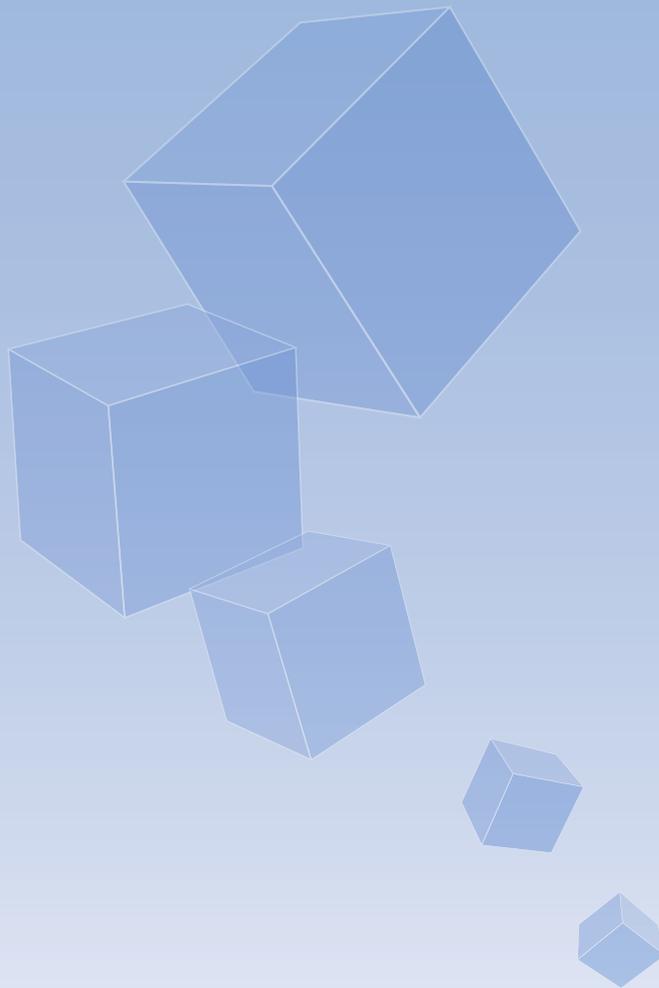


Open Educational Resources

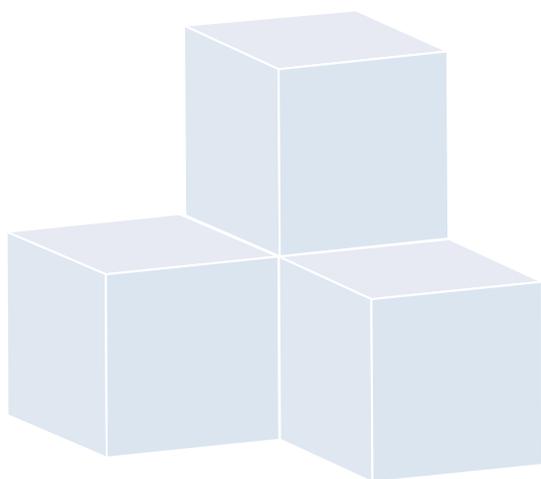
*Vignettes of Selected
Asian Experience*

Edited by
G. Dhanarajan



Open Educational Resources

Vignettes of Selected Asian Experience



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Executive Summary

1. This report presents six case studies on the adoption of Open Educational Resources (OER) by institutions in Pakistan, India, Thailand, Malaysia and Hong Kong. Each of the cases describes the experience, the value and the outcomes that institutions derived from adopting the idea and purpose behind OER. Findings from the study of the six cases should be read with caution as the volume of data that was available is not adequate for any kind of statistical treatment.
2. Reasons for engaging in the adoption of OER varied by jurisdiction. Interest in reducing the cost of curriculum development and improving the quality of teaching and learning were relatively dominant in all institutions.
3. Awareness of OER as well as its usefulness is still not as widespread as could be expected, despite the massive global efforts at promoting it by organisations such as UNESCO, Commonwealth of Learning, the OECD and numerous other interest groups among others.
4. While the potential benefits of adopting OER has received overwhelming attention, the actual benefits realised until now, is somewhat modest.
5. Subject matter did not seem to be a limiting factor in using OER. Courses and programmes from the hard sciences, engineering, humanities and liberal arts were all produced or adopted under various forms of licence.
6. The experience of academic staff using OER in their course development indicates a positive shift in attitudes leading towards a more reflective approach to the interpretation of curriculum. There was also a sense of being “liberated” from the restrictions that textbooks impose.
7. The quality of the curriculum and the teaching and learning experience was not compromised because of the use of OER.
8. The inclusion of rich OER content helped to “excite” especially adult learners; there was also a marginal improvement in the performance of students in examinations and improvement in retention rates of those studying especially in the open universities.
9. There is a recognised need for higher levels of skills and competencies in those who work with OER.

10. There is some, though modest, evidence of active collaboration amongst institutions or individuals.

11. There was no evidence to support enhancement of access to higher education directly because of OER but indirectly, unencumbered access to knowledge through open courseware on the web is helping.

Acronyms

| | |
|--------|--|
| ADB | Asian Development Bank |
| CC | Creative Commons |
| EIU | Economic Intelligence Unit |
| GEHU | Graphic Era Hill University |
| HEI | Higher Education Institutions |
| HKUST | Hong Kong University of Science and Technology |
| ICT | Information and Communications Technology |
| IPR | Intellectual Property Rights |
| ITU | International Telecommunications Union |
| IIT | Indian Institute of Technology |
| IITR | Indian Institute of Technology Roorkee |
| KOER | Karnataka Open Educational Resources |
| MIT | Massachusetts Institute of Technology |
| MOOC | Massive Open Online Courses |
| NITK | National Institute of Technology Kurukshetra |
| NPTEL | National Programme on Technology Enhanced Learning |
| NROER | National Repository of Open Educational Resources |
| OCW | Open Courseware |
| ODL | Open Distance Learning |
| OER | Open Educational Resources |
| OUHK | The Open University of Hong Kong |
| QA | Quality Assurance |
| ROER4D | Research on Open Educational Resources for Development |

| | |
|-------------|--|
| TCU | Thailand Cyber University Project |
| UNESCO | United Nations Educational, Scientific and Cultural Organisation |
| UNESCO-IITE | UNESCO-Institute for Information Technologies in Education |
| WOU | Wawasan Open University |
| VUP | Virtual University of Pakistan |

Prologue

The technological innovations of the past fifty years or so have resulted in many ground-breaking changes in almost all spheres of human activity. Among these changes are a range of “Open” philosophies, many riding on the technological innovations of the period and others coming out of a range of expectations of democratic and free societies; simultaneously, some of them have also been seen as disruptive technologies, revolutionising the way everyday business is done. Many of the practices emerging from these philosophies have been driven and created by communities for themselves and others. Some of these open movements are tabulated in **Table 1**.

| Open content | Open process | Open infrastructure | Open culture |
|--|--|--|--|
| <ul style="list-style-type: none"> • Access to research literature • Data • Open software | <ul style="list-style-type: none"> • Open development • Open peer review • Open research • Open innovation | <ul style="list-style-type: none"> • Open software • Open infrastructure • Open standards | <ul style="list-style-type: none"> • Data • Open software • Open infrastructure • Open standards • Open development • Open peer review |

Table 1 The many types of “Open” movements

The Open Educational Resources (OER) movement is one such innovation. Like many other new ideas and innovations, no single definition has universal acceptance. The Cape Town Declaration¹ of 2010 stated that OER “*embraces and draws upon open technologies that facilitate collaborative, flexible learning and the open sharing of teaching practices that empower educators to benefit from the best ideas of their colleagues*”. Wikipedia modifies the definition marginally by explicitly highlighting factors such as digital formats and licenses reiterating that these are “freely accessible, openly formatted and openly licensed documents and media that are useful for teaching, learning, education, assessment and research purposes”. In practical terms OER are, “*teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property licence that permits their free use and re-purposing by others*”². Wiley, who is considered by many as the person who gave clarity to a defined purpose for OER, and his co-workers (Wiley, Green and Soares 2012) described the innovation as:

“educational materials — textbooks, research articles, videos, assessments, simulations — that are either licensed under an open copyright license — for example, Creative Commons — or in the public domain. In both cases, you have free (no-cost) access to the OER and free (no-cost) permission to engage in the “4R” activities when using them, including the freedoms to:

1. *Revise: adapt and improve the OER to better meet your needs.*
2. *Reuse: use the original or your new version of the OER in a wide range of contexts.*
3. *Remix: combine or “mashup” the OER with other OER to produce new materials.*

¹ <http://www.capetowndeclaration.org/read-the-declaration>

² <http://www.hewlett.org/programs/education-program/open-educational-resources>

4. *Redistribute: make copies and share the original OER or your new version with others, and more recently a fifth element was added to the 4Rs and called:*
5. *Retain: the right to make, own and control copies of the content (Wiley 2014).*

| Country | Economic status | Case study on | Case study authors |
|------------------|----------------------|--|--|
| Hong Kong, China | High income | Open Textbooks, a project launched in 2013 by the Open University of Hong Kong with funding from the Hong Kong Jockey Club to design and produce open textbooks. | KC Li, KS Yuen and Alex JW Wong |
| Malaysia | Higher-middle income | Three courses designed, developed and delivered to off-campus learners by the Wawasan Open University using OER as a main component of the content; the courses are at the undergraduate and postgraduate levels. | Madhulika Kaushik |
| Thailand | Higher-middle income | OER-based professional development course designed by the Thai Cyber University Project to train e-learning specialists. | Theeraroungchaisri, A. and Suwannattachote, P. |
| India | Lower-middle income | Open courseware produced by the National Programme for Technology Enhanced Learning (NPTEL), a collaborative attempt by a family of the Indian Institutes of Technology (IIT), which is made available for reuse by other colleges, and universities of engineering and technology. A comparative study of three universities, which are reusing a selection of the NPTEL courseware. The three are: Indian Institute of Technology, Roorkee (IITR), National Institute of Technology Kurukshetra (NITK) and the Graphic Era Hill University (GEHU). | Sanjay Jasola |
| India | Lower-middle income | Karnataka Open Educational Resources (KOER), a project of the Karnataka Ministry of Education, India, is an attempt to build a community of teachers through sharing of OER for knowledge and their professional development. | Rajaram Sharma |
| Pakistan | Lower-middle income | The Virtual University of Pakistan's (VUP) Open Courseware programme. VUP's learning materials are all video lectures broadcasted to all parts of Pakistan through four TV channels and globally through YOUTUBE. | Naveed A. Malik |

Table 2 The case studies

Dialogue regarding “retention rights” has been somewhat muted among scholars. This aspect of the OER movement becomes important when commercial content is remixed with non-commercial OER. Other than the Wawasan Open University (<http://www.wou.edu.my>), which has mixed a few commercial non-OER materials to its OER content, none of the other cases have mixed materials and hence the question of retention rights did not surface in the study.

In this study, we have used the broader term *adoption* rather than the sharper understanding of OER that is limited to the reuse, remix, revision and redistribution (the 4Rs) of educational resources. Broadening the scope, as we have done, reflects more of the sentiments conveyed through the *Cape Town Open Education Declaration*. Additionally it is also guided by our experience that even while recognising the value of the internationally recognised definition, that “*in most developing countries, we are still grappling with the seminal construct that describes OER practices including awareness of, access to, use of and various types of reuse such as revise, remix, redistribute*”, as well as OER policy development and implementation (Hodgkinson-Williams 2012).

Many see OER as a step towards more innovative open educational practices (OEP)³ to promote quality, innovation and transparency in higher and adult education (Downes 2007; Keates & Schmidt 2007).

The cases have been chosen from Asian institutions which are among the early adopters of OER. These are tabulated in **Table 2**.

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³ Open Educational Practices (OEP) are teaching practices that utilise open technologies and OER to facilitate collaborative and flexible learning. These practices manifest in different ways like online learning where access to learning opportunities is enabled through freely available content and services. These practices may also include the creation, use and repurposing of educational resources as well as the open sharing of teaching practices.

Web Resources

1. <http://www.capetowndeclaration.org/read-the-declaration>
2. <http://www.hewlett.org/programs/education-program/open-educational-resources>

Chapter 1 An Overview

~ G. Dhanarajan

Enabled by the ubiquity of the Internet, alternative intellectual property mechanisms and the growing “open” movement, the emergence of OER has been hailed as a potentially fruitful way to respond to some of the many challenges faced generally by post-secondary education globally, and emerging Asia particularly. The over exuberance of the sentiment while understandable is also misinformed. In itself, OER does not directly improve access to formal higher education for marginalised people, except where OER is presented as an Open Courseware (OCW) [Table 1]. However, in an indirect way, it has been suggested that OER lends itself to improvements in the quality of the curriculum; cost reduction in transforming the curriculum into learning experiences and at the same time, also becomes available for self and informal learning.

| What are Open Educational Resources ¹ | |
|--|--|
| What it is? | <i>OER typically refers to electronic resources, including those in multimedia formats, and such materials are generally released under a Creative Commons or similar license that supports open or nearly open use of the content.</i> |
| What it is not? | <i>An OER is NOT a course that carries a credit or credits though institutions which adopt an OER may use it as a whole or part of a course that carries credit or presented as Open Courseware (OCW)</i> |
| Where does it originate? | <i>OER can originate from colleges and universities, libraries, archival organisations, government agencies, commercial organisations such as publishers, or faculty or other individuals who develop educational resources they are willing to share.</i> |
| What format? | <i>OER include textbooks, course readings, and other learning content; simulations, games, and other learning applications; syllabi, quizzes, and assessment tools; and virtually any other material that can be used for educational purposes.</i> |
| How is it licensed? | <i>All content labelled as an OER often carries a license, usually a Creative Commons license that permits reuse under certain conditions and normally at little or no cost.</i> |

Table 1 OER traits

While dialogue and debate on OER have been intense since 2001 in high income countries, including a few in Asia, in the middle and low income countries, these discussions have been somewhat muted till about 2010. Reasons for this reticence can be attributed to a number of factors; most importantly, unlike the West, the pressure to cut costs of textbooks has not become a significant political issue. In most emerging economies of Asia, textbooks at the pre-tertiary levels have enjoyed huge subsidies from the public purse and at the tertiary level, development aid has kept prices down until most recently. Furthermore, a lackadaisical enforcement of intellectual property regulations, as it applies to educational materials has also meant textbook costs have not added to the personal cost of tertiary education. Notwithstanding, with increasing efforts by governments on the enforcement of IPR, especially those presented as digitised content as well as neo-liberal fiscal policies on government services, the situation is beginning to change. This to a

¹ Adapted from Educause. Available at: <https://net.educause.edu/ir/library/pdf/ELI7061.pdf>

certain extent has led to a renewed interest in OER, as can be seen by the number of conferences and seminars on the subject as well as the line blogs, webinars and participation by Asians in many of the global online forums.² In the next section of this report, an overview of the situation in the emerging economies of Asia is presented.

Open Educational Resources in Asia – ICT Environment and E-Readiness

Since the establishment of the first Open University in Pakistan in 1974, many Asian countries have been extensive providers of open education both at the pre-tertiary and tertiary levels. Open schools and open universities in Asia have enabled millions of Asians to pursue education that has been denied them for one reason or another. Five of the seven mega universities of the world are located in Asia and three of them, in Pakistan, India and China, cater for well over one million students each (Asian Development Bank 2012). These universities rely extensively on both analogue and digital technologies of the most advanced types to design, create and deliver self-instructional materials to their students, who study on their own outside of a campus. The self-instructional materials that they produce are not different from OER except for the fact that they are all copyrighted and made only available to their own students. Lately, since the emergence of OER, some of these institutions, especially the universities are removing the copyright restrictions of their learning materials, making them available “freely” to anyone wishing to access them. Therefore at both policy and practice levels, the acceptance of OER as a *philosophy* is not a challenge in itself for Asians; but, in reality, acceptance of OER as a strategy presents barriers of one kind or another. Not the least of these are those issues relating to the easy availability of and effective access to ICTs specifically for educational purposes, as well as the e-readiness of societies in general. Good, effective, reliable, affordable and a well-functioning ICT environment is an essential requirement for any venture in the use of OER in educational and training settings. These should include sound policy guides; adequate, efficient and functioning electricity and telecommunications assets; technical and appliances support for teaching and learning; as well as the knowledge, capacity and skills to use digitally available (content) resources skilfully. The spread of such infrastructural assets are not even across Asia. For instance, a recent report from UNESCO, 2014 highlighted some of the issues such as:

1. *Power Supply*: Reliability and continuity of supply especially in rural areas across the continent is not yet fully assured, though overall the UNESCO report claims that penetration of power supply has exceeded beyond 79% of households.
2. *Access to the Internet*: Despite efforts and investment into IT infrastructure, the digital divide is still an issue and of concern for a number of Asian economies, including those that have reached middle-income status. All countries in Asia have shown growth in their ICT infrastructure, but overall growth rates are not necessarily a reflection of the depth to which the technologies have penetrated the various segments of society. Cambodia, Laos, Sri Lanka, Indonesia and India have penetration rates of less than 10% (2008 figures). At the middle level are countries such as the Philippines and Thailand with rates at below 20% and others like Malaysia (59%), Korea and Japan (above 70%) (ITU 2014). For example, in 2012, for the five countries and regions with the highest penetration rates, the (mobile phone) penetration rate on average was 214 per 100 people, while for the

² www.oerasia.org

five countries and regions with the lowest penetration rates, it was just 35 per 100 people. There were 1.076 billion Internet users in Asia, with a penetration rate of 27.5%. Asians make up 44.8% of the world Internet user population. **Table 2** summarises data of the core indicators on access to and use of a broad range of ICTs by households and individuals in selected Asian countries (International Telecommunication Union 2014) as well as the levels of appreciation of ICT's value as an educational tool (UNESCO 2008) and the readiness of the countries to use ICTs for personal and official purposes (EIU 2003 and 2008). The UNESCO findings and EIU scores are based on a set of measures including:

- a. Connectivity, especially broadband, as well as ownership of personal computers and cost of connectivity.
 - b. Content development skills to be used in the new media and a capacity to manage the online learning transaction.
 - c. Capability, that is, the ability to design and deliver content through the Internet, and the ability of users to learn through the Internet.
 - d. A culture to promote, recognise, reward and accord respect to online teaching and learning ventures and accomplishments.
3. *Competencies and Skills to Apply Educational Technologies in the Classroom*: While schools in almost all Asian countries have high levels of competencies in the use of audio, video and the older analogue technologies-based broadcast media, very few have such levels of competencies with the digital technologies of today. The exceptions are countries like Singapore, Malaysia and Thailand, and teachers working in the secondary school sector in the Philippines. This lack of competencies also shows up in the use of technologies by teachers in the tertiary sector in countries such as Laos and Cambodia but not so in Singapore or Malaysia. In the higher education, there is a greater level of competencies.

| Country | ICT physical infrastructure as % of households (ITU 2014) | | | | ICT User Appreciation and Readiness | | |
|-----------|---|-----------|---------|-----------------|-------------------------------------|---------------------------------|--|
| | Internet Access | Computers | Mobiles | Fixed Line Tel. | ICT Appreciation (UNESCO 2008) | E-Readiness Score/10 (EIU 2010) | E-Learning Readiness Score/10 (EIU 2003) |
| Hong Kong | | | | | High | 8.22 | 7.34 |
| India | 3.4 | 9.5 | | 63.2 | Low | 4.11 | 4.56 |
| Malaysia | 64.7 | 66.9 | 141 | na | High | 5.93 | 6.48 |
| Pakistan | | | 76.4 | | Low | 3.55 | 3.22 |
| Thailand | 18.4 | 26.9 | 91.8 | 15.5 | Low | 4.86 | 5.11 |

Table 2 Core indicators on access to and use of ICT by households and individuals (%) in selected Asian countries³

³ <http://data.un.org/DocumentData.aspx?q=ict&id=352>

4. *Access to other ICT-based resources at the personal level:* While the availability of appliances, such as PCs, laptops, tablets and other mobiles, are critical indicators of the extent to which ICT tools are being used in Asian schools, colleges and universities, there are other facilities which also contribute to the extent in which ICTs are used. Specifically, these will include easier access to the Internet, the World Wide Web, presentation and other software, as well as in some cases, electronic libraries. **Figure 1** represents data from a survey done in 2011 on the availability and use of ICT-based resources by academics in higher education institutions in a number of South and South East Asian countries, including the TCU, IITs, WOU and OUHK. By and large in most HEIs, access to appliances as well as software does not seem to be a difficulty. Even with expensive cost of connection and frustrations with the slow speed, the use of Internet and WWW is also mostly accessible. However, library and services related to the library such as databases were somewhat poor (Dhanarajan and Ishan 2012).

