuller understanding of what occurred. These multiple sources of data can also enhance the validity and reliability of the evaluation.

Figure 20.9: Web-based Data Visualization Applications

For the purposes of data reporting, a number of very good and free Web-based data visualization applications and data dashboards allow evaluators to present quantitative evaluation findings in an attractive and intuitive format. Four are listed here:

1. Tableau Public: http://www.tableausoftware.com/
2. Data 360: http://www.data360.org/
3. BatchGeo (makes maps from spreadsheet data): http://batchgeo.com/
4. Gapminder: http://www.gapminder.org
5. BIRT on Demand (An open-source data dashboard builder): http://www.birt-exchange.com/

Chapter 21: Technology

Best Practice: *Technology should not drive educational decisions around distance education—rather, technology should support educational decisions.*

We bring this guide full circle with a concluding discussion of technology. Within this second section of the distance education guide, technology has deliberately been placed as the *last* consideration, because too often in the design of distance education programs, it is—wrongly—the *first* consideration. Available technology should certainly be a consideration in the design of any distance education program, since learning in a distance environment is mediated by and delivered through technology. Yet while technology can accelerate and expand the reach of distance learning, it cannot be the driver of distance education programs. The research on distance education is clear. Distance programs should be designed with the needs and learning goals of educational institutions and teachers in mind. Only then should the choice of technology be made. Selection should be driven by considerations of learners' needs, curriculum content, and the availability of learner support for all teacher-learners.

Inappropriate decisions regarding whether to use technology and what type to use are both costly and impede the quality of distance education offerings. In supporting teaching and learning in a distance education environment, the choice of technologies should be guided by multiple factors:

1. **Support the goals of the instructional program.** Distance learning programs should *not* start with the question, "How can we teach teachers using online learning?" Rather, the first question should be, "What should teachers know and be able to do as a result of this instructional program?" The second question should be, "How best can we do this: face-to-face, via distance, or both?"

2. **Select the instructional system—distance or non-distance.** Once these programmatic goals have been defined, policymakers and planners should consider the delivery system that can best help teachers attain these knowledge and skills. The technology or technologies selected must serve as the best vehicle to address the needs and goals of the teachers the distance education program is designed to serve.

3. **Facilitate learning.** The technology/technologies selected must be appropriate for curriculum delivery and support teacher effectiveness (Farrell & Isaacs, 2007). Initial development of distance learning programs should begin with two fundamental questions: What should teachers know and be able to do as a result of this distance program? What is the best possible way to help them attain that knowledge and those skills? Neither of these questions have anything to do with hardware, software, or connectivity—nor should they.

4. **Support best practices in instruction.** The technology or technologies selected must support best practices in learning: learner-centered instruction, interactivity with content and people, communication, collaboration, reflection, accessing and constructing information in multiple formats, exposure to new opportunities and practices, and assessment (Farrell & Isaacs, 2007; Kleiman, 2004; Capper, 2003; Mayer, 2001).

5. Include backup and support. Technology breaks down. When computers lie unused because of unavailable tech support, when television broadcasting ceases because of storm damage to a broadcast tower or satellite dish, when IRI broadcasts stop because of broken radios, education and professional development efforts are lost and money wasted (Gaible & Burns, 2007). Any technology-based distance education system must plan for such contingencies and eventualities.

6. Build on existing infrastructure. The technology or technologies selected for distance learning must build on a country's available communications, networked or broadcast infrastructure,[395] available equipment, physical infrastructure, and human infrastructural supports—content developers, instructional designers, and instructors within that particular distance education medium—as well as distance technology–specific assessment systems.

Figure 21.1: Securing Internet Access in Some of the World's Poorest Places (The Economist, 2011b:41)

Many African countries, such as the Central African Republic, Chad, the Democratic Republic of Congo, Eritrea, Guinea, Liberia, São Tome e Principé, the Seychelles, and Sierra Leone, lack fiber optic cables to link to the outside world. To secure Internet access, they must "trade cost for speed" through one of several options (listed below in declining order of both speed and cost):

Very Small Aperture Terminals (VSATs): These are satellite dishes that transmit digitally to satellites at high speeds. They can cost upwards of $8,000 US per month in addition to a steep installation fee but are typically the best way to secure good wireless access and reach rural communities. VSATS are expensive even in competitive environments because the space segment costs are so high.

Leased bandwidth through wireless connections: Some service providers disburse leased bandwidth through their own wireless connections, such as Asymmetric Digital Subscriber Lines (ADSL). For instance, a 512 kbit may cost hundreds of US dollars per month, in addition to the purchase of a modem. Moreover, ADSL service may be found only in capital cities and extend for only a few miles.

National Dial Up Services: This is basic dial-up service to the internet over phone lines offered by telecommunications companies. However, prices are high and quality is poor.

7. Design with ease of use in mind. Different distance technologies require different technical skills and dispositions on the part of potential users. The existing skills and readiness of distance instructors and learners is a critical consideration in selecting a particular mode of distance education delivery. The technology medium identified must be easy enough for instructors and learners to use so that

395 This is especially true for online learning which demands fixed broadband (including ADSL over existing copper lines or cable Internet over co-axial cables or fiber optic cables) or mobile/wireless options (including mobile Internet—either GPRS or EDGE; mobile broadband, such as 3G/HSPA [High Speed Packet Access]; WiFi; or WiMAX.) Fixed broadband is a better option for online learning since there isn't the slowdown in service that occurs with the increase of users to the wireless service.

technology—and difficulties operating it—do not obscure the focus on teaching and learning. The use of any technology will obviously and necessarily involve some form of technology training. But fluent technology skills do not guarantee fluency in teaching and learning with technology (McGhee, 2003; Dimock et al., 2001). Any distance learning program must devote less time, effort, and resources to teaching *about* technology and more time, effort, and resources to helping its teachers and learners teach and learn *with and through* technology.

8. An eye to the future. New technologies offer options to expand educational opportunities and improve educational quality. In selecting, designing, and making technology-related decisions, no entity should begin planning a distance\ education program without thinking very carefully about the convergence among technologies, trends in technology (hardware, software, types of computing, use, and digital content), and how they impact teacher training programs.

Conclusion

Distance education is not about technology, it is about people—about improving the knowledge, skills, attitudes, aptitudes, and values of *teachers* with the ultimate aim of improving the learning and achievement of our *students* of today and tomorrow.

To help teachers develop the characteristics of good teaching outlined in chapter 8, distance learning programs will need to provide teachers with ongoing opportunities to improve their content knowledge, instructional skills, knowledge about how students learn, and understanding of learning from a student point of view. To succeed in this endeavor, careful design of distance learning programs will need grounding in what we know to be best practices in teaching and learning: content that is linked to teachers' everyday classroom practice, and distance instruction that focuses on promoting high-quality teaching. Quality distance education needs to provide ongoing professional development that is based on proven best practices; builds in continual support; and helps teachers become not just a community of learners, but a community of practitioners. Distance learning programs must prepare their instructors and learners to succeed in a distance environment through orientation, preparation, support, and leadership.

All components of distance learning programs must be designed according to quality standards so that courses and learning experiences may be developed, teachers assessed, programs evaluated, and quality assured by measurement against these standards. Distance learning programs must formatively and summatively assess instructors and teacher-learners so that both can receive help as needed. Distance learning designers must integrate rigorous evaluation into program design so that programmatic and contextual factors can be addressed and remedied if needed. These components should not be used in isolation, nor are they *à la carte* options. All must be incorporated into a coherent distance education system.

The inputs and activities outlined in this guide are ambitious, because improving teacher quality is ambitious. Many distance education programs have approached the task of improving teacher quality with too much complacency and too little ambition and have little to show for it as a result. Other programs have focused too much on careful attention to technology inputs and infrastructure and not enough on human inputs and human infrastructure; as a result, there is little measurable improvement in the quality of their teacher graduates. Ambitions aside, the old bromide "think big, start small" prevails here: entities should begin any distance education initiatives with well-developed and well-evaluated pilots (or a series of pilots) before moving to scale.

An education system is measured not by the quality of its technology but by the quality of its *people*. This guide has outlined the inputs and activities necessary to create a high-quality distance education system that increases the chances of producing high-quality teachers. It is our hope that it will not be used to "change everything so that everything remains the same" (di Lampedusa, 1960) but will rather be understood as a call to change what is needed to improve teaching and learning for teachers and their students.