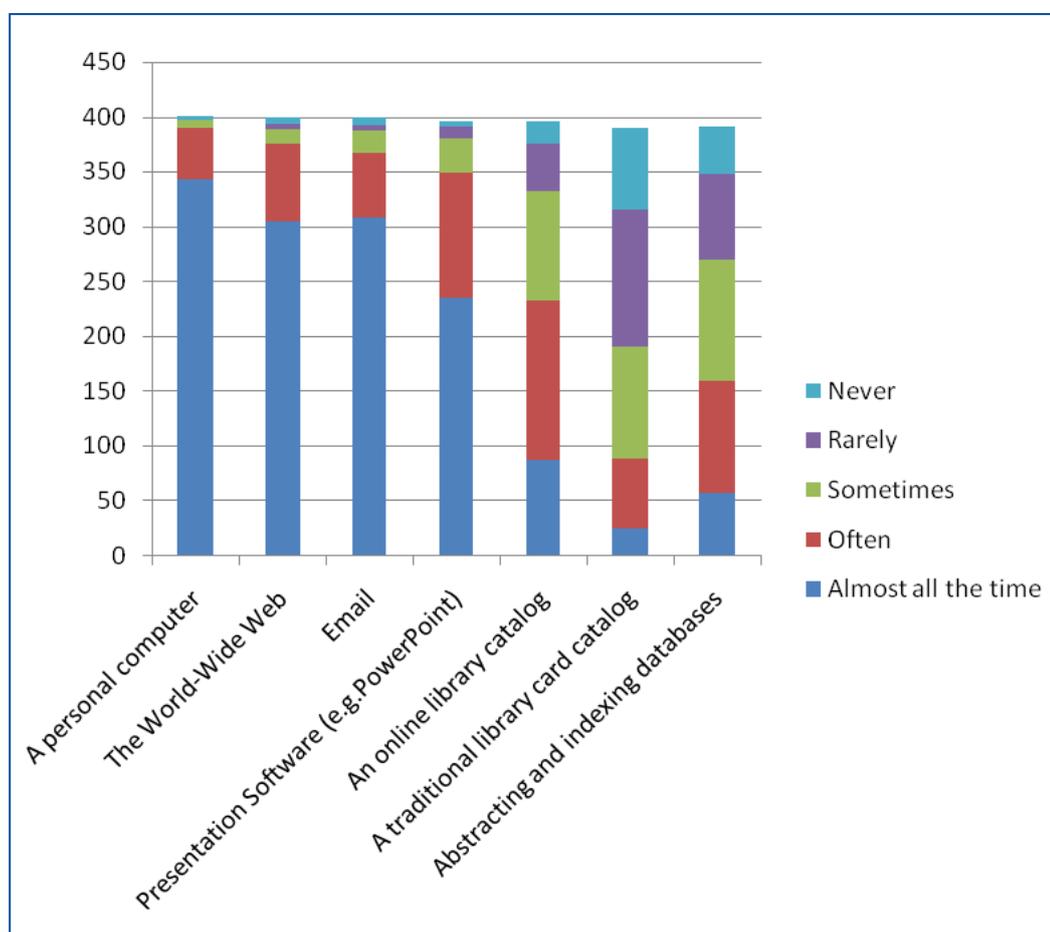


Figure 1 Access to ICT resources for individual academics from India, Malaysia, Pakistan and Hong Kong (After Dhanarajan & Ishan 2012)

5. *Use of digital resources for instruction*: By 2014, the number of Creative Commons licensed digital resources had already exceeded 800 million objects. They included image and visual materials such as drawings, photographs and art posters; online reference materials; digitised documents; digital film and video; and full course packs. However access to the huge volume of resources is largely dependent on bandwidth, cost of connections, access devices (e-readers, kindle) programmes like Acrobat and Adobe and technical skills and support that is available. The survey by Dhanarajan and Abeywardena (op. cit.) indicated that in many parts of South and South East Asia, almost all of these ICT facilities and digital resources are available and being used. However usage is not evenly spread across all the countries or even within countries. Those residing in low and lower middle income countries are somewhat handicapped as are those located in the rural parts of nations. **Table 3** lists the patterns of use. Most commonly accessed content are narratives in pdf files, images, online reference sources, discussion groups and the least accessed resources include data archives, audio materials such as speeches, oral interviews, online diaries, government documents, simulations and animations, and most surprisingly websites created by other faculties.

| Types of digital resources | Use (%) | | | | | |
|--|---------------------|-------|-----------|--------|-------|--------|
| | Almost all the time | Often | Sometimes | Rarely | Never | Number |
| Digital readers (e.g., Adobe Acrobat reader) | 30.4 | 34.2 | 21.3 | 8.0 | 6.1 | 395 |
| E-Book readers (e.g., Kindle) | 10.3 | 19.6 | 19.57 | 22.83 | 27.72 | 368 |
| Images or visual materials (drawings, photographs, art, posters, etc.) | 26.8 | 41.3 | 23.3 | 7.3 | 1.5 | 400 |
| Online reference resources (e.g., dictionaries) | 24.2 | 40.9 | 25 | 7.1 | 2.9 | 396 |
| Online or digitised documents (including translations) | 17.3 | 34.9 | 23.4 | 16.3 | 8.0 | 398 |
| Online class discussions (including archived discussions) | 15.9 | 25.8 | 27.4 | 16.6 | 14.3 | 391 |
| Digital film or video | 15.4 | 33.9 | 35.7 | 10.6 | 4.3 | 395 |
| News or other media sources and archives | 15.3 | 35.1 | 32.3 | 13.0 | 4.3 | 393 |
| Course packs | 14.7 | 20.4 | 35.6 | 16.2 | 13.1 | 388 |

| | | | | | | |
|--|------|------|-------|-------|-------|-----|
| Curricular materials and websites that are created by other faculties and/or other institutions (e.g., MIT OpenCourseWare, World Lecture Hall, Merlot) | 13.8 | 29.4 | 33.3 | 15.3 | 8.3 | 398 |
| Data archives (numeric databases; e.g., census data) | 9.16 | 23.4 | 31.6 | 20.6 | 15.3 | 393 |
| Audio materials (speeches, interviews, music, oral histories, etc.) | 7.9 | 23.5 | 35.4 | 22.0 | 11.1 | 395 |
| Personal online diaries (e.g., blogs) | 6.9 | 18.9 | 27.0 | 27.3 | 19.9 | 392 |
| Government documents in digital format | 6.6 | 21.1 | 33.84 | 21.37 | 17.05 | 393 |
| Simulations or animations | 5.37 | 26.6 | 34.2 | 23.3 | 10.5 | 391 |
| Maps | 3.8 | 12.2 | 33.9 | 29.4 | 20.8 | 395 |
| Others | 13.3 | 20.5 | 25.8 | 9.3 | 31.1 | 151 |

Table 3 Types of digital devices and resources used by academics in India, Malaysia, Pakistan and Hong Kong (After Dhanarajan, G. & Ishan, S. A. 2012)

6. *Search Engines and Sources of digital resources*: The same survey by Dhanarajan and Ishan (2012) also showed that almost all of the popular search engines (Google, Yahoo, Safari and Bing) are in use. Media sources such as CNN, BBC, and local television and radio channels are also used. Limited use is made of resources from museums and professional organisations as well as commercial databases (the limited use is probably a reflection of the cost to access these resources (**Table 4**)). A number of academics are also collecting, curating and storing a personal collection of digital resources of their own.

| Types of digital resources | Use (%) | | | | | Number |
|---|---------------------|-------|-----------|--------|-------|--------|
| | Almost all the time | Often | Sometimes | Rarely | Never | |
| Search engines/ directories (e.g., Google, Yahoo) | 54.38 | 32.47 | 9.54 | 2.32 | 1.29 | 388 |
| My own personal collection of digital materials | 30.59 | 39.85 | 17.48 | 9.77 | 2.31 | 389 |

| | | | | | | |
|---|-------|-------|-------|-------|-------|-----|
| Public (free) online image databases | 23.31 | 34.27 | 27.53 | 9.55 | 5.34 | 356 |
| Online journals (e.g., JSTOR) | 21.43 | 28.06 | 27.3 | 15.82 | 7.4 | 392 |
| Library collections (digital) | 16.41 | 27.95 | 29.23 | 17.69 | 8.72 | 396 |
| Campus image databases from my own institution (e.g., departmental digital slide library) | 13.44 | 22.22 | 28.17 | 18.35 | 17.83 | 387 |
| “Portals” that provide links or URLs relevant to particular disciplinary topics | 13.04 | 33.25 | 36.32 | 11.51 | 5.88 | 391 |
| Media sites (e.g., NPR, New York Times, CNN, PBS) | 10.97 | 25.59 | 32.64 | 19.58 | 11.23 | 383 |
| Others | 5.56 | 11.11 | 18.52 | 12.04 | 52.78 | 108 |

Table 4 Search engines and sources (%) of digital content used by academics in India, Malaysia, Thailand and Hong Kong (After Dhanarajan and Ishan, 2012)

National and Institutional Policies Environment in Support of OER Adoption

The five countries from which we have drawn the case studies are among the earliest to have aligned their ICT for education policies to that of their national ICT strategies. Briefly, these policy objectives reflect some of the following:

1. The ubiquity of ICT policies in the higher and upper-middle-income countries but in others, it is less so.
2. Alignment of ICT for education policies with national ICT vision and strategies.
3. Some countries have ICT policies specifically targeting secondary education while others include all sectors. In higher education, it is generally assumed that ICTs are an integral part of an institution’s basic infrastructure.
4. In addition to instruction in basic computer skills or computing, ICT is used to teach other subjects as well as to enhance or expand student learning opportunities, in some but not all countries.

Table 5 summarises the characteristics of the ICT policies of the four selected Asian nations from which the case studies were drawn.

| Country | Education policies related to ICT | Main actors | Policy objectives | OER policy Y (Yes) N (No) |
|----------|--|---|--|---------------------------------|
| India | <ul style="list-style-type: none"> National Policy on Education National Policy on ICT in School Education | <ul style="list-style-type: none"> Ministry of Human Resource Development Ministry of Communications and Information Technology | <ul style="list-style-type: none"> Exposure to computers and training to be part of professional education Employing educational technology to spread information and train and re-train teachers ICT literacy and competency enhancement ICT-enabled teaching-learning process Capacity building of teachers ICT infrastructure in schools ICT for open and distance learning | Y |
| Malaysia | Education Blueprint 2013-2025 | <ul style="list-style-type: none"> Ministry of Education (MOE) Multimedia Development Corporation (MDeC) | <ul style="list-style-type: none"> Provide Internet access and virtual learning environment Augment online content Maximise use of ICT for distance and self-paced learning | N |
| Pakistan | <ul style="list-style-type: none"> National Information and Communications Technology Strategy for Education (NICTE) [2005] National IT Policy [2005 revised 2008] | <ul style="list-style-type: none"> Ministry of Education Ministry of Information Technology Ministry of Science and Technology | <ul style="list-style-type: none"> Use ICT to extend the reach of education Use ICT to improve quality of teachers Use ICT to enhance student learning Integrate ICT into the curriculum Develop capacity at federal and state level education departments Provide low cost computers and connectivity to educational institutes Network all higher education institutes Enhance Open and Distance Learning Establish a national education intranet | N |

| | | | | |
|----------|---|--|--|---|
| Thailand | <ul style="list-style-type: none"> • Eleventh National Economic and Social Development Plan 2012 – 2016 (NESDP) • MICT Second National ICT Master Plan 2009 – 2013 (NICTMP) • MOE Master plan on ICTs in Education 2010 – 2011 (MICTE) | <ul style="list-style-type: none"> • Ministry of ICT (MICT) • Office of the Basic Education Commission (OBEC) • Office of the Education Council (OEC) | <ul style="list-style-type: none"> • Bridging unequal access to technology • Being creator of technology | N |
|----------|---|--|--|---|

Table 5 Aspects of ICT policies in a select group of Asian nations where the six case studies were conducted

Having a vision to use ICTs for purposes of education and training and being able to use and benefit from the technologies are somewhat different. While the former is driven by passion, enthusiasm and aspiration, the latter is dependent on policies related to infrastructure, policy, economics and know-how as well as the free flow of information, and limitations on access to search engines such as Google or Yahoo. Almost all countries in Asia seem to have some kind of restriction on the easy and free flow of information. In extreme cases, such restrictions limit the extent to which global curriculum and content can be explored to enrich local content. Governments have powers through a variety of instruments to retard innovation or by also limiting financial support to adopt innovations.

| | |
|--|---|
| The Creative Commons licenses attempt to achieve a balance between the “all rights reserved” regimes of IPR regulations and conventions. The CC tool gives everyone standardised ways of granting permission to their creative works without losing their rights of ownership. Licensees must credit licensor and keep copyright notices intact on all copies of the work. | |
|  CC BY | Attribution. The license allows others to reuse, remix, revise, redistribute [4R] even commercially. Most liberal and generous of licenses. |
|  CC BY-ND | Attribution-Non-Commer. Allows redistribution, for both commercial and non-commercial, but original content must remain unchanged. |
|  CC BY-NC-SA | Attribution-NonCommercial-ShareAlike. Allows the 4R; revision must credit originator of content and relicense under identical terms. |
|  CC BY-SA | Attribution-ShareAlike. Permits 4R, revised works must credit originator of content and relicense under identical terms. |
|  CC BY-NC | Attribution-NonCommercial. Permits 4R. Derived works must acknowledge originator and redistribution for non-commercial purpose only. |
|  CC BY-NC-ND | Attribution-NonCommercial-NoDerivs. Most restrictive license. Only permits download of works, without change and share it with others and originator acknowledged. |

Source: <https://creativecommons.org/licenses/>

On the other hand, governments are in a position to encourage rapid innovation through instruments such as adopting more liberal approaches to curriculum design and transformations, less regimentation in the interpretation of syllabi and more freedom for teachers to explore teaching resources outside prescribed content. Governments could also adjust IPR policies to accommodate licenses such as the Creative Commons family of licences to encourage the free movement of educational content through the adoption of OER practices. At the last count, some eleven countries in Asia had established national CC affiliates, with or without the blessings of their governments. **Table 6** is the recently published data on the types and versions of Creative Commons licensing tools available through local affiliates of the CC network.

| | | | | | | |
|-----------|-----------------|--------------------|-----------------------|-----------------------|--------------------|--------------------|
| India | CC-BY 2.5 India | CC-BY-NC-2.5 India | CC-BY-NC-ND2.5 India | CC-BY-NC-SA 2.5 India | CC-ND 2.5 India | CC-SA 2.5 India |
| Malaysia | CC BY 2.5 Mal. | CC BY-NC 2.5 Mal. | CC BY-NC-ND 2.5 Mal. | CC BY-NC-SA 2.5 Mal. | CC BY-ND 2.5 Mal. | CC BY-SA 2.5 Mal. |
| Thailand | CC BY 3.0 Thai. | CC BY-NC 3.0 Thai. | CC BY-NC-ND 3.0 Thai. | CC BY-NC-SA 3.0 Thai. | CC BY-ND 3.0 Thai. | CC BY-SA 3.0 Thai. |
| Pakistan | - | - | - | - | - | - |
| Hong Kong | CC BY 3.0 HK | CC-BY-NC 3.0 HK | CC BY NC ND 3.0 HK | CC BY NC SA 3.0 HK | CC BY ND 3.0 HK | CC SA 3.0 HK |

Table 6 CC Licensing Tools available through local affiliates in five Asian countries/regions⁴

Besides policy support at the government level, such support or lack of support at the institutional level also places limitations on the extent to which OER can play an effective role. Familiarity with the purpose and benefits of OER as well as comprehensive knowledge of copyright matters play a role in encouraging academic staff to engage in OER-related activities. Surveys undertaken amongst Asian HEIs including those in the six case studies, indicate that while there is sufficient familiarity at the surface level of copyright legislation and Creative Commons tools, in-depth knowledge of both was less so (Dhanarajan and Abeywardena 2012). Institutional policies to incentivize, through recognition and rewards, the production and use of OER, are also somewhat thin in most Asian institutions, including those institutions, which are part of this study. Other than WOU, all others (OUHK, VUP, and TCU) do not have clear policies of their own on OER.

⁴ Creative Commons CC Affiliate Network. Available at: http://wiki.creativecommons.org/CC_Affiliate_Network

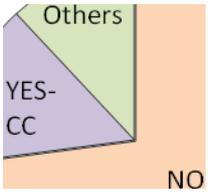
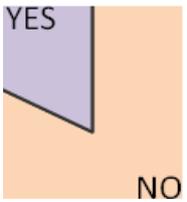
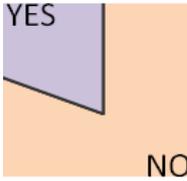
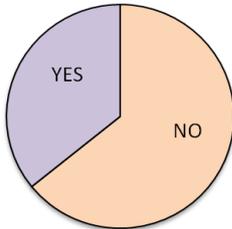
| Policy on | Response |
|---|--|
| <p>Copyright (Individual):</p> <ul style="list-style-type: none"> No policies – 73% CC licence – 15% Other types of licence 12% <p>N = 253</p> |  <p>A pie chart with three segments: a large orange segment labeled 'NO' (73%), a smaller purple segment labeled 'YES-CC' (15%), and a small green segment labeled 'Others' (12%).</p> |
| <p>Collaboration on OER projects (Individual):</p> <ul style="list-style-type: none"> No – 82% Yes – 18% <p>N = 389</p> |  <p>A pie chart with two segments: a large orange segment labeled 'NO' (82%) and a smaller purple segment labeled 'YES' (18%).</p> |
| <p>Sharing and importing Open Educational Resources (Institutional):</p> <ul style="list-style-type: none"> No – 82% Yes – 18% <p>N = 71</p> |  <p>A pie chart with two segments: a large orange segment labeled 'NO' (82%) and a smaller purple segment labeled 'YES' (18%).</p> |
| <p>Staff training to support OER activities (Institutional):</p> <ul style="list-style-type: none"> No (58%) Yes (42%) <p>N = 69</p> |  <p>A pie chart with two segments: a large orange segment labeled 'NO' (58%) and a smaller purple segment labeled 'YES' (42%).</p> |
| <p>Incentivising staff to engage in OER activities (Institutional):</p> <ul style="list-style-type: none"> No (65%) Yes (35%) <p>N = 69</p> |  <p>A pie chart with two segments: a large orange segment labeled 'NO' (65%) and a smaller purple segment labeled 'YES' (35%).</p> |

Figure 2 OER policy provisions at the institutional level at South and S. E Asian institutions (After Dhanarajan and Ishan 2012)

Open Educational Resources Potential and Practice

Notwithstanding the debates and dialogues around OER, especially in North America and Western Europe, the interest in OER in Asia began more as a result of the enthusiasm generated by the MIT Open Courseware (OCW) than well thought out and designed policies by either governments or their institutions. This is changing albeit cautiously. A number of countries, notably South Korea, India, and Indonesia, have OER policies or in the making. Even without explicit policies at the national level, higher education institutions across Asia are also creating their own policies to adopt OER in practice. This is especially the case in Malaysia, Philippines, Hong Kong, Japan, China, Sri Lanka, Mongolia and Vietnam (Dhanarajan and Potter 2012). Among the six case studies in this report, two, both from India, work within national and institutional policies, another (WOU) works within an explicit institutional policy, two (VUP and TCU) operate within a broader open access arrangement and the last one (Hong Kong) is creating open textbooks which carry a Creative Commons license but without any explicit national or institutional policies.

In all six cases, besides academic curiosity about OER as a disruptive entry into the world of education, there are many practical reasons why OER has begun to interest these institutions. Almost all of them anticipate their engagement to bring significant (and positive) changes in the ways they function and perform as teaching and learning communities. The next two sections of the report explores whether the much spoken potential benefits actualise in the sample of institutions in the report. The exploration will also include an examination of the nature of practices around the adoption of OER.

OER Potential

1. **Potential of OER in increasing accessibility to post-secondary education:** Daniel, Kanwar and Uvalic-Trumbic (Daniel, Kanwar, et al. 2006) expressed a hope that OER may be a way of addressing the demand for increased access to post-secondary education. In expressing this hope, they were not alone; others who also thought that OER had the potential to support the demand included Mulder (2012) and Dhanarajan (2010). However, many others were not so certain that this is being realised in the southern countries including those in Asia and Africa. (Hattaka 2009; West & Victor 2011; Wright & Reju 2012). This latter view seems to resonate with the four of the six case studies.

Except for the Virtual University of Pakistan which claims that through its open (OCW) access provision, over one million downloads of its courses were recorded during an eighteen month period between June 2013 and November 2014, none of the other three cases (WOU, TCU and NPTEL) reported similar engagement. These downloads of the VUP courses were both from within and outside of Pakistan and mostly from those who were not formally enrolled for study in the University. There is no direct evidence of increased access to formal study in all of the other cases. Anecdotes seem to indicate that there may be indirect benefits from the free access of content, available on the web, to anyone wishing to read the courses for personal enrichment. It is not surprising to witness the absence of increased access. At best, OER are no more than educational resources similar to textbooks. Exceptions to these is when an entire course is presented in its totality as an *Open Courseware* (OCW) such as those that were launched by the MIT in late 2001 or VUP in Pakistan. Even the OCWs do not actually increase accessibility to the formal post-secondary education directly.

They simply provide access for informal learning and at the same time, also permit other institutions from adopting the courseware and reusing them, in their entirety, for their own purpose. Of the millions of OER, available today, no more than a fraction is OCW.

2. **Potential of OER in increasing the affordability of post-secondary education:** Both WOU (Malaysia) and TCU (Thailand) attests to this value of OER. The former, as a not-for profit, is constantly exploring ways in which it can reduce the cost of its educational opportunities in order to increase affordability. The development of course materials, including the provision of textbooks, is a high cost item at WOU. Reusing available and appropriate OER as a part of its self-instructional learning materials development is expected to bring about significant cost efficiencies over the longer term. The latter, TCU, is projecting a similar potential in a limited way as currently, there is no requirement at the policy levels to use OER as a cost reduction strategy. The open textbook project in Hong Kong has the potential to bring savings directly to the textbook consumer. The Hong Kong study is worth monitoring over the next few years as lessons learnt may help many developing economies, as the cost of developing curriculum materials such as textbooks and multimedia self-instructional materials will continue to place a heavy burden on the public purse as well as the consumer. Open textbooks in particular are being seen as one way to reduce the personal cost of higher education in the western markets (Wiley, Green and Soares 2012).
3. **Potential of OER in improving the quality of post-secondary education:** The WOU case study is clear that the use of third party OER contents made a lot of qualitative difference to their courses. The university was able to use the freedom of OER to enrich its course content with a variety of learning materials from other sources. The university especially benefitted from accessing a variety of high quality broadcast standard audio, video materials as well as podcasts and games. The production of such a rich media mix, by themselves, is beyond the university's financial ability to produce. The WOU experience is not replicated in the other cases. VUP produced all of its materials without any inclusion of outside content. Unfortunately the universities that used the NPTEL materials used them as supplements. They did not try to manipulate or enrich them. Quality was determined by those who created the NPTEL materials. Not manipulating original materials and reusing them "as is" does lose out on an opportunity for continuous improvement of the originals.

In any case, the measurement of quality, especially when one is dealing with OER, is problematic as in the final analysis, any OER chosen to serve a particular curriculum must fit the purpose for which it was identified in the first place. Confounding this situation are also contentions around the whole issue of quality in open education. In a report entitled 'Access and Equity in Higher Education in Asia', the Asian Development Bank (2012) made the following comment on quality as it relates to open (higher) education: "The measurement of quality as it is currently applied to higher education generally and distance education particularly is contentious. There are those who argue that we are still not very explicit in establishing unambiguous parameters for the measurement of quality in higher education, when it comes to learning experience or learning outcomes. Some of the uncertainties relate to criteria and standards applied to measurements, the purpose of these measurements, and sometimes even the legitimacy of these measurements (Kis 2005). To help in this decision making, a number of tools are becoming available, as we shall see later.

- 4. Potential of OER in enhancing the relevance of post-secondary education by contextualising content:** Several commentators have expressed scepticism about this claim without denying its worthiness even though this potential is in fact touted as among the most value-add that OER can bring about to enhancing the “currentness” of curriculum by making available the best of global content to less developed educational systems. One key aspect of OER is that it can more easily be adapted to local needs so that materials can be made available in the language of choice using examples meaningful to local students. Contextualising content requires good pedagogical skills on the part of those who are doing the adaptation. These skills are clearly not present among most of the young faculties at GEHU which used the NPTEL materials as supplements. However, interestingly, teachers in Karnataka, India seemed to have taken advantage of the copyright-free content to contextualise the content and share it among their peers through email exchanges. Experienced pedagogues at WOU and TCU used clever instructional techniques to adapt and integrate many types of OER into their own courses. One of the biggest challenges institutions will continue to confront in accessing and adapting OER into the local curriculum is the old question of the “not invented here syndrome” which continues to plague the academic world (Stacey 2010); other inhibitors’ suggestions from Richter and McPherson (2012) as well as Lane (2008) that “OER will be of value for learners only if they fit the learners’ own context and are thus genuinely reusable or at least fully adaptable”.

OER in Practice

There are three traits of OER that differentiate them from commercial products which are:

1. Free access to view content i.e., cannot be downloaded, copied or redistributed
2. Free to download, copy, share, use and reuse the content in intact form (e.g., licensed under CC-BY-ND)
3. Free to revise, remix, reuse and redistribute (e.g., licensed under CC BY)

Not all OER have all of these legal freedoms. Because the assumption is frequently made that an OER can do whatever a similar proprietary product can do, other things being equal, users and re-users of OER may have to figure out whether an OER adds value beyond the effects of similar commercial products. On the other hand, numerous commentators have also been expressing the view that OER should not be seen as a mere addition to economic value for publishing, through the use of non-proprietary content; it should be viewed as a true game changer in the way education can work effectively and efficiently (Oblinger 2012). Susan D’Antoni (2007), who championed the cause of OER within UNESCO circles, implied during a round table discussion on the expectations as the four A's: *accessibility, appropriateness, accreditation, affordability*.

The case studies presented in this report consider how the concept of OER has been adopted, to suit the unique circumstances of six Asian institutions. These circumstances cut across a range of challenges like supporting the professional development of a community of Science and Maths teachers, preparing open textbooks for primary and secondary school students and teachers, creating and developing courses primarily using OER for undergraduate and postgraduate programmes, as well as reusing and remixing OER to enhance an undergraduate curriculum

and increasing access to quality content for faculty. These cases also seek to examine the other value-adds such as adoption strategies and implementation tactics under different social, economic and regulatory environments. The case studies attempted to seek evidence of the impact of OER on four specific issues which collectively influence the behaviour of educational systems. These are:

1. Curriculum and programme design.
2. OER procurement and development.
3. Teaching and learning practices.
4. National and institutional education policy issues including the IPR regulatory environment.

1. *OER in Curriculum and Programme Design and Development*

- a. *Types of Courses and Programmes*: It would not be misleading to state that OER has a use for and has been used in almost all academic fields as well as a wide range of training programmes (OER Africa⁵, Liu and Yeh 2012, Commonwealth of Learning⁶). While no survey focusing on popularity of programmes was undertaken as part of this study, there is sufficient evidence in the literature as well as in practice to attest to the usefulness of OER across many academic fields. The VUP which for instance, tracks visitors to its Open Courseware sites claims that the highest hits are those in Computer Science, with almost half a million downloads, and Mathematics with about half that number. Similarly, in the community development programmes using OER conducted by the KOER, the Science and Technology resources are those that are sought after. Courses in Technology and Economics have very high enrolment numbers at the WOU. NPTEL programmes until recently were mostly focused on Science, Engineering and Mathematics. More recently, the producers of the NPTEL programme are also developing courses in the Management Sciences. The NPTEL suite of courses available has passed the 1200 mark. VUP has almost similar numbers as OCW and WOU eventually will have in excess of 100 or so courses in the Arts, Education, Business and Technologies. Evidence from other regions such as the UK⁷ and North America⁸ also attest to the fact that almost all programmes gain from using OER as part of their curriculum.
- b. *Selecting OER*: By and large, individual teachers and faculty are the main decision makers in curriculum and programme design. At the tertiary level, this is common practice, at the pre-tertiary level, it is less so. Within the overall framework of an institution's programme structures and standards, faculties and subject specialist panels exercise choice in the selection and adoption of content such as textbooks and other teaching resources. In those jurisdictions (most countries in developing Asia) where ministries have sole monopoly in the design of curriculum and its transformation into

⁵ <http://www.oerafrica.org/find-oer/health-oer-repositories>

⁶ <http://www.col.org/progServ/programmes/livelihoods/skillsDev/Pages/tvetpacific.aspx>

⁷ <https://www.futurelearn.com/courses/categories>

⁸ <http://www.oercommons.org>

learning resources at pre-tertiary levels, school teachers may not have many options to intervene in the content. The prescribed textbook becomes the sole and only source of curriculum. Additional exploration of other sources of information and knowledge is further inhibited by the paucity of ICT infrastructure. In Hong Kong, where the ICT infrastructure as well as the community's e-readiness is among the highest in the world, this is not the case. The government provides a list of recommended textbooks from which teachers adopt those which are most appropriate for their subjects and enhance them with other resource materials. Their choices are extensive. The only condition is that the chosen textbooks have to be in strict compliance to prescribed curriculum and instructional standards. Furthermore, Hong Kong teachers and students have almost free, fast and unrestricted access to the WWW on top of a highly sophisticated portal called the Hong Kong Education City⁹. It is in environments such as Hong Kong that open textbooks offer almost unlimited latitude to enrich content in textbooks with other OER resources found in the Web. The case study presented by the Open University of Hong Kong (OUHK) of their attempt to develop a set of open textbooks for learning the English language for levels from primary 1 to secondary 6 illustrates the potential value of such options. In some instances, the use of OER was extensive (WOU) and in others, less so (TCU) and yet in others, none at all. VUP for instance is a producer of learning materials but it does not use OER content from other sources to create its own courses while at the same time, permitting others to reuse their courses through its generous "open access" practice. In three of the case studies (Thailand, Malaysia and India), teachers who were already familiar with OER incorporated them into their curriculum.

The inclusion of OER in the makeup of a curriculum is highly dependent on the level of awareness of OER by stakeholders. In the case of WOU, awareness of OER is relatively high, mainly because of that institution's policy to promote OER. Similarly, teachers of Science and Mathematics in Karnataka are becoming increasingly aware of OER through a well-designed OER induction activity conducted by the state. The result, as the case study shows, is that teachers are constantly exploring the Web for additional content to enhance their own knowledge, share these findings with peers, and through mutual exchanges of views and opinions, build their knowledge base. All of these are accomplished despite a very modest ICT infrastructure, in the rural parts of the state. Conversely, in Hong Kong, a survey done as part of this study showed that more than 75% of the teachers in the sample group were unaware of or used any form of OER. This did not mean that teachers were not accessing digital resources from the WWW, they did so; breaching Hong Kong's copyright laws unintentionally. The use of copyrighted materials without permission to support curriculum is fairly common and global.

- c. *Frequency of OER Use in Courses:* The frequency of use of OER is dictated very much by the needs of the subject taught and the extent to which instructors see a need for their integration into a programme curriculum. The WOU in its *ICT in Education* course relies extensively on the use of freely available open content, especially since the course requires video and audio materials for enrichment — in all, some sixty to seventy individual bits of OER were integrated into the five-credit course. On the other hand, in producing their open textbooks on English, the OUHK designed and developed almost all of the content by itself to suit the needs of their English language syllabus. It is for the

⁹ www.hkedcity.net

users (both teachers and learners) to add on to the published content other resources to suit their needs. Such remixing is legally permitted in their open textbooks. The TCU sourced between 10 and 30 percent of content from OER sites for five out of the twelve courses offered through its E-Learning Professional Development Programme. The University used open content materials (i.e., content that does not carry an OER label but permits free reuse with attributions) in ten out of twelve courses in the same programme.

- d. *Integrating OER into Learning Materials and Classrooms*: This requires skills and efforts in capacity building of all those engaged in the task including content experts, instructional designers, educational technologists, librarians and publishers. While efforts to build skills to access, source and reuse digital resources were reported in all of the six cases, only in three of them, namely WOU, OUHK and KOER, were these systematic and formally organised, either by the institutions themselves (WOU and OUHK) or by Departments of Education (KOER). In the other three, the nature of training has been somewhat ad hoc. Integrating OER requires not only the input of content specialists but also that of instructional and Web designers, assessment and evaluation specialists, as well as colleagues with high-level IT skills. WOU and OUHK have these skills mainly because as open universities, they place heavy emphasis on getting their instructional design to fairly high levels of sophistication. The others do not have such in-house skills and the instructional quality is somewhat weak. The Commonwealth of Learning lists nine categories of skills that are required to successfully adopt OER in an educational system (Butcher 2014). Four of them are necessary for anyone wishing to integrate OER into their courses. These are legal knowledge on intellectual property rights, pedagogical and instructional design, technical skills relating to aspects of e-learning, knowledge of curation and sharing of OER, as well as good communication skills. This kind of “training” is rarely provided in staff development programmes other than in the aforementioned three institutions. These skills, especially knowledge of IPR and curation, become very helpful when attempts are made to mix and match OER and the proprietary content. In the present study, WOU has used to a modest extent both OER and proprietary materials rather successfully. Course developers had the assistance of the University’s publishing division during the development process which enabled the university to negotiate the IPR minefields satisfactorily. Many universities, both conventional and innovative ones, lack such in-house facilities.
- e. *Remixing, Revising and Redistributing*: Remixing requires a serious consideration of a set of “legal, technical, linguistic and contextual issues” (Ameil 2013). Ameil (op. cit.) goes on to state that “...though OER opens the possibility of revision and remix, one should be aware of the many efforts and decisions associated with such practices. Issues of licensing led us to make complex choices in defining what to use and how to remix resources. Attribution can become a complex task as issues of authorship are on shifting ground. Issues of language and context make the straightforward reuse of resources difficult; we found revision to be the norm. Finally, we have found that technical issues, particularly concerning the use of open standards and editable sources, to be of the essence. Without attention to these technical concerns, the collaborative and participatory practices of remix can be cumbersome and problematic.” Remixing poses some difficult challenges especially when courses contain OER from a variety of sources. Most OER that are available from OER repositories have a CC licence but CC licences have many variations and choice has to be exercised as to the best resource that fits the users’ own licensing requirements. Of the six cases in this study, two (OUHK and VUP) created

courses that did not use resources from any other source; however, when their courses were used in other jurisdictions, no particular challenge was expected to be encountered as their content did not contain any third party resources. WOU on the other hand, used OER from a variety of sources but restructured the content of these materials by choosing content that met with its own licensing requirement (i.e., CC-BY-NC). WOU also incorporated a few proprietary materials into its courses. Where such materials had to be integrated into the locally created content, the university sought and paid the required copyright fees and ensured that the attribution of such resources indicated their proprietary nature. In the case of the three Indian universities (IITR, NITK, GEHU) that were using NPTEL's OER in their classrooms, liberties seemed to have been taken with the free use of proprietary materials (under the prevailing IPR regulations in India, universities have "free to use" privileges that allow them to do so within limits).