Appendix 1: Glossary of Terms

Accessible: Materials, technology, and learning experiences that individuals with auditory, visual, or motor disabilities can use, understand, interact with, and learn from to the same degree as individuals with no disabilities.

Accreditation: The systematic assessment of a program or institution in meeting certain standards. Accreditation is typically voluntary and involves a rigorous external, peer, and self-assessment process. Once programs or institutions meet or exceed all standards and evaluation criteria, they are accredited by an accrediting agency (such as AdvancEd), which provides official recognition of excellence. At the program level, accreditation focuses on the quality of a specific program or course of study. At the institutional level, accreditation focuses on the quality of the entire institution.

Active learning: A broad variety of strategies or pedagogical projects designed to place the primary responsibility for creating and/or applying knowledge on the students. Active learning is also known as "child-centered," "interactive," "student-centered," or "learner-centered" instruction.

ADSL: ADSL (Asymmetric Digital Subscriber Line, or DSL for short) is a high-speed Internet access service that utilizes existing copper telephones lines to send and receive data at speeds that are far faster than conventional dial-up modems.

Analog technology: Any technology that is not digital. Examples include many types of radio and television, as well as audiocassette players. These devices record sounds of different frequency and amplitude on magnetic tape.[396]

Application Programming Interface: A small software program that allows one software program to interact with another.

Applications ("apps"): Software applications that can run on smart phones, tablets, or any other portable electronic device.

Artificial Intelligence (AI): The branch of computer science dealing with the reproduction or mimicking of human-level thought in computers. Encompassing cognitive science, mathematics, and computational linguistics, AI breaks down human knowledge into a number of topics—reasoning, knowledge, planning, learning, communication, perception, and the ability to move and manipulate objects—and attempts to imitate these through use of algorithms. [397]

396 Development Research Group. (2005). *Improving educational quality through interactive radio instruction: A toolkit for policy makers and planners.* Washington D.C.: World Bank.

397 Retrieved from *Wiktionary*: http://en.wiktionary.org/wiki/artificial_intelligence

Asynchronous communication: Communication in which time typically elapses between when a message is sent and when it is received. A letter, written and received at two different times, is probably the best example of asynchronous communication. Other examples of asynchronous communication include e-lists, bulletin boards, e-mail, and discussion forums. (However, as anyone who has e-mailed a correspondent in real time—where both are communicating at the same time—knows, the notions of "asynchronicity" and "synchronicity" can get fuzzy. For example, there can often be synchronous communication using asynchronous tools. Asynchronicity refers to design, not use.)

Augmented reality: A live, direct, or indirect view of a physical, real-world environment whose elements are *augmented* by computer-generated sensory input, such as sound, graphics, or **GPS**.[398]

Avatar: A computer user's representation of himself/herself or alter ego, whether in the form of a three-dimensional model used in computer games or a two-dimensional icon (picture). An avatar can also refer to the personality connected with the screen name, or "handle," of an Internet user.[399]

Back channeling: A secondary, parallel communication that occurs at the same time as the main communication. A common example might be attendees at a conference using chat or Twitter[400] to communicate in real time about the main speaker. By using a hash tag (#) and naming their communication, users can search for this term and join the conversation.

Backward design: An instructional design approach developed by Grant Wiggins and Jay McTighe. A three-stage process, backward design begins with the end, or goal, in mind. What should students know or be able to do as a result of learning a certain unit? The second stage focuses on assessment. How will the teacher know that learners have attained instructional goals? The third stage focuses on planning for instruction. What kinds of activities, experiences, materials, and tools should the teacher design so that she can assess for understanding of learning goals?

Bandwidth: The carrying capacity or data transmission rate of a network. Bandwidth is typically measured in *bits per second*. A *bit* ("binary" + "digit") is a unit of measurement of information. There are eight bits in a byte.[401] The following table, taken from *Wikipedia*,[402] shows the maximum bandwidth (the physical layer net bit rate) of common Internet access technologies.

398 Retrieved from *Wikipedia*: http://en.wikipedia.org/wiki/Augmented_reality

399 Retrieved from *Wikipedia*: http://en.wikipedia.org/wiki/Avatar

400 All "tweets" (Twitter messages) can be accessed via a number of Twitter-related search engines such as Twitter.com/search (http://twitter.com/#!/search-home), Twazzup (http://www.twazzup.com/), Collecta (http://collecta.com/) and Topsy (http://topsy.com/)

401 Retrieved from Google: http://www.google.com

402 Retrieved from *Wikipedia*: http://en.wikipedia.org/wiki/Bandwidth_%28computing%29

Bits per second	Classification
56 Kbit/s	Modem/dialup
1.5 Mbit/s	ADSL Lite
1.544 Mbit/s	T1/DS1
10 Mbit/s	Ethernet
11 Mbit/s	Wireless 802.11b
44.736 Mbit/s	T3/DS3
54 Mbit/s	Wireless 802.11g
100 Mbit/s	Fast Ethernet
155 Mbit/s	OC3
300 Mbit/s	Wireless 802.11n
622 Mbit/s	OC12
1 Gbit/s	Gigabit Ethernet
2.5 Gbit/s	OC48
9.6 Gbit/s	OC192
10 Gbit/s	10 Gigabit Ethernet
100 Gbit/s	100 Gigabit Ethernet

Blog: (from “web log”) A publicly accessible journal that is kept online and allows for others’ comments. The blog owner may choose to identify himself or herself or write anonymously.

Blended learning: In distance education, an instructional approach that blends or combines face-to-face instruction with some form of distance-based or technology-based instruction (online courses, radio-based instruction, etc.). Blended learning is also called “hybrid learning.”

Bluetooth: A wireless protocol for exchanging data over short distances among cell phones, headsets, computers, and other electronic devices.

Broadband: A range of frequencies wider than that required for voice communications. Broadband is also a term used to describe systems and equipment with high bandwidth that can carry these ranges of frequency.

Bulletin board: An online space where users can post information and resources and communicate with others. It is an asynchronous technology.

Cable television: A television subscription service in which the signal is distributed via a cable (versus broadcasting or satellite). Cable carries a much larger number of channels. Increasingly, cable television viewers can interact with the distribution center or with content through downloadable apps, websites, and television features.

Compact disc (CD): An optical disc used to store digital data, such as digital audio and video. A CD-ROM ("compact disc read-only memory") is readable by a computer with a CD-ROM drive or by CD players.[403]

Code Division Multiple Access (CDMA): A generic term for a type of digital mobile telephony technology that supports a number of mobile connections. This technique is used by some alternative systems to GSM. CDMA has been pioneered by Qualcomm to develop a second-generation digital cellular telephony system and is very popular in the Americas and South Korea. [404]

Chat: A piece of software, such as AOL's Instant Messenger, ICQ, or iChat, that allows users to communicate synchronously (at the same time) with people who are also online and are logged into their the same "chat" software.

Child-centered learning: See **student-centered learning**, **active learning**, and **learner-centered instruction**.

Cloud computing: Internet-based computing in which applications are stored not on the computer's hard drive but on servers (the cloud) so that users can access them as needed without paying for a software license or devoting computer storage space to house them. Web 2.0 applications are examples of cloud-based applications and cloud computing.

Coding: In qualitative research, a descriptor assigned to a particular statement, behavior or attitude (referred to here as a variable) in a narrative text, audio, or video for the purposes of classification. In *inductive* or *open* coding, an evaluator assigns a code to a variable and then combines variables to enumerate the number of occurrences of a code or related set of codes to identify a theme. This is part of "grounded," or inductive, research. *Deductive* or *theoretical* coding involves identifying codes derived from the overall philosophical framework or hypothesis of the qualitative design and is used to confirm a hypothesis. *Hybrid* coding combines the use of inductive and deductive coding. Coding can be done by hand or, more commonly, through qualitative research software.

Compression: Any of several techniques that reduce the number of bits required to represent information in data transmission or storage, allowing for conservation of bandwidth and memory and thus faster transmission, downloading, and uploading times. WinZip is an example of a compression application.

403 Retrieved from *Wikipedia*: http://en.wikipedia.org/wiki/CD-ROM

404 Retrieved from Digikey: http://www.digikey.com/us/en/techzone/wireless/index.html and Vodafone: http://www.vodafone.com/start/investor_relations/shareholder_services/faq/glossary.html

Computer-aided instruction (CAI)/Computer-aided learning (CAL): Instruction delivered by a computer. The computer acts as a teacher and presents content, problem sets, and so on with which the student interacts. CAI programs vary greatly in quality. Some programs are behaviorist, drill-based applications, while others offer more iterative problem sets and feedback to address specific student weaknesses adjusted by the computer.