2. Procurement and/or Development of OER

a. Procuring OER

Nearly every week, if not every day, more open educational resources become available for use. It is impossible to ignore them and equally, it is impossible to keep pace with the new resources being added. The challenge for those wishing to reuse OER is not its availability but the skills and knowledge to identify and search for the resources that best fit a curriculum. Search engines like Google Scholar, Yahoo and others that are similar add modest value to the search. Ishan, Dhanarajan, et al. (2012) drew attention to a number of similar commentaries on the subject of procurement difficulties, including:

- i. Current inability to *effectively search and locate relevant and usable OER* from a diversity of sources (Yergler 2010)
- ii. Difficulty of *finding quality OER matching a specific context as it takes an amount of time comparable with creating one's own materials* (Dichev & Dicheva 2012)
- iii. "*Searching this way* (through popular search engines) might be a long and painful process as most of the results are not usable for educational purposes" (Pirkkalainen & Pawlowski 2010)
- iv. No single search engine is *able to locate resources from all the OER repositories* (West & Victor 2011)
- v. There is still *no generic methodology available* to enable search mechanisms to autonomously gauge the desirability of an OER, which is a function of (i) the level of openness; (ii) the level of access; and (iii) the relevance of an OER for one's needs (Ishan, Raviraja & Tham 2012).

However, innovations in search engine technologies are ongoing and as AI technologies get even more “smarter”, improved engines with much better capabilities should become available. One such exploration is the OERSCOUT, which is based on text mining solutions that will parametrically measure the usefulness of an OER for a specific academic purpose based on *openness, accessibility and relevance attributes* (Ishan, Chan & Tham 2013). Until such a time when much more intelligent search engines become available, OER re-users will have to depend on the common and popular engines and the aggregated sites/repositories that use them. An account in a 2013 EdTechPost¹⁰ listed some 163 of such search engines that mostly leaned towards North America and Western Europe¹¹. This is not surprising as most of the OER with appropriate licensing are mostly available in North America. With increasing activity relating to OER both in the developed and developing economies, a number of local search engines are beginning to emerge (Yamada 2014). Among the six case studies, WOU is the only case where third-party owned educational resources licensed for free use were reused. Authors of WOU’s courses spend considerable amounts of time searching for OER that best meet their needs. Anecdotal evidence suggests that at least 25 – 30% of course creation and development time was spent in such searches.

b. *Development of OER*

Universities, colleges and individuals rarely develop curriculum material specifically as OER. Many develop courses primarily for their use and subsequently make them available as OER. Exceptions to these are those developed by institutions like the Khan Academy¹², CK-12 Foundation¹³, Saylor Foundation¹⁴ and Openstax¹⁵, which are dedicated to the business of creating OER for the common good; almost all of these producers make their courseware available globally under one or another type of “commons” licence. In Asia, the Open Textbook project of the OUHK is one of the first attempts at producing open textbooks, from scratch, not specifically for the use of the University itself but for the use of school children, teachers and members of the public. Recently the Government of India, made all of the learning resources created by the nation’s National Centre for Educational Research and Training as OER under the Creative Commons license¹⁶.

Developing or adapting OER for reuse is both a complex and technically challenging task. Hodgkinson-Williams (2014) described the process of either producing a new OER or adapting an existing OER as the “10C Open Education Cycle” (**Figure 3**). The proposed cycle is rigorous and begins with Curriculum Planning (*Conceptualising*) to define what exactly needs to be done in terms of content, instructional design, activities, assessment and examination. Included at this stage is the assembly of a list of potential appropriate content from other sources. This stage is followed by:

¹⁰ <http://edtechpost.wikispaces.com/OER+Dynamic+Search+Engine>

¹¹ <http://edtechpost.wikispaces.com/OER+Dynamic+Search+Engine>

¹² Khan Academy – www.khanacademy.org

¹³ CK12 Foundation – www.ck12.org

¹⁴ <https://www.futurelearn.com/courses/categories>

¹⁵ <http://openstaxcollege.org/>

¹⁶ <http://www.nroer.gov.in>

- i. *Creation*: The design and development of content/material specifically as OER to be shared openly and freely.
- ii. *Curation*: In this phase, the material is hosted on a publicly accessible platform and will include sufficient information on the content as well as information on the type of licence with which it is being distributed.
- iii. *Copy*: Content that is created is made ready for distribution.
- iv. *Circulation*: Refers to the distribution of material.
- v. *Locate*: In reusing OER from other sources, this phase covers the search process.
- vi. *Customisation*: This phase is about revising, adapting, translating, modifying and editing the materials being reused.
- vii. *Combination*: This is the remixing stage where the content from multiple sources are remixed with indigenous content.
- viii. *Certification*: This refers to the post delivery of the content/course and will include tuition, assessment and examination leading to the award of a certification.
- ix. *Critique*: In some academic environments, the entire process and the product are subjected to an evaluation.

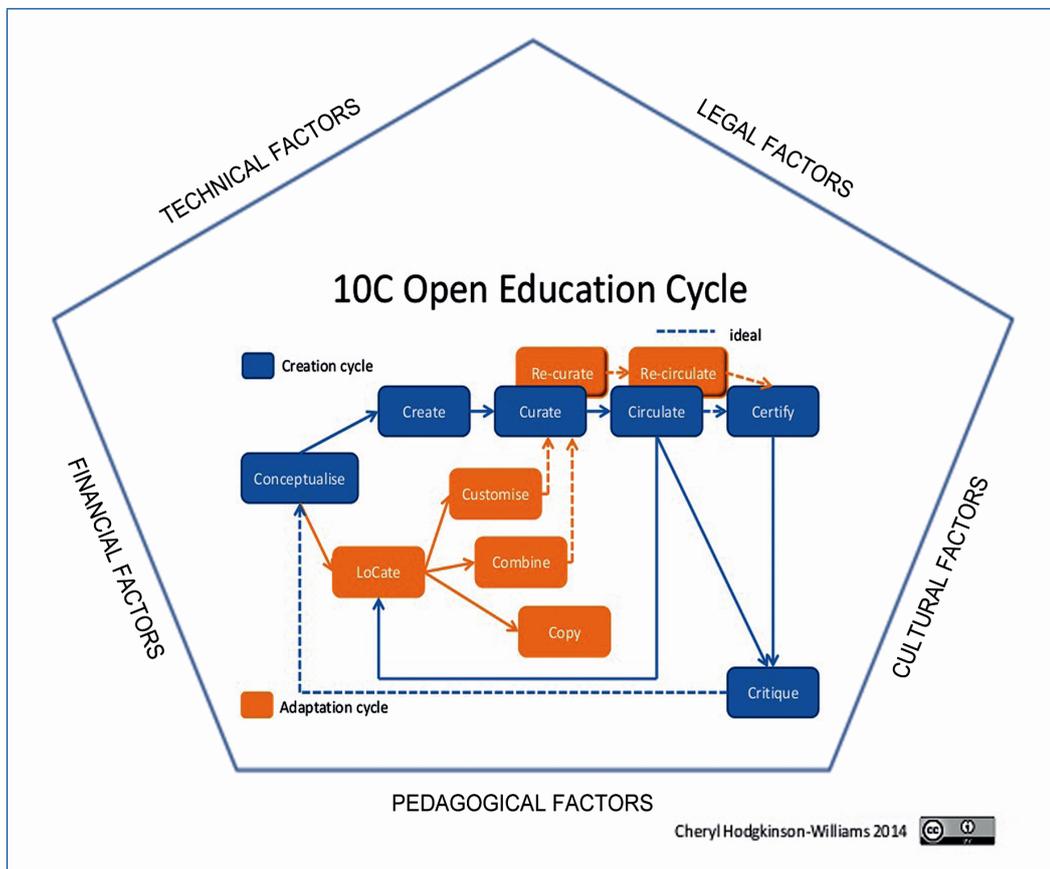


Figure 3 The 10C Open Education Cycle proposed by Cheryl Hodgkinson-Williams (2014)

Course procurement and development varies from institution to institution. Amongst the six case studies, all but one (KOER) either procured and/or developed the content. Two of them (OUHK and WOU) had clear protocols for both activities which resonated well with the 10C, two (VUP and TCU) had course development systems that did not resemble the 10C and in the case of the three universities that were using NPTEL materials to supplement their courses, there was an absence of discernible protocols. Where there are clear protocols, quality is rigorously managed at every stage and this is clearly the case at both WOU and OUHK. In cases where course development protocols are generally ad hoc and where no rigorous protocols are applied, the ideal 10C cycle is more intuitively rather than rigorously applied (**Table 7**).

| | OUHK | WOU | TCU | KOER | NPTEL | VUP |
|---------------|------|-----|-----|------|-------|-----|
| Conceptualise | + | + | + | - | - | + |
| Create | + | + | + | - | - | + |
| Curate | + | + | + | - | - | + |
| Circulate | + | + | + | - | - | + |
| Locate | - | + | - | - | + | - |
| Copy | - | + | - | - | + | - |
| Customise | - | + | - | - | + | - |
| Combine | - | + | + | - | + | - |
| Certify | - | + | + | - | + | - |
| Critique | + | + | - | - | - | - |

Table 7 State of adoption of the Open Education Cycle by six institutions in Asia

In an ideal situation, it is expected that the creation as well as reuse of OER will follow the 10C cycle in all institutions subscribing or planning to adopt OER. But such adherence is a time consuming, labour intensive and an expensive process. It is a fair argument to make that if it is both labour intensive and expensive to adopt, then OER may not be an attractive proposition; notwithstanding the additional value an enriched curriculum can bring.

c. *Management of OER Quality*

Managing quality is desirable but may prove to be difficult under circumstances where there is a lack of institutional infrastructure to manage quality. The Commonwealth Educational Media Centre for Asia (CEMCA) published and proposed a detailed guideline on assuring quality in the OER domain (Kawachi 2013). It is a comprehensive document in its treatment of quality in developing, accessing, reusing, revising, remixing and

redistributing OER. Called the “TIPS FRAMEWORK”, it contains a daunting list of sixty five individual items. The TIPS FRAMEWORK is yet to gain traction among institutions in Asia; at best it will be used as a reference point by those institutions already observing sound QA practices. Universities like WOU and OUHK, as open universities, have well-tested internal quality assurance arrangements and follow established and well-tested global good practices. Internal validation requires detailed assessment of programme and course content (which would include the quality of any OER that incorporated OER) while external validation examines processes more thoroughly. Such external validations rarely look at course contents in detail.¹⁷

These practices are further strengthened by regular external quality assurance audits mandated by the respective Ministries of Education through their national quality assurance agencies. These two institutions more or less have quality assurance measures that fit closely to the TIPS proposition. In the case of KOER, the user community manages the quality of resources captured in their repository by themselves. It is a self-regulating community. There is no external assessment per se as teachers identify and select only those resources that they deem fit for their purpose. In the case of the VUP and the three Indian universities, quality assurance is uncertain. VUP, for instance, applies its institutional quality regimes in the production of its courseware which by and large constitutes periodic evaluation of the system by internal quality auditors. The three Indian universities using NPTEL materials are totally dependent on the IITs that produce the courses to ensure the quality of the content they use. These universities do not have any provisions to validate the quality of reuse of the NPTEL content in their classrooms though NPTEL exercise internal quality assurance mechanisms before releasing its courses. TCU does not have any QA infrastructure as part of its establishment. It is totally dependent on those that provide it with materials for such quality assurance (**Table 8**).

| Institution | Internal quality assurance | External quality assurance | Community-based quality assurance | Informal quality assurance |
|-------------|----------------------------|----------------------------|-----------------------------------|----------------------------|
| ≠KOER | - | - | - | + |
| OUHK | + | + | - | - |
| NPTEL | + | - | + | + |
| TCU | + | - | - | - |
| VUP | + | - | - | - |
| WOU | + | + | - | - |

Table 8 Quality assurance mechanisms ≠KOER is neither a developer nor user of courses

¹⁷ See case study five by M. Kaushik for a detailed elaboration of the various steps and processes in QA.

d. *Funding OER Activities*

Many of the OER projects that have been ongoing globally for the past decade have been funded through external sources rather than internal institutional funds, with a few exceptions like the NPTEL projects in India. The William and Flora Foundation had invested millions of dollars in university-based OER. At the pre-tertiary level, the Bill and Melinda Gates Foundation, the CK12 Foundation and the Saylor Foundation, among others, have been active. Most of the abovementioned support has been largely focused in the developed economies of the world, with some investment going into Sub-Saharan Africa. To many of these “projects” receiving support from philanthropies, the question of sustainability has become paramount. This concern has been and continues to be at the heart of an active dialogue in the OER community. Because OER is considered to be a free common good, those who propose models of sustainability look at contributions of cash and kind to sustain the movement (Downes 2006; Dholakia, King, et al. 2006; Koohang and Harman 2007; OECD 2007; Lane 2008; Stacey 2012). By and large, all these models have focused on revenue and seemed to have ignored the demands of a complex business model which requires a balance between revenue, expenditure and a return on investment for long-term sustainability, regardless of charity.

Unlike most North American projects at the university level, institutions in Asia have largely supported their OER activities from their own funds. At the pre-tertiary level, governments have made the necessary investments. A good example of the latter is the Government of India’s initiative in the creation of the National Repository of Open Educational Resources (NROER)¹⁸, which acts as a host for teaching and learning resources used around the country. The NROER does not provide funds directly for the production of OER but does so indirectly through the nation’s education grants to the many institutes, colleges and universities. The NPTEL programme is another such initiative by the Government of India, where an enormous amount of money is being provided to the nation’s excellent Engineering and Technology schools to produce excellent OER in the Sciences, Engineering, Technology and Maths for use in the thousands of small rural colleges that are not populated by academic talent such as that found in the IITs. The NPTEL courses are available globally and free for use. Institutions like WOU, OUHK and TCU drive their OER engagement through revenue models based partly on philanthropies and mostly on tuition fees. VUP in Pakistan derives its funding from government grants for all of its programme development.

e. *Costing the Development and (Re) Use of OER*

The use of OER is one of the many strategies being suggested to bring down operational costs of higher education (d’Antoni 2009; Lane 2008). Wiley, Hilton, Ellington and Hall (2012) suggest that adopting open textbooks can reduce costs by over 50%. None of the cases reported in this study had any cost benefit analysis done. The very nature of OER, with its philosophy of easy, free and open access from multiple sources across the world, makes it problematic to work out a comprehensive account of the cost of production as

¹⁸ <http://nroer.gov.in>

well as its reuse. Furthermore, the cost of producing or adapting/using OER is highly dependent on the media-mix of the content being developed as well as the levels of instructional sophistication required. Simple and straightforward textual content, for example, is a lot less expensive than interactive multimedia content. The OUHK in the development of its open textbooks uses a whole range of media mix (text, audio, video and interactive multimedia) but spent the equivalent of about USD2 million to develop, from scratch, 18 open textbooks, including a custom-designed platform for users (especially teachers) to contextualise content to suit the needs of their local classrooms. This is significantly higher than the cost of developing a series of video-based lectures for a computing undergraduate course at the VUP in Pakistan. The instructionally well-designed content at WOU, with multimedia, is more expensive to produce because of its labour intensity than the straightforward reuse of the NPTEL materials at the three Indian universities or the TCU in Thailand. In any case, cost comparison across borders is meaningless as many factors (including labour cost) have an impact on it. **Table 9** illustrates the usage of various media tools by the institutions in their courses and the estimated costs incurred by five of the six institutions; KOER is a non-teaching professional development organisation.

| | ‡KOER | OUHK | NPTEL | TCU | VUP | WOU |
|--|--------------------------------|--------------|-----------------|------------|--------------------|-----------------|
| Text | - | + | + | + | + | + |
| Audio | - | + | - | - | - | + |
| Video | - | + | + | - | + | + |
| Interactive media | - | + | - | - | - | + |
| WWW accessed content | + | + | + | - | - | + |
| Total development cost/ course of 3 to 5 credits (Range) | Voluntary contribution of time | \$51,700* | \$1200 – \$1700 | \$8,823 | \$8,550 – \$13,500 | \$3,055 – 6,111 |
| Sources of funding | Institution | Philanthropy | Government | Government | Government | Institution |

Table 9 Comparative cost of developing OER

‡ KOER is neither a developer nor user of courses; it acts more as an OER hub/exchange for the STEM community in Karnataka, India

* Includes the cost of constructing an open platform for users of the textbooks to openly and freely interact.

A survey of the global literature shows that there is a paucity of studies relating to this aspect of OER adoption. In a detailed briefing paper on the cost-benefit analysis of open learning, the UNESCO Institute for Information Technologies in Education (IITE) remarked that, *“Understanding and achieving the cost benefits made possible by open learning will be difficult despite more than two decades of experience worldwide, because of the complexity of making viable comparisons.”*(UNESCO-IITE 2011)¹⁹ The same paper also tabulated a list of cost categories (**Table 9**) that influence the cost of all forms of learning. The differentiator between conventional forms of education and open education, the IITE policy paper states, is not so much in the *fixed costs* (staff salaries, infrastructures, resources and tools that students use) but in the *variable costs* of per learner support provided by the teaching staff. The IITE states that *“the distinction is important for comparing open learning with conventional modes because open learning achieves improved cost-benefits partly by transferring activities from variable costs to fixed costs and achieving economies of scale through large numbers.”*²⁰ Because of the mass reachability of technologies, it may be argued that the economies of scale will apply in spite of a higher initial investment in technologies, and thus the per capita cost of education can be significantly reduced. This argument, while applying to the economics of open learning, may not be totally applicable to OER, a subset of open learning. The benefits of OER and the use of OER go beyond numbers. A well-structured curriculum enhanced by the reuse of OER not only enhances the quality of the curriculum but because it is a freely shareable resource, it has the potential to improve per capita cost by *“reducing production costs through reuse or sharing of existing materials”* (Morris 2008). Open educational resources play an intermediate role by providing the shareable resources provided *“it can engage the teaching community to the idea of sharing and building on others’ teaching”* (Lane 2010). At the end of the day, as Bartolic-Zlomislic and Bates (1999) commented in a Canadian study on online learning, *“The economics of online courses are complex, fascinating, and not transparent. Under the right conditions, online learning can be cost-effective and actually bring in net profits for an educational institution. This requires quite a different approach to the development and management of teaching. It requires financial systems and financial management that, frankly, a few higher education institutions have in place or are even ready to contemplate. For instance, it requires up-front investment, development of business plans, project management, financial and technical support to faculty, allocation of revenues to those units that take the risk and do the work, and professionalism and a team approach to course development and delivery.”* The same would apply to the adoption of OER, which also requires major adjustments to the approach taken by colleges and universities to the questions relating to teaching, learning, curriculum, learning and teaching resources, textbooks, and technological tools (**Table 10**).

¹⁹ UNESCO-IITE (2011): Cost Benefit Modelling for Open Learning. Accessed on 28-11-15 from <http://iite.unesco.org/pics/publications/en/files/3214686.pdf>

²⁰ *Ibid*

| Cost categories | Factors affecting | |
|--|---|--|
| | Fixed cost per course | Variable costs |
| Teaching activity | <ul style="list-style-type: none"> Teaching and specialist staff for design and development of resources and learning activities Reuse of existing resources and design activities Amount of formative evaluation and redesign Updating and maintenance Different grades of teaching staff for different teaching activities | <ul style="list-style-type: none"> Group size for teacher-guided activities Cohort size for supervision and marking Degree of teaching involvement in the types of teaching-learning and assessment activities used Different grades of teaching staff for different teaching activities |
| Teaching infrastructure | <ul style="list-style-type: none"> Sharing of institutional physical and technical infrastructure Staff development and support needs | <ul style="list-style-type: none"> Group size for classroom and lab-based activities Cohort size for network support Cohort size for equipment, materials, licenses and delivery of materials |
| Administration | <ul style="list-style-type: none"> Sharing of administrative infrastructure for market research, marketing, recruitment, enquiries, enrolment, registration, QA, validation and accreditation | <ul style="list-style-type: none"> Cohort size for administrative processing of enrolment, registration, student support and accreditation Costs of student dropout |
| Students' course fees and costs of equipment and materials | <ul style="list-style-type: none"> Course fees and costs of equipment and materials for students | <ul style="list-style-type: none"> Cost of online communication tools for students Opportunity cost of time spent on course-related activities other than studying |

Table 10 Cost categories and the factors affecting all forms of learning (After IITE)

OER in Teaching and Learning

1. Teaching Practice

There is some research on how exposure to OER materials and tools can support collaboration among teachers and encourage new conversations about teaching practices (Petrides, Jimes, et al. 2010). Through TESSA (Teacher Education in Sub-Saharan Africa), a professional in-service teacher development project,²¹ researchers noted some success in improved collaboration among teacher educators in Sub-Saharan Africa (Wolfendon, Omar et al., 2010). Others have claimed that the use of OER can improve pedagogical practice (Casserly & Smith 2009) through collaborative development of materials, as well as by encouraging a shift in focus “from materials production to mentorship and facilitation” (Ossiannilsson & Creelman 2012). An empirical study on the quality of OER learning

²¹ www.tessafrica.net

materials and their reuse highlighted the importance of trust in resources, organisations and technologies in how teachers perceive “quality” (Clements & Pawlowski 2012). Although this is further confounded by the debate of what quality is with reference to OER, recent studies and guidelines on the subject, including that of Kawachi (2013) and Schuwer (2012) among others, are beginning to help, by identifying several key requirements of resources produced, distributed, reused, remixed, revised and redistributed as OER. The guidelines suggest that careful consideration is given to simple elements like, appropriate licensing arrangements, correct metadata, usability with PCs, currentness and levels of content, careful instruction and appropriate language to difficult challenges like fitness for purpose, instructional design, assessment strategies and technology demands.

Though not directly reflecting enhanced teaching practice, two other studies show how the use of OER has an indirect positive influence on pedagogy. The first is an experimental study at the Monterrey Institute of Technology in Mexico that reported that sharing OER in a virtual academic network by using and reusing enabled them to appropriate technology much more effectively (Betancourt, Celaya, et al 2014). The second [Tasmania] believed that adopting OER provided “opportunities and experiences, which were free from barriers and bias, and took into account individual learning styles/preferences and individual needs related to disability, race, socioeconomic status, gender, language, ethnicity, geographical isolation, sexuality, work commitments and family responsibilities”²².

Evidence of change in pedagogical practice is somewhat difficult to discern from the six Asian case studies, though a few trends reported in other jurisdictions seem to resonate in some of the abovementioned studies. Some such examples include:

- a. Technology appropriation in the case of the Karnataka case (KOER) through searching, sharing and exchanging of experience by teachers participating in the programme to enhance their own teaching. Where IT infrastructures were supportive, teachers were eager to go beyond their textbooks to search for current knowledge and enhance the presentation of their lessons.
- b. Some teachers in the Hong Kong (OUHK) study considered that the fact that open textbooks permitted them to reuse and remix content was supportive of their own inquisitiveness to experiment with new ways to treat content. Open textbooks, they felt, are liberating.
- c. The media mix and freedom to search for and use resources from a wide range of sources, greater use of instructional design to remix content, and a much better understanding of copyright regimes and ethics of attribution showed improvement through using OER to create courses at WOU. Academics also felt that integrating third party OER into their own content made them reflect much more deeply of the content that they were presenting to the class.
- d. In the case of the three conventional universities that used and benefitted from the NPTEL resources in India, faculty experience was enhanced by the following three elements:

²² <http://www.teaching-learning.utas.edu.au/designing/open-educational-resources/open-educational-practices>

- i. The coupling of empirical cutting-edge research to curriculum.
- ii. Enhancement of the knowledge base of faculty.
- iii. Revision and refreshing of their institutional curriculum.

2. Learning Outcomes

Of the six cases in this study, only two presented observational qualitative data on learning outcomes. Of the two, WOU presented data based on a number of performance or outcome indicators. *“The indicators used to assess impact on learner performance were learner retention rates, learner performance on continuous assessment and the final examination as well as the overall course score.”*²³ *In addition, assessment of the achievement of course learning outcomes has also been presented to showcase learner performance prior to and after OER intervention. Both the Microeconomics and Programming Fundamentals with Java courses present an interesting pre-post comparison as both were initially (from 2007-8 to 2012) offered as non-OER, self-instructional ODL materials wrapped around prescribed textbooks. These were revised in 2012 to be presented as OER-based stand-alone course materials. In both cases, measurement of course learning outcomes shows improvement over the past scores. In terms of learner performance, course scores in both cases showed a progressive improvement. As the course **ICT in Education** has only been offered as an OER course, it does not therefore have comparative non-OER learner assessment figures to compare against. The assessment figures and achievement on learning outcomes for this course compare very well with the non-OER courses in the M. Ed programme (Madhulika 2015).*

In the case of the OUHK, the open textbook project is still a work in progress and a comprehensive assessment of the open textbooks versus commercial publications cannot be as yet made. However, early observations of those who have used the textbooks have not shown any negative impact and in five cases, teachers reported some improvement in student performance. Teachers working in schools for children requiring special needs reported a positive impact on the uptake of vocabulary skills (this may have more to do with the good instructional quality of the books, rather than their openness).

The measurement of learning outcomes is both complex and complicated and this is reflected in the tremendous paucity of literature on the subject. Further confounding the problem is the yet to emerge consensus on designing, implementing and sustaining a comprehensive student learning outcomes’ assessment effort within an OER context. Other barriers to carrying out meaningful measurements include:

²³ *Assessment of learner performance at the university is conducted through assignments and term end examinations at the end of each semester. The overall cumulative assignments score (OCAS) and the overall examinations score (OES) are combined in a weighted sum of 50:50 for undergraduate programmes and 40:60 for postgraduate programmes to arrive at the course score (CS) (M. Kaushik)*

- a. An absence of knowledge about assessment processes, tools and models. Faculty training, especially in universities, is not a common phenomenon and where it is done, such training rarely includes developing measurable and valid learning outcomes; aligning the curriculum with those outcomes; developing assessment questions, instruments and methods; and developing and implementing a plan for assessing those outcomes that is manageable, meaningful and sustainable.
- b. Learning objectives, in course outlines for instance, are supposed to state measurable outcomes. However, what is common is that these objectives are not necessarily student-learning outcomes and are not stated in measurable terms. Also, these objectives are typically stated broadly, without specificity in terms of particular skills or competencies that students should acquire.
- c. Generally, both faculties in universities and colleges as well as teachers in schools do not receive adequate training or induction in carrying out such measurements. Confounding the situation is a lack of literature and guidelines that help in linking pedagogical techniques to student performance.

While all of the above challenges apply generally in both the non-OER as well as the OER environments, what makes it even more difficult in the case of the latter is the freely available nature of OER from its multiple sources, allowing remixing of content, which makes it difficult to isolate specific learning objects and measure their impact on the learning outcomes as observed by Wiley (2007) who stated that: “...with educational materials developed in a diversity of content types like audio and video, educational materials do not become more effective simply because they have a Creative Commons or other open source licence applied to them. Research questions of the form ‘are open educational resources as effective as traditional resources?’ are meaningless. The application of a Creative Commons licence to a textbook does not make it more instructionally effective. Open licensing makes educational resources infinitely more available, but does not improve their effectiveness.”

Notwithstanding Wiley’s earlier comments, a later report by Caswell, Henson, et al. (2008) holds that OER can improve the quality of learning; however, empirical studies in emerging economies have yet to provide evidence of this promise. More recently, in a study on the learning efficacy of open textbooks, a survey of some 4827 students in nine community colleges across six areas of study, three of the studies utilising OER appear to be correlated with lower failure or withdrawal rates and three showed that there was little or no difference between those using OER and those who did not. None of the six studies showed that students who utilised OER fared any worse than those who did not (Pawlyshyn 2013). In a much more recent study, Robinson, Fischer et al. (2014) reported *using a quantitative quasi-experimental study, which showed that students who used open textbooks scored 0.65 points higher on the end-of-year state-standardised science tests than students using traditional textbooks when controlling for the effects of 10 students and teacher covariates. Further analysis revealed statistically significant positive gains for students using the open chemistry textbooks, with no significant difference in student scores for earth systems or physics courses.*

OER and Education Sector Policy

Almost all Asian countries have, on paper, very helpful policies and strategies to use a range of technologies to support the learning environment, including the five countries from which the present case studies were gathered (**Table 2**). However, except for India, explicit policies specifically supporting the adoption of OER as an integral part of practice remains uncertain, despite these countries being participants in the World Conference agreeing to the Paris Declaration on OER developed by UNESCO and COL (Commonwealth of Learning 2012).

In 2012, Dhanarajan and Ishan wrote: *“Policy support by governments is extremely important to accelerate the adoption of innovations in education. Governments have it in their powers through a variety of instruments to support innovation or retard it. Policies restricting the free flow of information, limitations on access to search engines such as Google or Yahoo, limiting financial support to adopt innovations, limiting the extent to which curriculum and content can be explored at the delivery end, and not permitting open access to and use of data and content through adoption policies such as the Creative Commons family of licences are some of the ways in which Asian governments could discourage adoption of OER production, use, reuse and distribution, and some do..... Institutional policies to incentivise through recognition and rewards, the production and use of OER, are also somewhat thin in most Asian institutions.”*

This is amply evidenced in the WOU case study, which shows how a clear institutional policy on OER has galvanised the interest of the whole university. While cost savings may have been at the heart of the WOU interest, the use of it is also beginning to have an impact on teaching practices.

In the last two years, following the declaration by UNESCO²⁴ in 2012, more governments have become aware of the value that OER can bring and some have already designed policies, such as India, to support the further development of OER. At the institutional level, a number of colleges and universities have adopted OER practices despite an absence of an OER policy; for instance, Hong Kong and many like WOU, VUP and the IITs of India, have policies to buttress their use of OER. All of the countries in this study also have open access licences such as the suite of the Creative Commons family. **Table 11** illustrates licensing permits used by the six institutions.

| Institution | National policy | Institutional policy | Type of license used |
|-------------|-----------------|----------------------|----------------------|
| KOER | YES | N/A | CC-BY-SA-NC |
| NPTEL | YES | YES | CC-BY-SA 4.0 |
| OUHK | NO | NO | CC-BY |
| TCU | YES | YES | ? |
| VUP | NO | YES | CC-BY |
| WOU | NO | YES | CC-BY-NC |

Table 11 Policy provisions exercised by the six institutions in the case study

²⁴ http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/Events/Paris%20OER%20Declaration_01.pdf

OER, e-Learning and MOOC

Introduced in 2002 by UNESCO, the development of OER initiatives has led the way to MOOCs or Massive Open Online Courses. There is a whole body of opinion that holds the view that MOOCs, along with OER and to an extent e-learning, are a form of distance education; the difference being the emergence and intrusion of very sophisticated ICT into the education space which allows for very big numbers of learners to view content and if they choose to register and participate in a number of activities like peer to peer learning, tutorials with mentor support and assessment. MOOCs perhaps are a practical expression of using the huge reservoir of OER. By and large, the MOOC phenomenon has not caused as much churn in the emerging economies of the world as it has done in the developed world.

“MOOCs, as popularised by Udacity and Coursera, have done more harm to the cause of open education than anything else in the history of the movement. They have inflicted this harm by promoting and popularising an abjectly impoverished understanding of the word “open”. Wiley (2014), The MOOC misstep and the open education infrastructure. Accessed from <http://opencontent.org/blog/archives/3557>

There is a relationship between ODL, MOOC and OER.²⁵ ODL predates both OER and MOOC. Despite the relationship, there are basic differences between the ideas and practices, and while an OER can be a MOOC, except under special conditions, a MOOC seldom is an OER. The freedom to exercise the 4Rs makes all the difference. Wiley, who is credited with the authorship to the 4Rs, very recently lamented that MOOCs may be a serious deterrent to the “openness” that we know and practise (Wiley 2014). This is not an uncommon view as many perceive a big gap between the aspirations and purpose of MOOC and its practice.

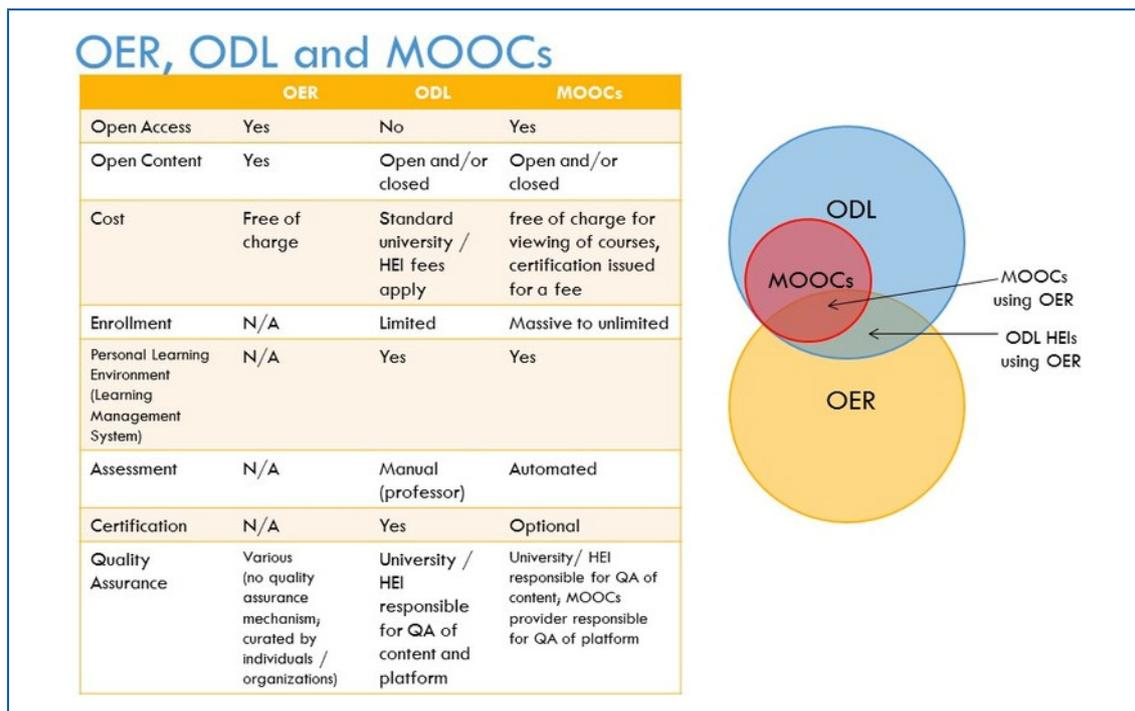


Figure 4 The OER, ODL and MOOCs relationship (After UNESCO)

²⁵ Source: UNESCO ICT in Education Newsletter (January 2014)

Other than a few research universities in developing Asia, many of the less endowed ones seem not to have pursued the MOOC innovation to any serious degree. There are many reasons for this lukewarm response but the following may be pertinent (Liyanagunawardena, Williams, et al. 2013):

1. The lack of reliable ICT infrastructure
2. Poor digital literacy
3. Language competencies (most MOOCs are in the English language and despite its widespread use in Asia, many do not have the level of competencies required to either present or participate in studying through a MOOC)
4. Structure of learning such as peer to peer learning and free flowing content
5. Critical abilities and skills to evaluate large quantities of information enabling participants to benefit from part of the MOOC virtual classroom
6. Many of the universities are labelled tier 3 universities and there are not big enough academic “rock stars” to attract the large numbers of learners that would justify investing in MOOC efforts

As of now, none of the six institutions participating in this study have launched a MOOC except for TCU, which is experimenting with launching a Thai MOOC.²⁶ Plans are also afoot at the OUHK, WOU[‡] and VUP to pilot one or two programmes. Not all institutions that are contributing to the NPTEL project have indicated plans for a MOOC launch in India, though the Indian government has announced plans for an Indian MOOC.²⁷ Late last year, Malaysia launched a Malaysian MOOC which limited participation to its publicly funded universities.²⁸ It is difficult to predict if MOOCs launched from Asia will have the same volume of participation reported by the Ivy League institutions, especially those of the USA.