Computer-mediated communication (CMC): Any communicative transaction that occurs through the use of two or more networked computers. This can involve the use of e-mail, chat, bulletin boards, discussion forums, or any type of one- or two-way communication occurring over a computer via a network.[405]

Connectivity: The technological capacity that specifically allows computers and other electronic devices to communicate with one another, particularly in relation to telecommunications technologies such as e-mail, the Internet, and chat.

Content management system (CMS): A system used to manage the content of a website. Typically, a CMS consists of two elements: the content management application (CMA) and the content delivery application (CDA). The CMA allows the content manager or author, who may not know HTML, to manage the creation, modification, and removal of content from a website without needing the expertise of a webmaster. The CDA element uses and compiles that information to update the website. The features of a CMS system vary, but most include Web-based publishing; format management; revision control; and indexing, search, and retrieval.[406]

Constructivism: A learning theory that has its roots in a number of disciplines—philosophy, anthropology, the natural sciences, semiotics, sociolinguistics, and education. The central idea of constructivism is that knowledge is not fixed, but rather is constructed by the learner. Some of the other major concepts of constructivism are that learners bring unique, prior understandings to any learning situation; learning is an adaptive activity; learning is situated and contextual; learners may resist, accommodate or assimilate new learning; and learners interact through interaction with materials, resources, experiences, and other learners.[407] The instructional offspring of constructivist learning theory is learner-centered or student-centered instruction.

Cookie: A line of text accessed and written by websites that is saved to a computer's hard drive. It sends information via the browser both to and from the user's computer to the cookie originator (a website). Cookies are used for authentication purposes (e.g., saving a user's password or log-in information), storing site preferences, and identifying a student who logs into an online course.

Course Management System (CMS): See Learning Management System.

405 Retrieved from *Wikipedia*: http://en.wikipedia.org/wiki/Computer_mediated_communication

406 Taken verbatim from Hanlon, M. (2002), *Digital Dictionary*.

407 Boethel, M., & Dimock, K.V. (1999). *Constructing knowledge with technology: An overview of the literature*. Austin, TX: SEDL.

Creative Commons: Creative Commons is a new type of copyright that provides users with more permission to use content than a traditional copyright. Creative Commons is part of the larger movement of open source advocacy in favor of freeing copyright regulations—referred to as "copyleft." This movement aims to provide flexible handling of copyright protection for all kinds of creative works.

Criterion-referenced assessment: One that measures a learner's performance against a predetermined set of standards (criteria).

Data dashboard: Displays of small pieces of various types of visual data such as gauges, charts, and tables within a Web browser. The concept is similar to the information provided by a car's dashboard.

Digital game: A game played by manipulating some form of electronic media (game console, cell phone, computer). Web-based digital games can be played across media, time, and social spaces.[408]

Digital learning game: A game that, unlike entertainment games, targets the acquisition of knowledge in a particular domain or set of domains and habits of mind (creativity, problem solving, conative skills, inquiry, distributed cognition, heuristic methods, etc.) across all academic content areas.[409]

Digital rights management: Protection of copyrighted digital content to prevent unauthorized viewing, copying, or distribution.[410]

Discussion forum: An online or virtual message board where users post materials, comments, ideas, and so on. Typically, discussion boards are asynchronous.

Distance education: An educational process and system in which all or a significant proportion of the teaching is carried out by someone or something removed in space and time from the learner. Distance education requires structured planning, well-designed courses, special instructional techniques, and methods of communication by electronic and other technology, as well as specific organizational and administrative arrangements.

Distance learning: A system and process that connects learners to distributed learning resources. Distance learning can take a variety of forms, but all distance learning is characterized by (1) separation/distance of place and/or time between instructor and learner, amongst learners, and/or between learners and learning resources; and (2) interaction between the learner and the instructor, among learners, and/or between learners and learning resources conducted through one or more media.[411]

408 Klopfer, Osterweil, & Salen, 2009.

409 Adapted from Klopfer, Osterweil, & Salen, 2009.

410 Commonwealth of Learning. (2003). *Education for a digital world*, p. 19.

411 Retrieved from UNESCO: http://www.unesco.org/education/educprog/lwf/doc/portfolio/definitions.htm

Digital Video Disc/Digital Versatile Disc (DVD): An optical disc storage media format that can be used for data storage of, for example, movies with high video and sound quality. DVDs resemble CDs in terms of physical dimensions, but they can store much more data than a CD.[412]

Digital Video Recorder (DVR): A device that records television programs as they are broadcast and stores them on its hard drive. One of the most common brands is TiVo.

Dual-mode institution: An institution in which teaching, learning, and administrative systems support both campus-based and distance-based education. The UWIDEC (Distance Education Centre) at the University of the West Indies, which has physical campuses in the three Caribbean islands of Trinidad, Jamaica, and Barbados, is a model of a dual-mode institution.

E-learning: A course that is digitized and stored in an electronic format. "E" refers to the format. "Learning" is the content and the way students achieve educational goals.[413] E-learning typically, but not always, refers to Web-based learning, though in some countries and contexts it refers to any technology-based learning, whether online or offline.

E-reader: An electronic reader, such as the Kindle or Nook, that stores hundreds of books and allows users to read, bookmark, annotate, purchase, and store books in a digital format. Text is displayed via **electronic ink**.

Education management information system (EMIS): A computer-based system of hardware, software, (and people) that allows institutions to store, search, and retrieve data in order to make educational decisions about enrollment, resources, cost, and so on. An EMIS is typically a database program. There are numerous variations of EMIS, for instance, Student Information Systems (SIS), etc.

Educational television: Noncommercial television that provides programs, especially of an educational nature, for the public. Its programming emphasizes formal classroom instruction and enrichment, in contrast to commercial television, which generally focuses on entertainment. *Sesame Street* and *Blues Clues* are examples of educational television programming. See also **instructional television**.

Electronic ink (e-ink): "[A] display technology designed to mimic the appearance of ordinary ink on paper. Unlike a conventional, flat-panel display, which uses a backlight to illuminate its pixels, electronic paper reflects light like ordinary paper. It is capable of holding text and images indefinitely without drawing electricity, while allowing the image to be changed later."[414] E-ink is used in e-readers because e-ink displays don't drain batteries as much as backlit-screen devices, thus extending battery life.

Electronic mail (e-mail): A method of composing, sending, and receiving messages via the Internet.

412 Retrieved from *Wikipedia*: http://en.wikipedia.org/wiki/DVD

413 Commonwealth of Learning. (2003). *Education for a digital world*, p. 13.

414 Retrieved verbatim from *Wikipedia*: http://en.wikipedia.org/wiki/Electronic_Ink

Experimental design: An evaluation design in which participants are randomly assigned to treatment and control groups. Experimental designs are considered rigorous, because they can minimize the confounding effects of other variables through random selection.

Firmware: A micro-program stored in a computer's read-only memory (ROM) that performs the tasks normally carried out by hardware or software.

Fixed cellular terminal: A box that is connected to a computer and a phone, giving the computer and phone access to the cellular network as well as computer fax, e-mail, Internet, and SMS capability.

Flexible assessment: A form of learner-centered, alternative assessment that gives learners the choice of completing all or some combination of a series of optional assessment items, or allows learners to select an assessment option. Flexible assessment can include checklists, portfolios, product assessment, oral or written exams, and computer-based or performance-based assessment. Flexible assessment is designed to accommodate the learner's pace, style, and context of learning.

Folksonomy: A collaborative method of categorizing information online, often via tagging, so that it can be easily searched, retrieved, and shared. It is also known as social bookmarking.

Formative assessment: Assessment that is ongoing and continual and not used to certify mastery or assign grades. Formative assessment is instructional in nature; it provides information about the learner's progress and understanding of a certain concept or skill.

Formative evaluation: Evaluation that involves periodic or continual monitoring of the progress of a project or its participants. Formative evaluation can be for diagnostic or program improvement purposes.

General Packet Radio Service (GPRS): A mobile data service for second-generation mobile telephone services or networks that supports wireless access protocols, SMS text messaging, and Bluetooth (a standard for replacing wired connections between devices with wireless radio connections).