A MOOC is often referred to as an event — “an Internet happening,”²⁹ and like events or “happenings”, MOOCs from well-known and highly ranked institutions such as Stanford and MIT attract large numbers of participants. Brand names count. The higher-ranked Asian universities such as the National University of Singapore or the Hong Kong University of Science and Technology are using platforms such as Coursera and edX to host their events. Participation numbers have not been published but one report on the HKUST website mentioned an expectation of 8–10,000 registrants.³⁰ The MOOC phenomenon has yet to gain widespread use in many Asian countries and even before it does, there is a sentiment which is being expressed that it may be a “passing fad” until the next fad comes along (Dennis 2014). Perhaps, but it may be too early to write MOOCs off. Perhaps innovations such as MOOCs will continue to have a role to play in expanding access to the world of knowledge.

[‡] WOU recently launched its first MOOC on 29/01/2015 on <http://wawasan4pace.wou.edu.my>

²⁶ <http://imlf.mobi/presentations/Anuchai.pdf>

²⁷ <http://edtechreview.in/trends-insights/trends/1598-indian-hrd-ministry-launches-a-mooc-platform-swayam>

²⁸ <http://www.pendidikanmalaysia.com/2014/09/massive-open-online-courses-moocs-for.html>

²⁹ <http://odl.mit.edu/david-cormier-moocs-for-selfish-reasons/>

³⁰ <http://www.universityworldnews.com/article.php?story=20130417153545600>

Findings from the Case Studies

The six case studies presented in the next part of this report represent the simple *adoption*, as well as *adoption and use* of OER in economically, culturally and socially diverse communities, spread across four different nations and one special administrative region [Hong Kong]. Furthermore, their education systems emerged from different colonial pasts (except for Thailand which was never colonised). Since their independence, the education systems of India, Pakistan and Malaysia have also evolved in different directions. However, at least in the tertiary sector, influenced by liberalisation, globalisation and market forces, these nations confront very similar challenges of cost, relevance and quality. The arrival of technologies, especially disruptive ones, is acting as a catalyst to bring about change. Open educational resources are being seen by many as a major game-changer. Even though the six studies are about six institutions, almost all of which are in the early stages of *OER adoption and use*, a trend is being seen that despite various barriers, a positive impact is being discerned in one, many or all of the following ways:

1. **Pedagogy:** *The experience of academic staff of the three courses which embedded OER within their curriculum at Wawasan Open University is a clear example of a shift of attitudes where search for OER-licensed content relating to course development and construction helped develop reflective practices resulting in “feelings of liberation” from the restrictions that textbooks imposed.* It also stimulated academics to look for the best content available to share with their students, including utilising a range of non-text media to better explain concepts. Similarly, teachers in Karnataka experienced enrichment in their shared knowledge within the community and those in Hong Kong recognised the value of manipulating content in the open textbooks to suit the learning needs of their pupils. In the case of the reuse of the NPTEL materials in the three Universities in India, reusers, either through lack of experience or skills in dealing with OER seemed to have opted for the easy option i.e., to use the NPTEL content as a supplement to classroom lectures. While taking this option does serve the purpose of helping learners to make up for weaknesses of their inexperienced neophyte lecturers, it may not have any significant impact on the teaching behaviour of the lecturers themselves other than enhancing the currentness of their discipline knowledge.
2. **Learning outcomes:** *These are not easily measurable; however, both retention rates as well as exam grades seem to indicate that the inclusion of carefully chosen OER content helped in exciting students; marginally increase retention rates of those studying in the open universities and to a certain extent, improved their exam grades as well.* The TCU study of their student’s post-graduation behaviour is a good example of the positive impact the entire e-learning Professional Development Programme seem to have made on the learners. They were clearly better prepared to use e-learning methodologies in their own situation and more critically a number of them were also much more receptive to reusing the OERs in their own teaching. A comparison of learner performance at WOU of two cohorts of students of the same course, *Microeconomics* — one cohort that used a standard textbook and the other without a standard textbook showed the latter had marginally better retention rates and better grades. This seems to be the case in all of the three courses studied at WOU. It is likely that factors other than OER may have played a role in this but all things being the same, the inclusion of OER did not negatively impact performance in examinations. In both the WOU and TCU cases, the OER was integrated seamlessly into the course materials unlike the use of the NPTEL materials in India where they supplemented the classroom lecture. The NPTEL materials are

mostly in English and require a fairly good level of English language competencies. Where students had these competencies, learning outcomes were found to be positive but where these competencies were lacking (in the case of many GEHU students), another layer of difficulties got imposed on them. One of the lessons for teachers and their institutions to note is the required due diligence before selecting the resource that best meets the needs of their learners.

3. **Quality:** In systems having robust quality assurance processes (WOU and OUHK), which are monitored both internally as well as externally, *the quality of the curriculum and the teaching and learning experience is not compromised because of the use of OER*. In India, quality enhancement was evidenced, as neophyte lecturers in the two engineering colleges (GEHU and NITK) used NPTEL materials to improve on their own levels and currentness of knowledge through the use of the NPTEL materials. However, poorer English language competencies disadvantaged weaker students at GEHU. A very high proportion of OER materials on the WWW are in English and though licences permit translation into other languages, the cost and time involved in such efforts may be inhibiting.
4. **Content:** In the case studies, *subject matter did not seem to be a limiting factor. Courses and programmes from the hard sciences, engineering, humanities and liberal arts were all produced or adopted under various forms of licence*. In developing content for almost all subjects, various OER freedoms were exercised to some degree. **Table 12** briefly highlights the extent to which the freedoms were used by the institutions in the six case studies.

| | Reuse | Revise | Remix | Redistribute | Remarks |
|-------|-------|--------|-------|--------------|--|
| KOER | √ | √ | √ | √ | As a resource exchange hub among teachers, the traffic amongst teachers is quite intensive. |
| NPTEL | √ | - | - | - | By and large, OER content supplements classroom lectures. Other than reusing, none of the other R's is done. |
| OUHK | - | - | - | - | OUHK acts as a production house of open textbooks to fit the HK syllabus and therefore creates almost tailor-made content to fit the syllabus. |
| TCU | √ | √ | √ | √ | Multiple reusers of content produced by TCU carry out all of the acts, though not all of the reusers redistribute revisions. |
| VUP | - | - | - | - | VUP produces its own OCWs and does not use other sources. Data is not available to show that users of these OCWs undertake any of the 4R activities. |
| WOU | √ | √ | √ | √ | No evidence is available to show those reusing WOU course materials revise or remix. |

Table 12 Extent to which the four freedoms available through OER are used

5. **Skills and Competencies:** *There is a recognised need for higher levels of skills and competencies in those who work with OER.* While in the case studies presented, none of the institutions highlighted the use of talent from outside their institutions, all of them expressed the view that skills such as searching for appropriate content, computing skills to manipulate the incorporation of “imports” and knowledge of licencing regimes were all found to be requirements. There is an unfounded assumption that all academics have these skills — it may not be so. Recognising the existence of such gaps, institutions such as the OUHK and WOU invest in “training” their academic staff to work in an “OER environment”. The benefit of training is also most evident in the case of the KOER study, where IT neophytes became quickly adapted and enthused about the use of IT for their needs after an induction programme. There are freely available, range of online and Web-based courses for this purpose.
6. **Collaboration:** Other than the teachers in Karnataka (KOER), *evidence of collaboration is somewhat modest across all six cases.* The OUHK association with the Educity Hong Kong [www.hkedcity.net] in the production of their open textbooks is an exemplar where the former clearly benefitted from the resources of the latter, but there is no evidence of active collaboration between both parties in the creation of new content. Besides using some Educity content, the OUHK also uses the Educity platform as an additional distribution point. The entire TCU project in Thailand is a massive collaborative arrangement though OER is not the catalyst of this effort; in time to come, TCU may approach the issue of OER more robustly than it presently does.
7. **Cost:** In two of the six cases, *cost considerations were a major reason to consider OER.* The two cases are WOU in Malaysia and OUHK. Both these institutions are unique among the six; they are both not-for-profit self-financing universities and are expected to be fiducially prudent. As open universities, a major cost of their operations is the production of instructionally sound self-learning materials. Reducing the costs of developing these materials means paying as little as possible for proprietary content. The use of OER in the case of WOU has clearly brought down the cost of materials development. In the case of the OUHK, their effort in launching the open textbooks project is to help consumers in Hong Kong reduce the costs of textbook ownership. Their projections indicate that this is achievable. All the other four cases are government funded, the reasons for adopting OER, at least for now, are not cost driven.
8. **Policy changes:** *Policy changes at both institutional and national levels are not widespread.* Among the six institutions, three (WOU, NPTEL and VUP) have in place policies supporting OER, which means that there is recognition of the value of OER, investments in staff development programmes to enhance the skills of staff in OER practice, and academic recognition and incentives to encourage greater involvement. OUHK and TCU do not have explicit policies on OER. At the national level, despite the exhortations of UNESCO, except for India, none of the other countries in this study have in place explicit OER policies.³¹ It is likely that universities across Asia which do have some latitude in the way they exercise their IPRs will create their own OER policies (like the WOU) or work under the umbrella of their national Creative Commons affiliates.

³¹ http://www.itforchange.net/sites/default/files/ITfC/revised_policy%20document%20ofICT.pdf

Recommendations

In 2012, UNESCO tabled an OER Declaration in Paris which listed ten recommendations for member states to adopt for the promotion of Open Educational Resources.³² The following year, the Hewlett Foundation, which has been a major funder of almost all the early and groundbreaking initiatives on OER, published its white paper on OER titled “Breaking the Lockbox of Education”.³³ The white paper summed up the experiences and findings of almost a decade of work on the subject, drawing on activities mostly in North America and a few in Europe and fewer still in Africa. The white paper published a set of goals for educational systems which are confronted with huge challenges and where OER can be one of a number of solutions to resolve concerns such as the continuing escalation of textbook costs, outdated curriculum and information in many poorly resourced schools, the high cost of curriculum development, lack of good instruction, and underqualified academic staff and teachers. UNESCO in its lead up to the 2012 OER Paris Declaration³⁴ also reinforced these issues. The concerns implied and expressed by both the Hewlett Foundation and UNESCO, resonate well with those that the six cases in this study also express.

The value of OER in the educational ecosystem is being realised globally and its use in Asia is reflected in the six case studies in the report. As these stories tell, adoption is not as enthusiastic as could be expected and confronted with barriers and challenges, some through a lack of awareness and others through a lack of clear policy drivers, ICT technologies deficit, a paucity of skills and associated competencies, as well as language and associated cultural issues. There are exceptions such as the Wawasan Open University and the NPTEL programme in India; the former as both user and producer, and the latter mostly as producers. Adoption of OER leads to a number of gains beyond cost efficiencies. Openness brings with it both a philosophical and practical gain. For nations to benefit, much needs to be done both at the national and institutional levels. Governments should provide leadership, direction and funding. There are barriers, challenges and difficulties to confront but at the same time, there are also enthusiasts and champions who would like to see and bring change.

Governments can help. They can also undertake by themselves or through their institutions of learning, policy discussion and dialogues on OER and its promotion. Intergovernmental organisations and international financial institutions, like the ADB, can also play a critical role, especially in those countries where they are active in supporting educational development. Support by the ADB can be through acting as a catalyst to raise awareness and bring about changes in the attitude of senior policymakers in governments. It can do this by focusing on a few select areas such as:

1. Urging loan recipients to declare as “open” all educational as well as education relevant content developed through government funding that restricts free global access.
2. Encourage and support the digitisation of open content for greater portability across institutions and borders. A lot of valuable content is only published in non-digital format which restricts the free movement of such content and does not avail itself for easy manipulation.

³² http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/Events/Paris%20OER%20Declaration_01.pdf

³³ <http://www.hewlett.org/library/hewlett-foundation-publication/white-paper-open-educational-resources>

³⁴ http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/Events/Paris%20OER%20Declaration_01.pdf

3. Support efforts to establish national repositories of open educational content to enable ease of search.
4. Improve and strengthen data collection and storage of OER-associated activities. Data for meaningful analysis is still available.
5. Encouraging greater investments in improving the present IT environment for education. Almost all governments have near-perfect policies for this purpose but modest resources are expended in making these policies a reality.
6. Supporting region-wide activities, through its Technical Assistance programmes, to improve technical capabilities, collaboration and associated programmes aimed at building and strengthening an incipient community.
7. Promoting “Openness” as a mantra to cover as many aspects of socio-economic activities as possible, but particularly education, both at pre-tertiary and post-secondary levels.

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Chapter 2 Open Educational Resources: Building Communities and Building Knowledge

~ Rajaram Sharma

Abstract

OER movements aim to free resources, enabling adaptation and contextualisation. It further engages persons making adaptations in a process of critical reflection and creation, contributing to their professional development. Based on such a premise, the Subject Teacher Forums and the Karnataka Open Educational Resources programme (in the state of Karnataka, India) aim to bring teachers into a collaborative learning community, hoping to engage them in OER access-creation-curation-publishing, leveraging this engagement into a professional development exercise.

The programme has grown over two years to over 3500 teachers; a steadily growing exchange of information and resources; and increasing attention to contribution of resources. There is evidence of these resources being used in classrooms. The programme's objectives of bringing together teachers show clear signs of fructifying and the interactions when nurtured will result in a professionally aware group, willing to and adequately informed to take on their rightful roles of arbitrating the curriculum and the schooling process.

Participating teachers spend their own time, effort and money, clearly making its sustainability a function of its quality rather than cost. The quality of the resources is also a function of relevance as perceived by the teachers themselves.

Overall, the programme presents an interesting model of ICT mediated collaboration and OER exchange, suitable for most contexts, particularly in the developing world. If the programme matures to help the teacher take charge of her professional life, the hopes of the OER enthusiasts would have been met.

The STF-KOER Programme

The secondary school teachers from the public school system in the state of Karnataka, India are being brought together into subject-based collaborative networks using google groups and a wiki platform. Configured as forums in science, social science, mathematics (mathssciencestf@googlegroups.com, socialsciencestf@googlegroups.com and englishstf@googlegroups.com) and one for head teachers (focussing on their leadership and administrative needs), they network teachers across a large geography, unifying them on common issues and aim to break their professional isolation. The wiki-based Open Educational Resources (OER) platform is emerging as a shared repository of teacher's finds and creations. Together they engage teachers in a peer-supported OER access-creation-curation-publishing (OER ACCP) programme, and intend to promote their creative exploration of ICT possibilities in education and their capabilities of critical reflection, two important facets of a professional practitioner.

The programme is embedded in the regular in-service training support organised by the Department of Education in the State. The training programmes organised for ICT-enabled education (one among the many areas for which training is organised) has included a hands-on introduction to digital literacy and ICT basics; accessing, creating and curating digital resources; and their use in teaching learning. The training has also introduced teachers to Free Software, Open Educational Resources and enrolled them into the Subject Teacher Forums (STF). IT for Change (ITfC¹), a NGO, which has the vision of appropriating digital technologies for a just and equitable society, has been contributing as a resource institution.

A glimpse of the State's aspirations vis-a-vis the subject teacher forums can be found in its website at <http://karnatakaeducation.org.in>. What stands out in this note is the:

1. Recognition of the need for a community of peer practitioners for continuous learning and professional development.
2. Recognition of the limitation of providing such an experience only through physical interactions and meetings due to the geographical spread and the classroom responsibilities of the teachers.
3. Recognition that a digitally enabled community of teachers can optimally utilise ICT possibilities to enhance their teaching learning.
4. Recognition that such practices promote deeper understanding of the subjects, as well as enable teachers to participate at a systemic level thus enabling decentralisation.

Together these lay down the contours of the activities of the STF as well as the KOER. The STF-KOER process of resource creation is both an objective and a method of Teacher Professional Development.

The Study

The objectives of this case study are to investigate the participation of teachers in the STF as well as KOER and to understand the use and impact of these forums. The study would help understand whether and how a collaborative learning community can support a sustainable environment for OER ACCP as well as become a systemic method of teacher professional development in the public education system. It will cover the mathematics and science forums and the OER contributed and curated in these two subjects.

The study has accessed the activities on the subject teacher forum², the monthly summaries of the mails, the content of the postings (what teachers have written, created, shared and debated), the published documents describing the scope and intent of the forums, the KOER wiki and its contents, as well as the server logs indicating the nature of the traffic.

¹ See www.ItforChange.net/Education

² <https://groups.google.com/d/forum/mathssciencestf>

A survey questionnaire was posted on the mailing list (in English and Kannada) by this author, which initially elicited no response, but received 80 responses, following a recommendation from an official of the Rashtriya Madhyamik Shiksha Abhiyan (RMSA). This was followed by interviews of 14 members of the forums, including a senior educational functionary from the RMSA, who were chosen from among the relatively more active participants on the forum. This purposive sample was expected to reveal the benchmarks the forum is setting for itself.

STF-KOER Programme Processes

The programme was started in 16 districts of the State to build a community of teachers in mathematics, science and social science in the years 2011 – 12. This programme was extended to cover all the 34 districts in the years 2012 – 13. Essentially a mail forum, it has grown into a vibrant community, which exchanges resources, shares information, debates issues and motivates each other. The Subject Teacher Forums in Mathematics, Science and Social Science have each begun to emerge as distinct communities, with their own champions from among the teachers.

During the second year of the programme (2012 – 13), a concept workshop discussed the form, structure and organisation of a portal for OER (KOER, the wiki platform³) for the teachers of the State. A core group of teachers and teacher educators (in 2013 – 14), designed the repository and now collaboratively access, create, review and publish curricular materials. This group has also conducted the training in the districts, where teachers have been introduced to the STF and KOER repository. The core group has been further expanded in 2014 – 15. The resource creation has focussed on digital learning resources for the topics covered in the new textbooks, thus aligning it to the immediate priorities of the teachers. The mailing forum and resource portal are used for providing continuous support for the district workshops.

The Context

The State Educational Context

Karnataka is one of the southern states of India. The public school system is administered by the Department of Public Instruction and assisted in its academic tasks by the Directorate of State Educational Research and Training (DSERT)⁴ (more details are available at <http://schooleducation.kar.nic.in/>).

³ The mediawiki platform has been consciously chosen since it is designed to enable collaborative resource creation and curation.