Global Positioning System (GPS): A worldwide radio navigation system formed from a constellation of 24 to 27 satellites that constantly orbit the Earth and their ground stations, making two complete rotations each day. On Earth, after locating four or more of these satellites, GPS receivers employ a process of trilateration to calculate the distance to each and then use this information to deduce their own latitude and longitude. Many cell phones now include a GPS, and hand-held GPS devices can be inexpensively purchased and used for educational activities.

Global System for Mobile Communication (GSM): An open, non proprietary digital wireless technology platform that covers a wide area of the globe and is the platform for cell phones in Europe. Like CDMA, it is a second-generation digital mobile cellular technology. GSM operates in several frequency bands: 400MHz, 900MHz, and 1800MHz.[415]

415 Retrieved from Telkom: https://secure1.telkom.co.za/ir/glossary/glossary.jsp and National Highway Traffic Safety Administration: http://www.nhtsa.gov/people/injury/research/wireless/append.htm

Graphical User Interface (GUI): A type of computer interface that allows the user to interact with icons versus text commands. Windows, Linus, and Apple operating systems are all examples of GUIs. Unix is not.

Hand-held device: Any digital device, such as a Palm Pilot or cell phone, that is small and light enough to be portable and self-contained enough to allow the user to complete specific tasks.

High Speed Packet Access: High Speed Packet Access (HSPA) (and a later version, Evolved HSPA) is an amalgamation of High Speed Downlink Packet Access (HSDPA) and High Speed Uplink Packet Access (HSUPA), that extends and improves the performance of existing 3G/WCDMA wireless standard (WCDMA is the 3G standard that most GSM carriers are moving to).

Hybrid learning: See **blended learning**.

Hypergrid: In gaming, a mechanism that allows users to link their OpenSim to other OpenSims on the Internet, supporting seamless agent transfers among those OpenSims. It can be used both in stand-alone mode and in grid mode. The hypergrid effectively supports the emergence of a web of virtual worlds. Hypergrid enables region/grid administrations to place hyperlinks on their map to hypergridded regions run by others, to which users can choose to teleport. Once users reach the region behind the hyperlink, they are automatically interacting with a different virtual world without having to log out of the world from which they came and while still having access to their inventory.[416]

Immersive digital environments: Artificial, interactive, computer-created scenes or worlds within which users can engage or "immerse" themselves in some experience or activity. Immersive digital environments may be thought of as synonymous with virtual reality, but without the implication that actual reality is being simulated. An immersive digital environment could be a model of reality, a complete fantasy user interface or abstraction, or some sort of simulation.[417] Immersive environments are also known as multi-user virtual environments (MUVEs) or virtual worlds. One such example is Second Life.

Impact evaluation: An evaluation that measures the program's effects and the extent to which its goals were attained.

Instant messaging (IM): A form of real-time communication between two or more people based on typed text. The text is conveyed via devices (desktop, laptop, or hand-held computers) connected over a network such as the Internet. IM is also known as "chat" and increasingly as "texting," even when used with laptops rather than cell phones.

Instructional design: In this guide, the process of creating instructional tools, content, experiences, and activities to help learners attain a specific set of learning goals. Instructional design can occur with or without technology. It consists of diagnosing the needs of the learner; defining the end goals of instruction; determining how learning goals will be assessed and evaluated; and developing interventions, experiences, and activities to assist in the learning transaction.

416 Retrieved from OpenSimulator: http://opensimulator.org/wiki/Hypergrid

417 Retrieved from *Wikipedia*: http://en.wikipedia.org/wiki/Immersive_digital_environment

Instructional strategies: Activities teachers design and the way instruction occurs around such activities (what students must do and how they must do it) in order to help students attain learning outcomes.

Instructional television: A distance education strategy that uses television broadcasts to instruct learners in a particular skill or concept. The medium can be active or passive. *Telesecundaría* (México) is an example of instructional television programming.

Intelligent tutoring system (ITS): A learning technology that is an outgrowth of CAI and dynamically adapts learning content to objectives, needs, and preferences of a learner via a series of algorithms that adapt learning to learner inputs.[418]

Interactive audio instruction (IAI): A distance learning method that uses the same methodologies and approaches as IRI (see below) but is delivered via prerecorded CDs or audiotapes rather than as a live radio broadcast. The audio teacher interacts with students while providing in-class directions to teachers.

Interactive radio instruction (IRI): A one-way distance education system for students (and teachers) that combines radio broadcasts with active learning techniques. IRI requires teachers and students to react verbally and physically to prompts, commands, questions, and exercises posed by radio characters (the radio teacher).

Interactive television (ITV): Television programs with one-way video transmission, allowing students see the instructor at a distance, and two-way audio, allowing students to hear the instructor either through the television or by phone while the instructor can hear students by phone. With the advent of compressed video, ITV programs that allow both students and teachers to see, hear, and respond to each other via video and audio in real time are now being implemented.

Interactive whiteboard (IWB): A large display, also known as a "smart board" or "electronic white board," that connects to a computer and projector, which then displays the computer's desktop onto the board's surface, where users can control the computer with a pen, their finger, or another device. The board is typically mounted on a wall or floor stand. Various accessories, such as student response systems (see below), enable additional interactivity, and students can view games and multimedia applications stored on a teacher's computer and interact with the content either alone or in groups.

In an online environment "whiteboards" are a different application, though they function in much of the same way as a physical IWB. For instance, in webinars or online meetings they allow participants to simultaneously view one or more users drawing on an on-screen blackboard, presenting information, or running an application from their computers.

Internet: A network of networks on a worldwide scale through which millions of computers are interconnected through a set of computer protocols.

418 Retrieved from Erudium: http://www.erudium.polymtl.ca/html-eng/glossaire.php

Internet protocol television (IPTV): A system through which Internet television services are delivered via broadband Internet access networks, rather than through traditional radio frequency broadcast, satellite signal, and cable television formats. IPTV services may be classified into three main groups: (1) live television, with or without interactivity related to the current television program; (2) time-shifted programming, replaying a program that was broadcast hours or days ago or replaying the current program from the beginning; and (3) video on demand (VOD), a catalog of videos, not related to television programming.[419]

Learner-centered instruction: See **student-centered learning**, **active learning**, or **child-centered learning**.

Learning management system: See **course management system**. A Learning Management System (LMS) is a digital platform that enables instructors to organize and post course content materials over the Internet for their students. Examples include Moodle, Sakai, and Blackboard. Also known as a course management system.

Learning object: A small chunk of information (text, video, audio, Flash applets, etc.) delivered over the Internet that serves as an object of study. Learners and instructional designers can use, re-use, adapt, and save learning objects in a number of different learning contexts.

Listserver: A listserver or 'e-list" is a specific Internet application that gives users the opportunity to distribute e-mail messages to multiple addresses. Automated mailing lists allow for online discussions conducted by e-mail. E-lists are an asynchronous communication technology.

Media: Means and ways of distribution and communication—from text, audio, graphics, and animated graphics to full-motion video. Multimedia is the mix or combination of media.

Metadata: Data about data or a "data dictionary" that provides information about data. Examples include information about data (for instance, types, compatibility issues, etc.), about files (versions, date of creation or updating, and author's name), or about content or applications (standards, specifications, software, or application versions, etc.). Metadata are different from tags, which are keywords that allow users to improve their searching capacity, because metadata usually contain a set of specifications and are structured according to a standardized concept using a well-defined metadata scheme. Metadata are particularly important for open educational resources.

Micro-blogging: A web service that allows the subscriber to broadcast short messages (up to 140 characters) to other subscribers of the service. Micro-posts or "tweets" (if using Twitter) can be made public on a website and accessed by individual subscribers to that person's posts.

419 Taken verbatim from *Wikipedia*: http://en.wikipedia.org/wiki/IPTV

Micro-learning: An emerging learning theory according to which people learn more effectively if bite-sized information is delivered in small units that are easy to understand and apply. Because mobile devices present short chunks of information at a time due to small screen size, they are effective micro-learning tools.

Mobile learning: Also known as "m-learning," learning through portable, hand-held electronic devices, generally with wireless communication capabilities. Mobile technologies include cell phones, personal digital assistants, hand-held computers, or mobile gaming devices.[420]

Modem: A modulator-**dem**odulator (modem) is a device that transmits digital data over a phone line. The sending modem *modulates* the data into a signal that is compatible with the phone line, and the receiving modem *demodulates* the signal back into digital data. Wireless modems convert digital data into radio signals and back. Modems are generally classified by the amount of data they can send in a given unit of time, usually expressed in bits per second (bit/s, or bps).

MP3/MP4: Audio compression standards developed by the Moving Picture Experts Group (MPEG) for encoding audio so that it can be transmitted via the Internet or another network. An MP3 player is a hand-held device, such as an iPod, that allows a user to listen to MP3 files.

Multichannel learning: A vehicle whereby the interaction between learners and the learning source takes place through a variety of communication channels (e.g., print, television, e-mail, Internet, and video).

Multimedia Service (MMS): Similar to a text message, a method of using multimedia to allow cell phones to send and receive audio, video, and digital imagery.

Netbook: A computer designed specifically for more limited uses than a notebook computer. Netbooks often lack a hard drive and are therefore suitable for use with cloud-based applications. They are also better suited for writing, e-mailing, and surfing the Web rather than for high-graphics applications such as gaming or virtual worlds.

Network: An arrangement of objects or people interconnected electronically. In telecommunications, networks are transmission channels interconnecting all client and server stations.

Norm-referenced assessment: An assessment in which a student's or a group's performance is compared to that of a "norm" group. The test measures student achievement against the norm—a mean level of performance—not against a criterion standard.

Notebook: A mini-laptop computer that is cheaper and more portable than a standard laptop.

One-way audio: Audio information broadcast only in one direction, not enabling the listener to respond to the audio or communicate with the broadcaster via the same means.

420 Pouezevera, S. L., & Khan, R. (2007). Training secondary teachers in rural Bangladesh using mobile technology, p. 87. In *ICT in Teacher Education: Case Studies from the Asia-Pacific Region*. Bangkok: UNESCO.

Online: The state of connectedness of a computer to a network. Online is the opposite of offline. In this guide, "online" is synonymous with "Web-based."

Open education resource (OER): Open and free educational content (including metadata) for educational institutions and end users such as teachers, students, and lifelong learners. Since OER is liberally licensed for re-use in educational activities, it is free from restrictions on modifying, combining, and repurposing. Ideally, OER should be designed for easy re-use, in that open content standards and formats are being employed, and it should employ open source software for which the source code is available, open application programming interfaces, and authorizations to re-use Web-based services.[421]

Open enrollment: A term with multiple meanings depending on the jurisdiction. For instance, open enrollment may mean that students, regardless of prior qualifications or standardized test scores, may enroll in a learning program as with open universities. In the United States, open enrollment often refers to situations in which students may take classes (typically online or via virtual schools) in a school district that is not their own. Finally, open enrollment can refer to self-placed, online classes in which a learner begins and finishes at any point in the course trajectory as he or she deems necessary.

Open learning: An instructional system in which many facets of the learning process are under the control of the learner. It attempts to deliver learning opportunities where, when, and how the learner needs them.

Open source software (OSS): Software for which the underlying programming code is available to users so that they may read it, make changes to it, and build new versions of the software incorporating their changes. OSS comes in many types, differing mainly in the licensing term under which (altered) copies of the source code may be redistributed. Sometimes referred to as Free/Libre Open Source Software (FLOSS), the big difference is that OSS is usually, but not always, free, whereas FLOSS is always free.

Open university: Distance education institution in which students from a particular nation and, increasingly, other nations enroll and study at a distance using print-based materials, phone, audio, video, television, and the Internet. Open universities typically admit all learners regardless of prior academic records or accomplishments and allow them to take courses as their schedule permits. The best-known and best-regarded open university is that of the United Kingdom. Within Asia, open universities are so large (having hundreds of thousands of students) that they are often called "mega-universities."

Outcome evaluation: A type of summative evaluation that measures changes in designed outcomes, particularly as they affect the target group.

Pattern matching: In qualitative evaluations, the core procedure of theory testing with cases. Pattern matching involves comparing two patterns (sets of codes or values) to determine whether they match or not and then testing to see if these observed patterns match with expected patterns (a hypothesis) to confirm or dispute the hypothesis (Hak & Dal, 2009: 4).

421 Retrieved from *Wikipedia*: http://www.wikieducator.org/Open_Educational_Content/olcos/introduction

Performance-based assessment: A form of alternative assessment in which learners are asked to create, produce, or do something, often in settings that involve real-world application of knowledge and skills.

Peripheral: Any type of computer hardware that is added to a host computer in order to expand its abilities. Examples of peripherals include printers and scanners and many assistive technology devices like joysticks.

Personal digital assistant (PDA): A hand-held computer for managing contacts, appointments, and tasks that typically includes a name-and-address database, calendar, to-do list, and note taker and serves as a personal information manager. Wireless PDAs may also offer e-mail, Web browsing, and cellular phone service.[422] Given the increased popularity of smart phones, PDAs are a highly threatened technology species.

Pipes: A free online service from Yahoo! that lets users remix popular feed types and create data mash ups using a visual editor. Pipes can be used to run one's own Web projects, or publish and share Web services, without ever having to write a line of code.[423]

Place-shifting technology: A piece of firmware that allows anyone with a broadband Internet connection to forward live or prerecorded video streams from their home television set, DVR, or other video source (such as a DVD player) for remote viewing on a computer, tablet, or mobile phone at any location with a high-speed Internet, cellular data, or Wi-Fi connection.

Podcast (iPOD broadCAST): An audio broadcast that has been converted to an MP3 or other audio file format for playback in a digital music player or on a computer. Podcasts contain primarily text as well as music, images, and video (see **Vodcast**). Podcasts can be automatically downloaded to a computer via a subscription or RSS feed.[424]

Post: In an online environment, a written communication uploaded to a blog, discussion forum, bulletin board, wiki, or e-list. The term is used as a noun and a verb.

Printcasting: A tool that allows users to create their own online magazines. It takes its name from a website that offers that service; other examples of printcasting, or social publishing media, include Scribd[425] and Lulu.[426]

Probabilistic sampling: Probabilistic sampling or *probability sampling* is any method of sampling that uses some form of random selection. Random selection depends on setting up a procedure assuring that the different units in your population have equal probabilities of being chosen.

422 Retrieved from the *Free Dictionary*: http://encyclopedia2.thefreedictionary.com/PDA

423 Retrieved from Yahoo!: http://www.yahoo.com (Search "Pipes")

424 Retrieved from *PC Magazine*: http://www.pcmag.com/encyclopedia_term/0,2542,t=podcast&i=49433,00.asp

425 See http://www.scribd.com/

426 See http://www.lulu.com/

Problem-based learning (PBL): An instructional strategy in which students solve a real-world problem. First developed for medical schools, PBL activities are often loosely structured, involve cooperative teaming, anchor all learning to a larger task or problem, and support the learner in developing ownership of the overall problem or task. Tasks are generally complex, involving higher-order thinking. Students must often identify resources, overcome problems with data, and decide upon the content and format of the information gathered.

Process evaluation: A type of evaluation used while a program is in progress, also judging the extent to which it is operating as it was intended. It examines whether program activities were carried out, looks at program operations, and investigates procedures. It is essentially focused on issues of compliance.

Project-based learning: An instructional philosophy in which learning is organized around a driving question or issue, Learners collaborate to address this issue, find information, and then present their findings. Project-based learning, like problem-based learning, is complex, involves student collaboration, and is characterized by a high level of learner autonomy. Unlike problem-based learning, with which it is erroneously conflated, a project-based approach may not involve a real-world problem (many project-based activities are *simulations* of real-world issues) and is not as loosely structured as problem-based learning.

Purposive (or purposeful) sampling: A deliberate method of sampling used in qualitative designs such as case studies. It is a sampling technique in which a particular audience with a particular set of characteristics is deliberately or purposefully selected in order to yield information-rich cases from which one can learn a great deal about issues of central importance to the purpose of the evaluation.

Quality assurance: A set of systematic management and assessment procedures used to monitor performance against objectives or standards and to ensure the achievement of quality outputs and quality improvements.

Quality control: A procedure or set of procedures to ensure that products and services adhere to a set of predetermined standards or criteria for quality. It is part of a quality assurance system.

Quasi-experimental design: An evaluation design that uses many, though not all, of the characteristics of an experimental design. For example, quasi-experimental designs use comparison groups rather than randomized groups.