⁴ Directorate of State Education, Research and Training, Bengaluru, the apex body for curricular resource design and material development, as well as Teacher Professional Development in Karnataka state



The school system in the state is grouped into 34 educational districts. Each government secondary school has a head teacher and subject teachers, who in most cases, share all academic and administrative responsibilities. Students in grades 8 through 10 are enrolled; each grade having one or more sections depending on the number of students enrolled.

14,892 secondary schools have been reported of which 34.6% are government schools, 24.7% operate under a grant-in-aid from the government and the remaining are private or run by the Central Government; 57.5% schools are in rural places and 42.53% in urban areas⁵.

The gender ratio of teachers across the state stands at 1.08 (52% female teachers to 48% male teachers). There are 26,754 mathematics teachers and 15,402 science teachers out of a total of 418,670 teachers as per 2013-14 data⁶.

⁵ More details are available from http://rmsaindia.org/en/schools-by-management-total-schools-by-management.html?id=karnataka&year_value=2013-14 (data accessed on 8 January, 2015).

⁶ More details are available from http://rmsaindia.org/en/teachers.html?id=karnataka&year_value=2013-14 (data accessed on 8 January, 2015).

Computers and accessories, including a projector have been supplied to 3147 government schools till date. Of these, 1097 were deployed before the year 2006 (older than 8 years now). Hence ICT infrastructure should be expected in less than the 3147 number of schools reported⁷.

The major funding support to the state government initiatives in the secondary education sector across the country has derived in recent years from a scheme of the Government of India, called the Rashtriya Madhyamik Shiksha Abhiyan (which translates to National Secondary Education Mission and is commonly known as RMSA). Launched in March 2009, the scheme has the objective to enhance access to secondary education and to improve its quality. The scheme is implemented by State government societies established for the purpose and is funded by the Central and State governments on a 75:25 sharing basis. Apart from infrastructure, the scheme supports appointment of additional teachers, in-service training of teachers, ICT-enabled education, curriculum reforms and teaching learning reforms.

The in-service training of teachers is organised typically during the school term and the RMSA society seeks the resource support of academics and organisations within and outside the government. Each teacher accesses (is deputed to) a five day training programme each year. The training programmes span all aspects of secondary education and operate around a training calendar developed by the society. Given the large numbers of teachers and the geographical spread, cascade models are adopted, wherein a first level training develops a key resource person, who then carries out training at the subsequent level.

Policy Context

There is no explicit policy on Open Educational Resources, either at the State or National level⁸. However, the Ministry of Human Resource Development, Government of India (MHRD) has issued the “National Policy on ICT for School Education”, 2012⁹ which inter-alia emphasises the use of Free and Open Source Software tools for technology integration and creation of a digital resource-rich learning environment. There is no state policy on Open Educational Resources in Karnataka too.

Public education in India is totally managed through state funds. State functionaries rarely engage with issues of copyright. Traditionally, publications of any kind including textbooks are funded by the state, rarely sold, even then at grossly subsidised costs and almost always cover the entire population. Educational resources are de facto treated as open, with states encouraged to freely share, adapt and reproduce materials developed by each other.

Also, typically, these are produced involving a large number of people drawn from different specialisations within the education system. Outsourcing is only for printing or logistics. In the absence of private participation, the need for explicit statement and ensuring enforcement of legal rights has never been recognised.

⁷ More details are available at <http://dsert.kar.nic.in/html/chapter06.html> (data accessed on 8 January, 2015).

⁸ Even the mission document of National Mission for Education through ICT (NMEICT) stops short. It lays an emphasis on open access to the resources developed, but does not recommend explicit declaration of these as Open Educational Resources (available at <http://nmeict.ac.in>)

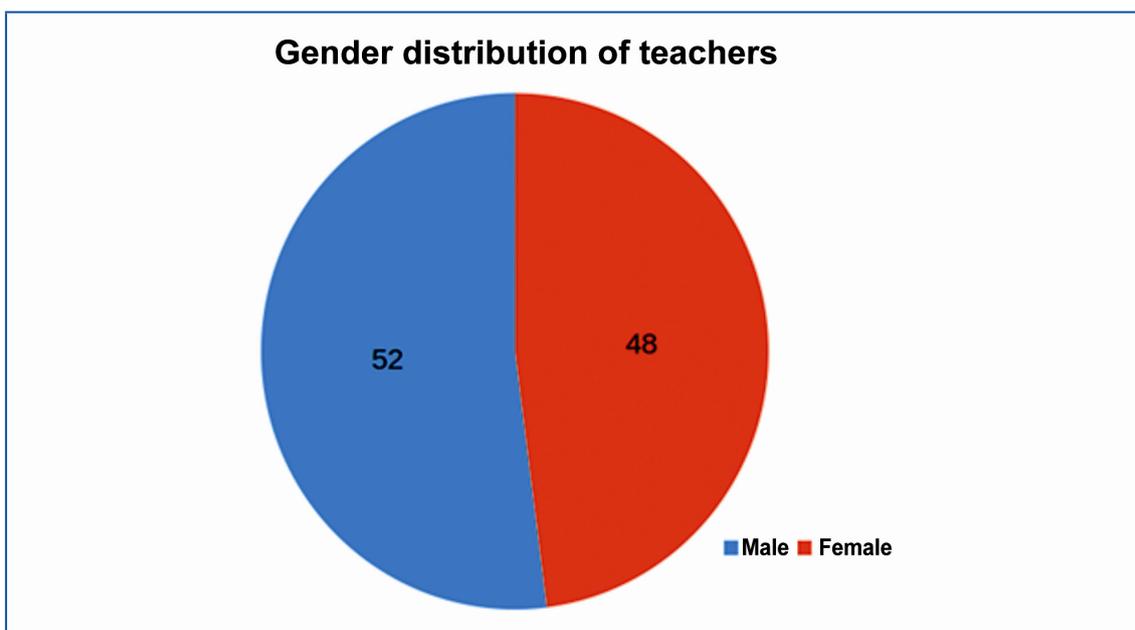
⁹ http://www.itforchange.net/sites/default/files/ITfC/revised_policy%20document%20ofICT.pdf

With the advent of technological vehicles — websites, computer storage, tablets and mobiles — and the large scale participation of private enterprises, the need to become aware of licensing has arisen. Proponents of the OER movement would like state-developed educational resources to be naturally considered as OER, arguing that they were developed using public money and is for the public good. The launch of the National Repository of Open Educational Resources (NROER) by the Government of India, the suggestion for which emerged from the National Policy on ICT for School Education mentioned above, has also provided an opportunity to formally collect these resources as OER.

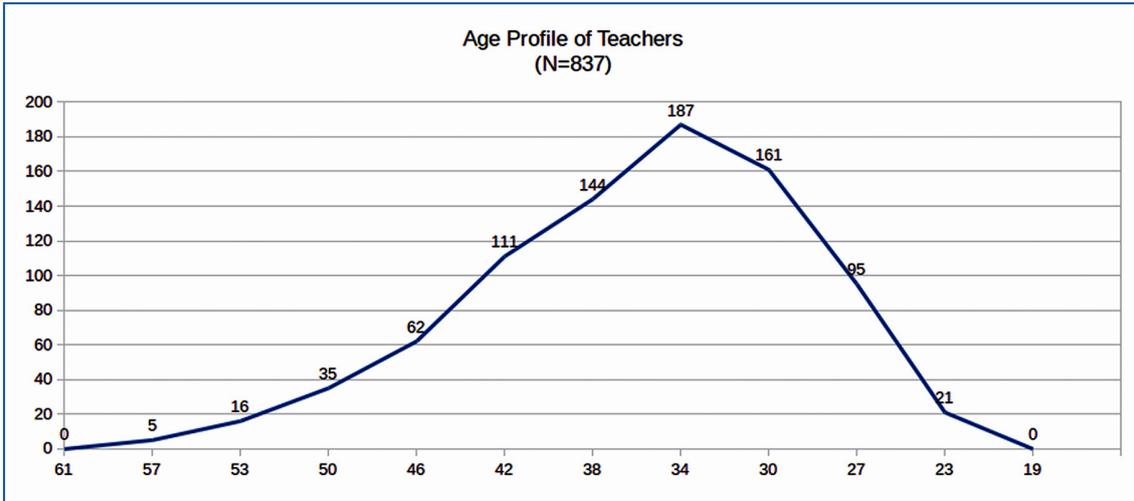
But as of now, the curricular and other academic resources developed within the State are “implicit OER”, they can be freely adapted and disseminated within the system. Hence there is more value to perceiving OER as a process, which can lead to participatory, collaborative activities or reuse, remix and revision, rather than a license. The biggest gains from encouraging such processes would be, as the State itself hopes¹⁰, professional development of its teachers and consequent impact on the quality of teaching learning.

Results of the Study

Demographic data like age, gender, qualifications and location of teachers in STF-KOER are not available. The registrants typically have to declare only their email ID to join the forum. No other data is sought. The only readily inferrable data is about qualifications. All secondary teachers in mathematics and science have to possess a Bachelors degree in science (B.Sc) and a Bachelors degree in education (B.Ed). Some teachers may have higher qualifications like Master’s degree in science, education or other subjects. A partial data from the 837 science teachers attending the ICT workshops across various districts in 2013 indicates a gender ratio of 48 female teachers to 52 male, which is not very dissimilar to the State average.



¹⁰ Note from the desk of the Director, RMSA, Karnataka “...The vision of this portal is to enable teachers to blog, discuss and share their ideas, resources they create and their concerns to promote deeper understanding of their subject, as well as enable teachers to participate at a systemic level thus enabling decentralisation...” in http://rmsa.karnatakaeducation.org.in/?q=subject_teacher_forum



The geographical spread of the overall programme is large. The academic spread is also broad. The in-service training programme which introduces a neo-initiate to ICT, includes an introduction to free software, OER, educational possibilities of ICT, a range of educational software and networking for professional development. Teachers attending these courses come with varied exposures to IT and ICT. Their subject domain exposure is varied too. This widens the expectations they have and the directions they have grown the forums in.

Partiallying out gains to the teachers from the interactions on the forums and attributing it to particular inputs and features of the programme is difficult; the range of interactions between variables is just too large. Therefore, what has been attempted is to study the trends, the growth of participation, the expectations of the members and indications available in the postings, of these expectations being met.

It must be noted that while the forum is of teachers in a public school system, brought together by a government intervention, the STF as well as KOER clearly stand independent of the Directorate’s own activities. This gives it a level of freedom and autonomy, enabling teachers to critique textbooks, classroom practices, question papers, etc. Interestingly, the few educational functionaries from DSERT as well as RMSA who participate in the forums, believe in the need for this autonomy as well as its import on the professional self-belief it is expected to foster in the teacher community.

Resources Used in Creation, Use and Dissemination

The district level training programmes are conducted in the ICT labs maintained in the “Colleges of Teacher Education” (CTE) and the District Institutes of Education and Training (DIET) in each district¹¹. The funding for the training is covered under the RMSA in-service teacher education budgets. The programme is coordinated at state level by RMSA and DSERT officers and at district level by DIET and CTE nodal officers (who are teacher educators). This includes all logistical aspects of the workshops as well as the deputation of teachers. Some funding support is also provided by non-state agencies such as UNICEF.

¹¹ Karnataka has around 5,100 government high schools across its 34 educational districts, supported by 30 DIETs and 10 CTEs. Each school has an average of 10 teachers; each DIET has 25 and each CTE has 17 teacher-educators.

Costing therefore can only be indirectly estimated. Almost no money is being spent on creation of OER per se. The training programmes funded by RMSA costs up to a maximum of Rs. 300 per person per day (at current rates, a US dollar is about 60 rupees). The cost of training the resource persons and training the teachers at the district level is estimated at around Rs. 2,200,000. The effort has been towards creating a large pool of teachers who can plug into the online resource creation environment and peer learning environment. The OER creation activity on the KOER portal was taken up in the third year of the programme (2013-14). The cost of this resource creation activity, involving about 25 teachers across mathematics, science and social sciences was about Rs. 825,000.

The current year estimate for this activity is also Rs. 825,000 and the cost of building the forum community is estimated at Rs. 860,000. The total community of mathematics and science teachers who are now part of the forum (including estimated numbers for 2014-15) is about 3500. Based on this, the entire intervention till date, spanning three years and over 3500 teachers, has cost a figure of less than Rs. 5,000,000.

The continued participation of teachers in the forums is entirely at their personal costs — time, effort and connectivity. It was heartening to note that many teachers, inspired by the initial orientation have invested on personal devices and actively participate in the forums outside the school interface.

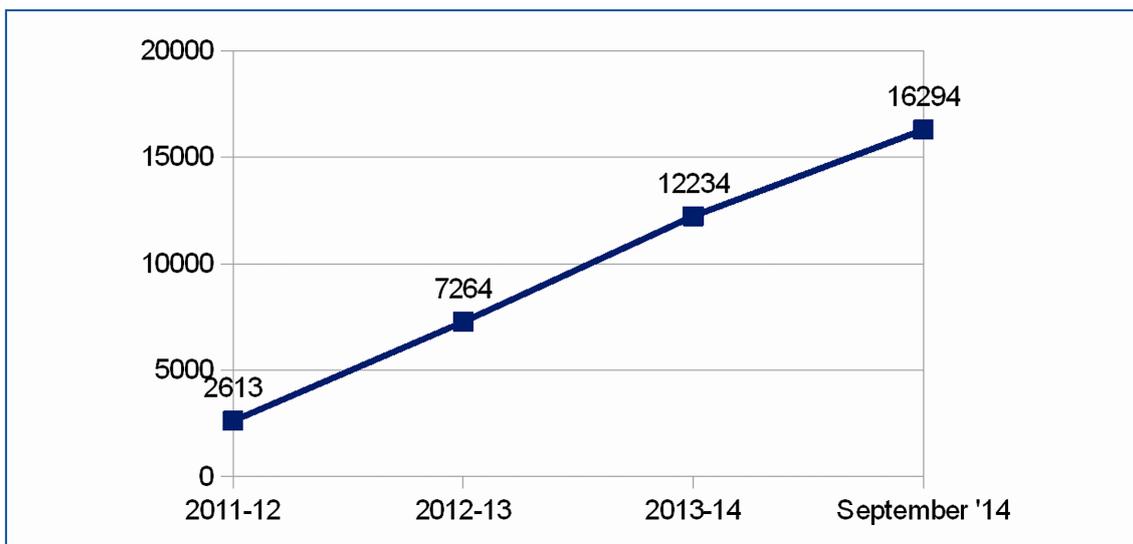
The DSERT also supports the orientation of teacher-educators from DIETs and CTEs on KOER, familiarising them with the idea and processes of OER, utilising funds available for teacher education. Increased and formal participation of the teacher-educators from DIETs and CTEs in the online discussion forums and in the OER activities would provide a mainstream method of ongoing support to teachers by teacher educators.

The DSERT proposes to set up a State Resource Group for teacher-education that would oversee all aspects of Teacher Professional Development including the STF-KOER programme, the virtual forum and the resource repository.

Dissemination of Strategy, Advocacy and Information Flows

The STF mailing list is the primary forum for dissemination of resources. Resources shared on the mailing forum are uploaded on the KOER repository; links from KOER are shared on the list. KOER e-newsletters are shared in wider virtual networks for creating awareness about KOER.

Participation in the forums and therefore the progress of the community is indicated by the mail traffic on the forums. The number of emails shared in the mathematics and science forum is as follows:

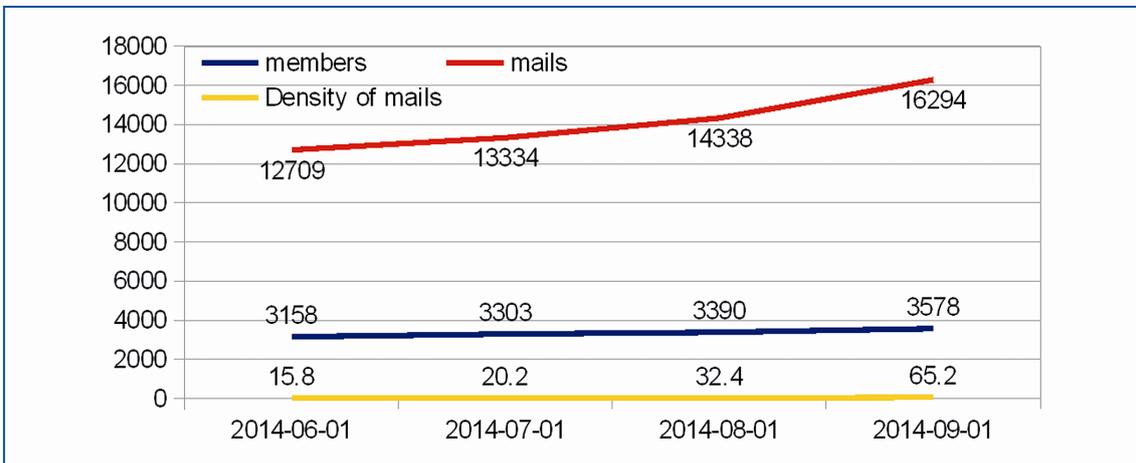
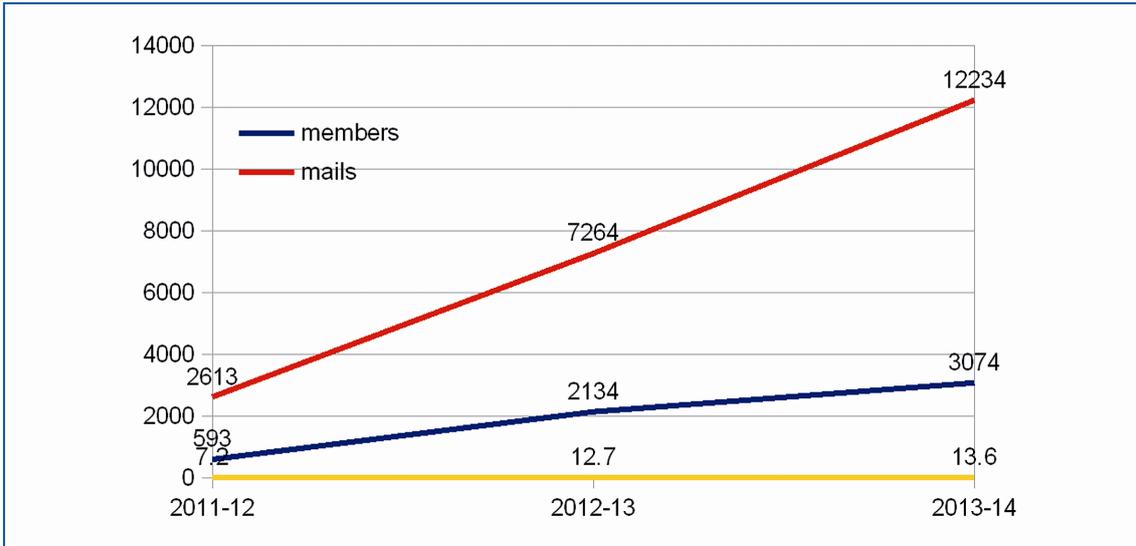


During the month of August, which was used as a representative month for assessing participation, the number of emails shared on the forum was close to 1000, of which about 84% had resources attached¹².