Quick response (QR) code: A two-dimensional code that consists of black modules arranged in a square pattern on a white background. Prevalent in Japan and South Korea, QR codes store text, URLs or other data. To use QR codes, you need (1) a phone with a QR code generator, an app that is freely downloadable from Apple or Android app stores, and (2) a QR code reader. Some phones automatically include QR code generators and readers. Some applications, such as NeoReader, can be installed on phones to generate and read QR codes.

RCA connector: An electronic plug or jack that carries audio and video signals. It was first developed by the Radio Corporation of America (RCA), hence the name.

Real Simple Syndication (RSS): An XML-based format that allows for the syndication of Web content. Content can include data such as news feeds, events listings, news stories, headlines, project updates, or excerpts from discussion forums. Newer browsers allow users to set up automatic RSS subscriptions (feeds) so that content is delivered automatically from a website to the user's computer.

Reliability: In evaluation, a measure accorded to an instrument that can be used repeatedly with different groups of similar subjects and yield consistent results. There are a number of ways to measure the reliability of an evaluation instrument. One way is a test/retest method: the same instrument is used with the same group but at different times, and results are then compared. A second way is to create two forms of the same instrument with slight variations in items, administer the instrument, and then compare results. A third way is to administer half of the instrument with one group and the other half with the same or similar group and then compare results. A fourth way is to employ a joint-rater exercise, in which two individuals administer the same test to the same group and then examine the similarities and differences in item responses. Most reliability uses statistical methods such as Cronbach's Alpha or the Kuder-Richardson Formula 20 (KR20).

Rich media: A broad term for interactive media that mix audio, video, text, and animation. It is often used to classify high-graphics video or multimedia.

Rubric: A scoring tool that contains criteria for scoring, descriptors of the criteria, and a scoring scale. Rubrics are matrix-like in their organization and can be analytic (with highly detailed descriptors under each level of scoring pertaining to each criterion) or holistic (more general, with less descriptive information).

SCORM (Sharable Content Object Reference Model): A set of technical standards for e-learning software products. SCORM defines how to create "sharable content objects" (SCOs) that can be re-used in different systems and contexts and governs how online learning content and LMSs communicate with each other.

Server: A computer that provides a service across a network. The service may be file access, login access, file transfer, printing, and so on. Many institutions are bypassing physical servers in favor of cloud computing and "software as a service," storing all content and files online and using only Internet-based applications.

SIM (Subscriber Identity Module) card: A memory chip used in cell phones. Some SIM cards are portable and can be removed from a phone, while others cannot be removed.

Simulation: A computer program (often Web-based) that models or imitates an entity, state of affairs, or process. Simulations provide users with experiences that might otherwise be unavailable due to cost, difficulty, or logistics. Some examples are flight simulation programs used to train airplane pilots, virtual dissection kits for students to dissect a frog or cat in biology class, or Web-based simulations to teach scientific or mathematical concepts.

Single-mode distance institution: A distance learning institution in which teaching, learning, and administrative systems are designed and dedicated to the provision of distance education. Examples include many open universities.

Smart phone: A cell phone that has many of the same functions as a hand-held computer, including e-mail, photo and video capture, document viewing, and development and Internet browsing.[427]

SMS (short messaging service): A text message composed on and sent via cell phone.

Social constructivism: An aspect of constructivist learning theory, advocated to large degree by the Russian psychologist Lev Vygotsky, that stresses the importance of the nature of the learner's social interaction with more knowledgeable peers or colleagues. Social constructivism essentially states that learning is developed through personal relationships and participants in a shared learning experience.

Social media: User-created media (video, audio, text, or multimedia) that are published and shared in a social environment, for example, a blog, wiki, or video hosting site. Examples include YouTube and Flickr.

Social networking sites: Internet sites that enable the creation of online communities of people who share interests and activities, or who are interested in exploring the interests and activities of others. Most social network services are Web-based and provide a variety of ways for users to interact, such as e-mail and instant messaging services. The best-known examples of social networking sites are Facebook and Yammer, both of which contain professional interest groups, such as teachers.

Software: A set of instructions for the computer. A series of instructions that performs a particular task is called a program. Two major categories of software are system operating software and application software.

Student-centered learning: An instructional approach that acknowledges that students bring unique prior knowledge, experience, and beliefs to a learning situation; helps students construct knowledge in multiple ways using a variety of authentic tools, resources, experiences, and contexts; promotes learning as an active and reflective process; and encourages students to interact socially and collaborate in order to solve real-world problems and create their own understanding of situations. See also **active learning**, **learner-centered instruction**, and **child-centered learning**.

Student response system (SRS): A hand-held wireless response system, also called a classroom response system or "clicker," that allows students to respond to a teacher query by clicking on a response pad; the answer is then transmitted via a radio signal to a receiver attached to a computer. The response can be displayed on the teacher's computer screen or on an interactive whiteboard. The percentage of students providing the correct answer is then immediately displayed on the board in a bar graph or pie chart.

Summative assessment: A final assessment, such as an exam administered to learners for the purpose of judging performance, grading, or certifying a learner's level of knowledge.

427 Pouezevera, S. L., & Khan, R. (2007). Training secondary teachers in rural Bangladesh using mobile technology, p. 87. In *ICT in Teacher Education: Case Studies from the Asia-Pacific Region*. Bangkok: UNESCO.

Summative evaluation: An evaluation occurring at the end of a program or project designed to determine the program's overall effectiveness or worth.

Synchronous collaboration tools: Web-based technologies that allow for real-time or synchronous communication—for example, text chat, audio conferencing, videoconferencing, VoIP telephony (such as Skype), and multi-user domain, object-oriented environments (MOOS).

Tablet: A wireless computer that allows a user to take notes using natural handwriting with a stylus or digital pen on a touch screen. A tablet is approximately the size and thickness of a legal-size notepad and is intended to function as the user's primary personal computer as well as a note-taking device.[428]

Tagging: A process by which users can provide metadata (data about content) about particular Web-based content in order to facilitate searching and sharing. It is particularly common in social bookmarking sites such as del.icio.us and photo-sharing sites such as Flickr, which are also called *collaborative tagging* sites. Though tagging can create metadata, metadata are not necessarily tagging.

Telecollaborative project: An educational project that involves sharing information with another person or group of people over the Internet. Telecollaborative projects range from simple key pal relationships between learners and another class to involving many classrooms and experts from around the world in an information-gathering project that requires a collaborative effort.[429]

Teleport: A regional telecommunications network that provides access to communications satellites and other long-distance media. "Teleporting" is also used as a verb to describe users moving from one virtual world or immersive environment to another.

Telepresence: The ability to feel that one is "present" in a situation through the use of certain technologies—Web-based conferencing, teleconferencing, telephone, audio chat, and so on—that bridge distances. Telepresence is also a proprietary videoconferencing system.

Tethering: Connecting a cell phone or other mobile device and a computer via a cable or wireless connection. The purpose of tethering is for the mobile device to gain Internet access via the connection to the computer.

Total cost of ownership: The financial estimate of all costs associated with a particular program, purchase, or intervention. Using technology as an example, it includes all capital and recurrent costs for equipment, connectivity, supplies, supporting infrastructure, training, and support for a fixed period (five years, a decade, etc.).

428 Retrieved from Search Mobile Computing: http://searchmobilecomputing.techtarget.com

429 Harris, J. (1998). *Virtual Architecture: Designing and Directing Curriculum-Based Telecollaboration*. Eugene, OR: International Society for Technology in Education.

Two-way audio: A voice-only communication system that allows for two-way communication —listening and speaking. Audio can be transmitted via phone, satellite, the Internet, or high- frequency radio. The best-known example of two-way audio instruction for distance learning is Australia's Schools of the Air.

Ubiquitous learning: Learning via mobile technologies so that a course of study can be accessed any time, any place. Also known as "u-learning."

Universal design for learning (UDL): A design principle—for buildings, technology, the environment, industrial products, and so on— that aims to be barrier free. UDL advocates equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, and size and space for approach and use.[430]

USB flash drive: A small, portable flash memory card, also known as a thumb drive or pin drive, that plugs into a computer's USB port and functions as a portable hard drive. USB flash drives are small and easy to use and can plug into any computer with a USB drive.[431]

Validity: In evaluation, a measure that typically addresses the question, "Did the evaluation measure what it was supposed to measure?" There are generally at least three types of validity. *Content* validity is the extent to which the content of the test matches the instructional objectives. *Construct* validity is the extent to which a test, instrument, or assessment corresponds to other variables, as predicted by some rationale or theory. *Criterion validity* is the extent to which scores on the test are in agreement with some externally established criterion or criteria. Evaluators also talk about concurrent validity, predictive validity, and face validity.

Evaluations primarily concern themselves with two types of validity: internal (Did the innovation make a difference to the population under study?) and external (Can the effects of the evaluation be generalized to other populations, situations, or locations?).

Variable-bit-rate compression: A compression technology that reduces the size of video files by using more data for complex segments of audio and video and less for simpler content.

Videocassette recorder (VCR): A magnetic videotape recorder for recording and playing back television programs or prerecorded video.

Videoconferencing: Two-way, real-time transmission of audio and video signals between specialized devices or computers at two or more locations via satellite (wireless) over a network such as a local area network or the Internet.[432]

Virtual learning: See **online learning**, **e-learning**, or **distance learning**.

430 Retrieved from Center for Universal Design: http://www.design.ncsu.edu/cud/

431 Retrieved from Evergreen College Multimedia Workshop : http://blogs.evergreen.edu/portrait2010/glossary/

432 Retrieved from the *Business Dictionary*: http://www.businessdictionary.com/definition/video-conferencing.html

Virtual reality: "[C]omputer-simulated environments that can simulate places in the real world, as well as in imaginary worlds. Most current virtual reality environments are primarily visual experiences, displayed either on a computer screen or through special stereoscopic displays, but some simulations include additional sensory information, such as sound through speakers or headphones. Some advanced, haptic systems now include tactile information, generally known as force feedback, in medical and gaming applications."[433]

Virtual schools: A **virtual school** or **cyber school** is an institution that teaches courses entirely or primarily through online methods. Though there are tens of thousands of commercial and non-accredited courses available online, the term "virtual school" is generally reserved for accredited schools that teach a full-time (or nearly full-time) course of instruction designed to lead to a degree. At the primary and secondary levels, accreditation means that virtual schools tend to receive public funding. Some publicly funded and private universities also provide accredited online degrees.[434]

Virtual world: A computer-based simulated environment intended for its users to inhabit and interact in via avatars. These avatars are usually depicted as textual two- or three-dimensional graphical representations, although other forms are possible—auditory and touch sensations, for example. Some, but not all, virtual worlds allow for multiple users. In a virtual world the computer accesses a computer-simulated world and presents perceptual stimuli to the user, who in turn can manipulate elements of the modeled world and thus experience some degree of telepresence.[435]

Vodcasts: The video equivalent of podcasts, whereby video is distributed to an MP3 player or computer from the World Wide Web. Like podcasts, vodcasts (this is a specialized term for the sake of illustration—"podcast" is the generally used term for all content downloadable to an MP3 player) can be obtained via subscription to an RSS feed.

Voice over Internet Protocol (VoIP): A transmission technology for delivery of voice communications over the Internet, also known as Internet telephony. Using software such as Skype or CoolTalk, users can use the digital audio features of the Internet to talk with another person using a computer. Typically, computer-to-computer calls are free, and computer-to-phone calls involve a nominal charge.

Web 2.0: The second generation of the World Wide Web. While Web 1.0 was largely a "read" medium, Web 2.0 is a "read/write" medium in which users create and publish content without complicated authoring tools such as Web design software. Examples of Web 2.0 content include blogs, wikis, and social networking sites. The term "Web 2.0" is often used synonymously with "social media," but this guide argues that social media are a category of Web 2.0 applications.

Web 3.0: The third generation of the World Wide Web, which will, or should, involve "semantic tagging" of content. Semantic tagging is a group of methods and technologies that allow machines to understand the

433 Retrieved verbatim from *Wikipedia*: http://en.wikipedia.org/wiki/Virtual_reality

434 Retrieved from *Wikipedia*: http://en.wikipedia.org/wiki/Cyber_school

435 Retrieved from *Wikipedia*: http://en.wikipedia.org/Virtual_world

meaning, or semantics, of information. Semantic tagging, part of this new "semantic Web," is supposed to allow users to find, share, and combine information more easily.[436]

Webinar: An interactive, Web-based seminar in which instructors and learners interact using documents such as PowerPoint presentations, video, audio, and chat tools.

Webcast: The equivalent of traditional television and radio broadcasting, transmitted live over the Internet. Webcasts can be used as stand-alone events for which participants register or as a component of an online course, conference, or session.[437]

Webquest: An inquiry-oriented activity in which some or all of the information that students interact with comes from resources on the Internet. Webquests provide models for teachers searching for ways to incorporate the Internet into the classroom on both a short-term and long-term basis.[438]

Widget: In a graphical user interface, a combination of a graphic symbol and some program code to perform a specific function. For example, Microsoft Windows OS comes with a number of built-in widgets ("gadgets") such as calendars, world clocks, currency converters, and so on. As widgets become easier to create and more powerful, they may serve as a potential self-teaching tool in a particular concept or knowledge domain.

Wiki: A page or collection of sites designed to enable anyone who accesses it to contribute to or modify content, using simple formatting rules. Wikis, an example of a Web 2.0 technology (from the Hawaiian word for "quick"), are often used to create collaborative websites and to power community websites. The collaborative encyclopedia *Wikipedia* is the best-known example of a wiki.[439]

Wireless: The ability of one ICT device, for example a computer or cell phone, to communicate with another without cables or wires.

Wireless Wide Area Network (WWAN): A wireless network that uses mobile telecommunication cellular network technologies such as GPRS, GSM, or 3G (third-generation) mobile telephone services that allow higher rates of transmission for more types of data, such as voice, video, and Internet content.

World Wide Web: An information distribution method that operates via the Internet to enable users to access information resources linked to uniform resource locators (URLs) or other codes. Webpages are displayed in browsing software and may contain links (often called "hypertext") to other resources.

XML (extensible markup language): A flexible text format for creating structured computer documents on the World Wide Web.[440]

436 Retrieved from *Wikipedia*: http://en.wikipedia.org/wiki/Semantic_Web

437 Commonwealth of Learning. (2008). Education for a Digital World, p. 490. Vancouver, BC: Author.

438 Retrieved from San Diego State University: http://webquest.sdsu.edu/about_webquests.html

439 Retrieved from *Wikipedia*: http://en.wikipedia.org/wiki/Wiki

440 Retrieved from *Wiktionary*: http://en.wiktionary.org/wiki/xml

Appendix 2: Annotated List of Open and Distance Learning Resources

Though this guide provides references to hundreds of programs, technologies, and websites for distance learning, we have included here an annotated list of a few more of the most potentially useful distance education resources for teacher training.

Carnegie Mellon Open Learning Initiative (OLI)

The OLI is a collection of "cognitively informed," openly available, and free online courses and materials that provide instruction for an entire course. The project adds to online education the elements of instructional design grounded in cognitive theory, formative evaluation for students and faculty, and iterative course improvement based on empirical evidence. A primary objective is to build a community of use that will play an important role in ongoing course development. The courses are developed in a modular fashion to allow faculty at a variety of institutions to deliver the courses as designed, or to modify the content and sequence it to fit their needs.
URL: http://www.cmu.edu/oli/index.shtml

Caribbean Knowledge and Learning Network (CKLN)

The CKLN project seeks to enhance the competitiveness of Caribbean countries by upgrading and diversifying the skills and knowledge of human resources in the Caribbean region through greater collaboration and connectivity. Information and communications technologies will be used to connect the region's colleges and universities, fostering collaboration, the development of region-wide e-learning programs, and knowledge sharing. See also http://www.open.uwi.edu/
URL: http://www.dec.uwi.edu/projects/ckln.php

Commonwealth of Learning

An intergovernmental organization developed by British Commonwealth heads of government to encourage open and distance learning technologies, supports, and resources.
URL: http://www.col.org

Community College Consortium for Open Educational Resources (CCCOER)

CCCOER is a joint effort by the Foothill-De Anza Community College District, the League for Innovation in the Community College (U.S.), and many other community colleges and university partners to develop and use OER in community college courses.
URL: http://cccoer.wordpress.com/

EdTech Leaders Online (ETLO)

ETLO is EDC's capacity-building online program for school districts, state departments of education, regional service centers, teacher training institutions, and other educational organizations. It provides online learning programs for teachers, administrators, and students. ETLO programs include graduate-level training courses for online instructors and course designers and a catalog of online workshops focused on specific subject areas and grade levels.
URL: http://www.edtechleaders.org

Education Network Australia (EdNA)

EdNA is a network of the education and training community. It includes government and nongovernment schooling systems; early childhood, vocational, and technical education; adult and community education; and higher education.
URL: http://www.edna.edu.au/edna/go

e-Learners.com

e-Learners.com is an online community full of highly differentiated resources for those interested in e-learning.
URL: http://community.elearners.com/default.aspx

Higher Education Open and Distance Learning (ODL) Knowledge Base

The main website for UNESCO's ODL projects, this site supports decision-makers and practitioners, particularly in terms of developing and managing ODL courses.
URL: http://www.unesco.org/odl

Improving Educational Quality Through Interactive Radio Instruction (IRI)

This World Bank toolkit is intended for African policymakers, education planners, and pedagogical specialists who may be considering the feasibility of using IRI in their education systems to improve teachers' and students' skills.
URL: http://bit.ly/lX6JVC

The International Association for K–12 Online Learning (iNACOL): How to Start an Online Program

iNACOL (http://www.inacol.org) strives to ensure that all students have access to a world-class education and quality online learning opportunities that prepare them for a lifetime of success. Its website contains numerous resources on setting up and evaluating online learning programs. iNACOL has also designed standards for online learning. This site offers information on designing, budgeting for, and assuring the quality of online programs. It is designed for program administrators—the people who are either investigating the possibility of creating an online program or have already been assigned this task. The site also contains useful information for policymakers, departments of education, and district administrators who wish to establish a positive policy environment for online learning.
URL: http://www.onlineprogramhowto.org/

Indiana University School of Education Instructional Consulting

A comprehensive site with numerous free resources for Web design, structuring online courses, using video, podcasts, and Web 2.0 tools—all in the service of distance learning. The site contains many free video lessons that help viewers learn about design, instruction, and assessment in an online environment.
URL: http://www.indiana.edu/~icy/media/de_series.html

Lulu

This Internet-based print-on-demand service permits students to order printed copies for a minimal fee.
URL: http://www.lulu.com/

Multimedia Educational Resources for Learning and Online Teaching (MERLOT)

MERLOT is a leading-edge, user-centered, searchable collection of peer-reviewed and selected higher education online learning materials, catalogued by registered members and a set of faculty development support services.

MERLOT's vision is to be a premier online community in which faculty, staff, and students from around the world share their learning materials and pedagogy. MERLOT's strategic goal is to improve the effectiveness of teaching and learning by increasing the quantity and quality of peer-reviewed, online learning materials that can be easily incorporated into faculty-designed courses.
URL: http://www.merlot.org/merlot/index.htm

National Education Association Guide to Teaching Online Courses

Though geared primarily toward teaching online courses for U.S. secondary school students, this guide focuses on overall implementation of online courses, including professional development.
URL: http://www.nea.org/assets/docs/onlineteachguide.pdf

National Repository of Online Courses (NROC)

NROC is a growing library of high-quality online course content for students and faculty in higher education and high school. This nonprofit project, supported by the William and Flora Hewlett Foundation, is an OER and facilitates collaboration among a community of content developers to serve students and teachers worldwide.
URL: http://www.montereyinstitute.org/nroc/

National Staff Development Council (NSDC) Standards for Professional Development

NSDC's (now Learning Forward) revised Standards for Staff Development reflect what NSDC and the broader staff development community have learned about professional learning since the creation of the original standards in 1995.
URL: http://www.nsdc.org/

New Teacher Center

Housed at the University of California at Santa Cruz, the New Teacher Center offers a wealth of research, updates, publications, and courses (the latter for a fee) on addressing quality, job satisfaction, and retention issues for new teachers.
URL: http://www.newteachercenter.org/index.php

Online Journal of Distance Learning Administration (OJDLA)

OJDLA is a peer-reviewed electronic journal offered free each quarter over the World Wide Web.
URL: http://www.westga.edu/~distance/ojdla/

PhET Interactive Simulations

PhET is a large online library of free interactive simulations, mainly pertaining to the sciences and mathematics. The site is housed at the University of Colorado at Boulder (U.S.). Each simulation targets a particular science or math concept. These simulations are designed to be used by teachers or students who have minimal background in the concept and who have had no training in using simulations.
URL: http://phet.colorado.edu/

RezHub

A social networking platform and online hub for educators using virtual worlds, this site offers free access to the educational resources about virtual worlds, research in the field, and a network of educators using virtual worlds for learning.
URL: http://rezedhub.ning.com/

Success at the Core

Co-developed by EDC, Success at the Core is a free, field-tested professional development toolkit designed to help middle school leadership teams and teachers elevate classroom instruction and improve student outcomes. All materials are free, and many modules are video-based. This is an example of distance-based professional development that blends text, the Internet, and video.
URL: http://successatthecore.com/

TeKete Ipurangi (TKI)

Initiated by the New Zealand Ministry of Education, TKI is a bilingual portal and Web community that provides quality-assured educational material for New Zealand teachers, school managers, and the wider education community.
URL: http://www.tki.org.nz/

UNESCO Bangkok

UNESCO Bangkok promotes international cooperation, sets standards, and disseminates information in the fields of education, natural sciences, social and human sciences, culture, and communications in the Asia and Pacific region. It has a particular strength in the area of ICT in education.
URL: http://www.unescobkk.org/

UNESCO Global Forum on Quality Assurance, Accreditation, and the Recognition of Qualifications

This UNESCO site provides a platform for dialogue about frameworks for quality assurance of ODL courses.
URL: http://www.unesco.org/education/higher_education/global_forum/main

Wikiversity

Wikiversity is a Wikimedia Foundation project devoted to learning resources, learning projects, and research for use in all levels, types, and styles of education from preschool to university, including professional training and informal learning. Teachers, students, and researchers are invited to join in creating open educational resources and collaborative learning communities.
URL: http://www.wikiversity.org/

Appendix 3: List of Countries Referenced in This Guide

This guide references issues, projects, initiatives, programs, or policies from more than 100 countries and territories, listed here:

Albania	Ghana	Palestine
Anguilla	Greece	Panama
Antigua and Barbuda	Grenada	Papua New Guinea
Argentina	Guatemala	Philippines
Australia	Guinea	Poland
Azerbaijan	Guyana	Russia
Bahamas	Haiti	Rwanda
Bangladesh	Honduras	Samoa
Belgium	Hong Kong SAR	São Tome e Principé
Belize	Hungary	Saudi Arabia
Bhutan	India	Scotland
Botswana	Indonesia	Seychelles
Brazil	Ireland	Sierra Leone
British Virgin Islands	Israel	Singapore
Brunei Darussalam	Italy	Slovak Republic
Canada	Jamaica	St. Kitts and Nevis
Cayman Islands	Japan	St. Vincent
Central African Republic	Jordan	South Africa
Chad	Kenya	South Korea
Chile	Kuwait	Sri Lanka
China	Lebanon	Sudan
Colombia	Lesotho	Suriname
Comoros	Liberia	Swaziland
Costa Rica	Lithuania	Sweden
Denmark	Madagascar	Switzerland
Dominica	Malaysia	Syria
Dominican Republic	Maldives	Taiwan
Democratic Republic of Congo	Mauritius	Tanzania
Ecuador	Mexico	Trinidad and Tobago
Egypt	Montserrat	Turks and Caicos
El Salvador	Namibia	Uganda
England	Nepal	United States
Eritrea	Netherlands	Venezuela
Finland	Niger	Wales
France	Nigeria	Zambia
Gambia	Norway	Zimbabwe
Germany	Pakistan	

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Appendix 5: Interviews

Monica Beglau, Director, eMINTS, Columbia, Missouri. Phone interview, December 2, 2008.

Dr. Cornelia Brunner, Senior Research Scientist, Education Development Center, Inc., New York, NY. Email communication, December 8, 2008.

Dr. Bakary Diallo, Rector, African Virtual University, Nairobi, Kenya. E-mail communications, October 26 and 29, 2010.

Earlene Patton, Director of Technology Initiatives, Alabama Department of Education. Personal communication, San Antonio, Texas, June 28, 2008.

Dr. Tae Rim-Lee. Chair, Department of Information Statistics, Korean National Open University. President KCS and KOSHIS. Seoul, South Korea. Personal communication, January 14, 2010.

Barbara Treacy, Director, EdTech Leaders Online, Education Development Center, Inc., Newton, MA, USA. E-mail communications, December 2, 2008, and July 12, 2011.