The STF-KOER project aims to cover all Government and aided high school teachers in Karnataka. The size of this universe is around 10,300 schools. With each high school having at least one teacher each for mathematics and science, the number of teachers is at least 20,600. Of these, around 4,000 have received STF-KOER training and the mailing list has 3,500 members. Over the next years, the department plans to cover all the mathematics and science teachers in Government and aided high schools across the state. Till such time, trained teachers have taken up the initiative of motivating fellow colleagues to explore ICT.

| No. | MathsScience group | 2011-12 | 2012-13 | 2013-14 | Jun/2014 | Jul/2014 | Aug/2014 | Sep/2014 |
|-----|--|---------|---------|---------|----------|----------|----------|----------|
| 1 | Cumulative members net count | 593 | 2134 | 3074 | 3158 | 3303 | 3390 | 3578 |
| 2 | Cumulative mails as at end of the period | 2613 | 7264 | 12234 | 12709 | 13334 | 14338 | 16294 |
| 3 | Density of mails for the period | 7.2 | 12.7 | 13.6 | 15.8 | 20.2 | 32.4 | 65.2 |

¹² All data pertaining to mails have come from the server logs shared by the STF



Advocacy on the promotion of KOER is through the efforts of the teacher education cell in DSERT. The primary purpose of this advocacy is to involve the entire community of teachers and teacher educators across the state and to facilitate the activities of the STF-KOER.

Presently the participation of the teachers is itself functioning as an important mode of advocacy. Teachers inviting each other to critique their contributions, seeking redressal of their doubts and queries, and in general, keeping the forums active contributes significantly to establishing faith in the mechanism. The professional development they experience also makes them aware of ICT possibilities and encourages them to try it out. Interviewed teachers report having enlisted fellow colleagues directly on to the forum. These new member teachers have not yet undergone the ICT training.

User Experience

A small group of 14 teachers who are active on the subject teacher forums and who have grown to be trainers for the programme were interviewed. The relatively unstructured format of the interviews attempted to help the teachers articulate their growth of ICT awareness, participation in the STF as well as KOER, their insights into the happenings in the forum, their classroom teaching learning practices and the effect they have observed on their outlook to teaching learning.

Typically, these teachers have had a long, although narrow exposure to ICT tools and techniques. Participation in the training programmes of the STF-KOER has opened their minds to other possibilities. Each one of those interviewed expressed happiness at a realisation that they were not alone in their difficulties and frustrations. This appears to have brought them closer and enhanced participation on the forums.

Teachers reported connecting with each other even in channels outside the forums (Whatsapp and Hike Messenger being popular)¹³. Teachers in one of the southern districts of the state have also found common cause and have set up their own subject teacher forum. Teachers in one of the northern districts have had a ground based forum much before their joining of the STF and are contemplating strengthening the communication by supporting the direct ground based interactions with ICT.

A small number have diversified the range of their participation on the forums, indulging in discussions which include policy, curriculum, and such other system issues.

An analysis of the submissions and interactions on the forums is indicative of growing awareness, proactive participation and the development of a community.

The training interventions have introduced teachers to a variety of software tools and web resources, encouraging them to engage with these resources, create their own and share them with their peers. There is clear evidence that this is happening.

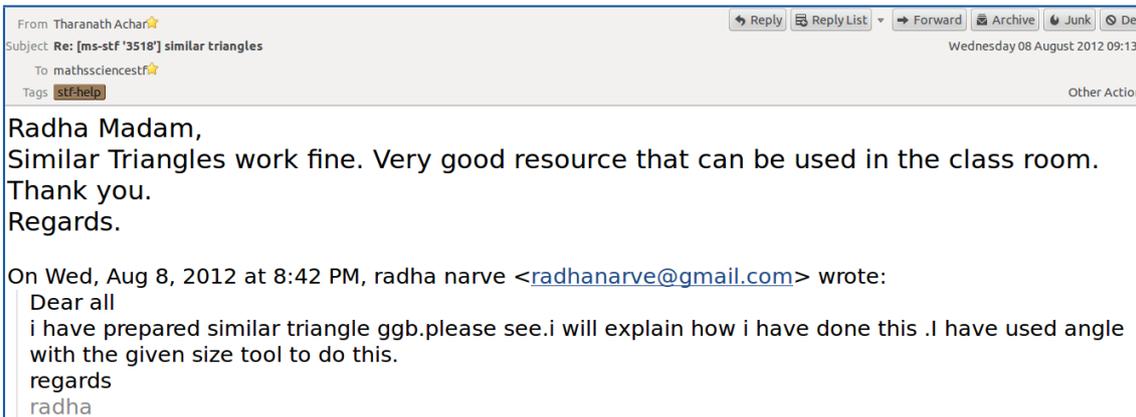
¹³ There are at least five known Whatsapp groups, two in Bengaluru, a metropolis and the other three in significantly smaller towns.



A video shared on the forum; a recording from the stellarium software



A presentation to help students prepare for their board examinations; shared and comments sought



A shared interactive media, created by a teacher; shared with the forum

From shashi kumar <bsskumar7@gmail.com>
 Subject [ms-stf '4169'] 8th and 9th science Q papers
 To pradyumnahosurkar@gmail.com, Swamy Devnalli <swamyhrgghs@gmail.com>, mathssciencestf, shashi kumar <shashikumarstf@gmail.com>
 Tags stf-help Important
 Thursday 20 September

Hi All,

Attached are the 8th & 9th Standard Science Midterm Question papers. Please review the question papers and let me know if you need any changes.

Regards,
 Shashi

--
 Please join to this mathssciencestf@googlegroups.com for your valuable suggestions and your new ideas to the forum.

There should be signature in the mail that means your name and school name with phone number and email address.

 You received this message because you are subscribed to the Google Groups "Maths & Science Secondary School Karnataka Teachers Forum" group.
 To post to this group, send email to mathssciencestf@googlegroups.com.
 To unsubscribe from this group, send email to mathssciencestf+unsubscribe@googlegroups.com.
 Visit this group at <http://groups.google.com/group/mathssciencestf?hl=en-US>.
 For more options, visit https://groups.google.com/groups/opt_out.

2 attachments 65.0 KB

A shared question paper

From Tharanath Achar
 Subject Re: [ms-stf '4406'] IN PhET no SIMS are there for BIOLOGY .In STF District Training we should work only on physics and chemistry ????? ANY SOLUTION FOR IT ???
 To maheshsindagi77@gmail.com
 Cc mathssciencestf
 Tags stf-help
 Monday 29 October 2012 06:5

Sir,

Please simply click on the following link of official website of PhET. Let us verify whether it is true or not.
<http://phet.colorado.edu/en/simulations/category/biology>
 There are chances of biology having some simulations among 90 million. Offline installation of phet need not have everything that the portal has.
 Please keep the internet on while using phet.
 Regards.

On Oct 29, 2012 5:44 PM, "mahesh sindagi" <maheshsindagi77@gmail.com> wrote:

--
 MAHESH SINDAGI
 GHS NAGARAL
 TA BILAGI DT BAGALKOT.karnataka.587102

A shared web link to a subject resource

The exposure to the free and open source software applications has introduced teachers to a variety of resource formats, enabling their movement from the common “powerpoint presentations” to mindmaps (using Freemind), interactive simulations (using Geogebra), text and presentations (using Libre Office), weblinks and video files (using RecordmyDesktop). They are also seeking and exploring multiple tools that can work on different devices and looking for convergent solutions — mobile upload of a solution to a solved problem (solved by hand), sharing recordings of broadcasts by teachers, looking for mathematical teaching learning software for the smart phone, exploring unicode font converters for local language typing or upgrading Geogebra from its 2D version to a 3D one.

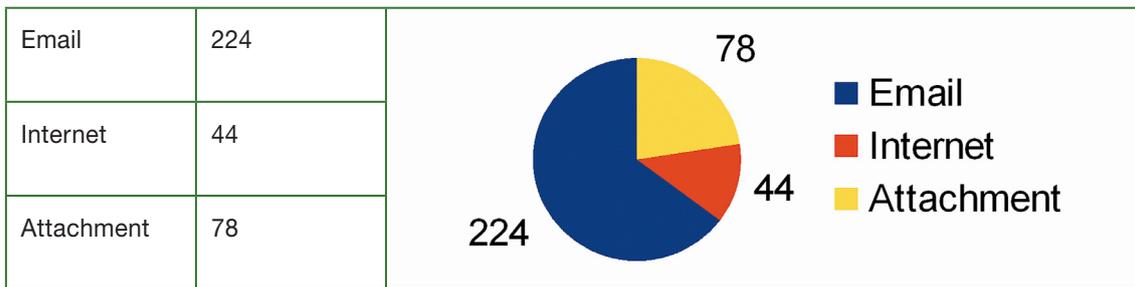
Some conversations on the forums and resources created by the teachers demonstrate the possibilities opened up for teachers:

1. Teachers conversing on a night sky observation (between two districts in Karnataka); each one of them using a desktop planetarium tool as a reference.
2. Recording a lesson using Google Maps on a desktop recording tool to supplement a lesson in a mathematics class on mapping and measurements. The teacher recorded the lesson as a backup in case connectivity fails in the classroom during class time, suggesting some proactive engagement with technology to address the challenges of infrastructure limitations.
3. Teachers initiating creation of school websites (at block and district levels) on a school wiki platform and sharing information on school events and happenings.
4. Teachers more actively documenting classroom processes — field visits, lab work, specimens collected, places visited, etc. This is a significant shift in the way teachers are viewing resources.

An analysis of all the submissions to the subject teacher forums in mathematics and science in the month of August, 2014 was made. The analysis gives us an insight into the ways, the forums are evolving. The tables below take cognizance of all the mails sent into and out of the subject teacher forums during the month. The project considers conversations, arguments, etc., as OER, as these contribute to the professional development of the participants. Carrying this premise forward, a few assumptions have been made for categorisation.

1. A Wikipedia article, tagged to specific topics of the curriculum is taken as explicit OERs
2. Giving a link and copying is common so this is included in email and Internet as a method of sharing
3. News article is explicit non-OER; but comment is implicit OER
4. A question and answer is considered implicit OER
5. A file that is created and shared but in a non-editable format is implicit non-OERs
6. PDFs of textbooks, books, media articles, etc., are explicit non-OERs
7. When someone sends a revised resource, feedback is assumed; so feedback is not checked separately; revision subsumes feedback
8. Wishes and requests for adding to the forum are treated as “others” in categories of OERs

Method of sharing in the forums



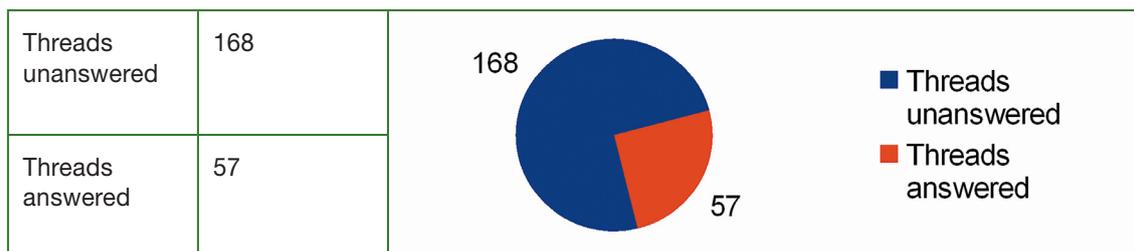
Format of files shared as resources (Total files shared = 323)

| | | | |
|----------------|-----|----------------|----|
| DOC, PDF | 2 | MM | 1 |
| EML | 229 | MPEG4 | 2 |
| EML, JPG | 1 | ODS | 1 |
| EML, PDF | 2 | ODT | 4 |
| Facebook video | 1 | PDF | 15 |
| FLV | 3 | PMD | 1 |
| GGB | 20 | PNG | 2 |
| GGB,EML | 2 | PPT/PPTX | 7 |
| GIF | 2 | WMV | 1 |
| JPG | 15 | XLS, XLSX | 4 |
| JPG, DOC, PDF | 1 | XLS, XLSX, FLV | 1 |

Purpose of the submission (Total mails = 400)

| | | | |
|--------------------------------|----|-----------------------|----|
| Ask for help/seek information | 61 | Share ideas | 17 |
| Respond to question | 47 | Feedback on resources | 23 |
| Share resources — Accessed | 41 | “Thank you” emails | 14 |
| Share resources — Departmental | 13 | Others | 72 |
| Share resources — Created | 65 | Adding members | 43 |
| Share resources — Revised | 4 | | |

Response to the discussion threads



Sharing created resources not only scores the highest in the sharing category (46.5%), but also the highest among all types of mails (65/400 or 16.25%). Overall, sharing resources constitutes 35% (140/400) of the total mails. Mails seeking clarifications/help/information stand second (61). Most of the resources shared are in the form of email text. Sometimes, teachers share weblinks. A large number contain attached resources.

Resources shared include lesson notes, web resources (links), pictures and videos for demonstration and discussion, videos about their schools, interactive applets (geogebra), general articles of interest on education, new software applications, critiques of examination papers/question pattern/ blueprints, school-wise notes of lessons and approaches for assessment. Question papers are at the top of resources accessed, alluding to the significance teachers attach to these.

Majority of the mails pertain to academic concerns. Engagement also spans availability and maintenance of school laboratories, availability of textbooks, and examinations.

The above patterns are vindicated by the survey results too. The response to the survey posted on the mailing list was low (only 80 responses), but shows consistent trends which are positive. The survey form had two sections. Section A had 7 questions pertaining to the use of the STF, which included difficulties faced in accessing relevant resources; finding useful ideas shared in STF; sharing resources on the STF; reasons for sharing/not sharing resources; modifying shared resources. Section B had 12 questions with two parts each (behaviour before the training and after the training); these 12 questions pertained to the use of ICT, creating resources, sharing resources and using the resources in the class.

The questionnaire was bilingual, in English and Kannada¹⁴. Some teachers have opted to respond in Kannada, but most have responded in English. The questions in section A expected teachers to articulate their ideas in a short sentence. Teachers have stated their views differently, but predominantly concur in their view that the resources shared in the STF are useful, and that they are agreeable to sharing and allowing the modification of these resources. To the first question, which sought to know the difficulties they faced, about 8 teachers have pointed to typing math symbols and non-availability of resources in Kannada.

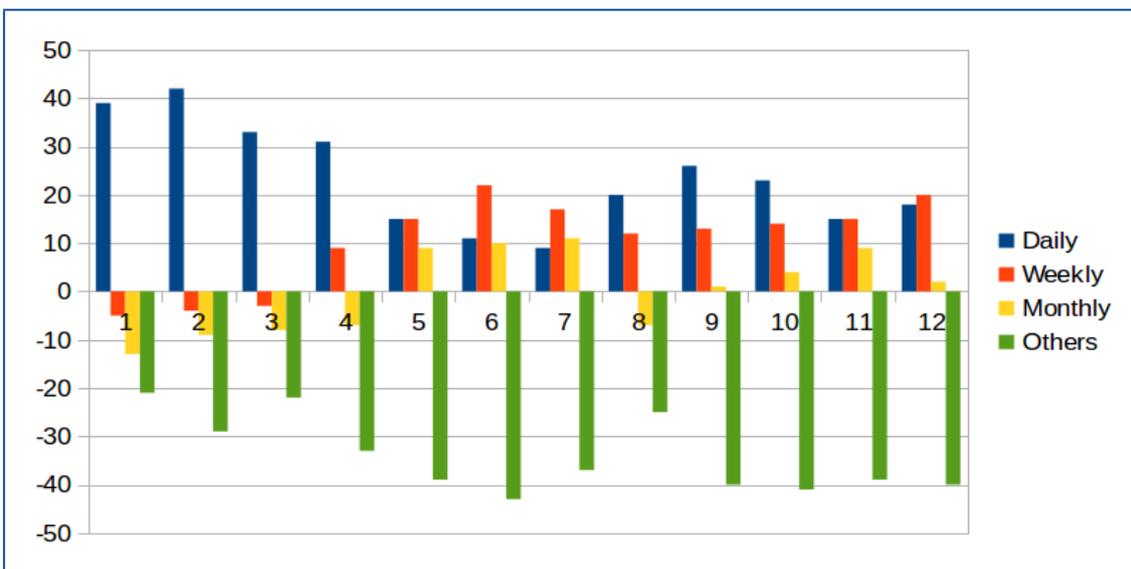
Across all questions of section B, teachers had to opt for the frequency of use — daily, weekly, monthly and *any other*. The responses indicate that there has been an increase in the frequency; teachers use the Internet more often, create more often, share more often and use these in classes more often.

¹⁴ Kannada is the official language of the Karnataka state; and also the medium of instruction across most Government secondary schools.

The change in behaviour before the training and after the training (difference between the two parts) shows an interesting pattern. Questions 1-4 sought to know how often teachers used computers, email, Internet and downloaded resources. A big shift towards *daily* use is noticed, with *weekly*, *monthly* and *others* showing a decline. Q4 (downloads) however shows a smaller shift with weekly use still positive, accounted not so much by a lower increase of *weekly* users, but by a very large shift amongst the rare users (32 to -1) and *monthly* users (11 to 4). Overall, the impact of the training in motivating teachers to become ICT users is clearly visible.

This trend continues across all the questions — teachers having discovered the use of ICT have significantly moved away from *rare users* to *more frequent users*. The very high negative scores in the *others* row is revealing.

| | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Daily | 39 | 42 | 33 | 31 | 15 | 11 | 9 | 20 | 26 | 23 | 15 | 18 |
| Weekly | -5 | -4 | -3 | 9 | 15 | 22 | 17 | 12 | 13 | 14 | 15 | 20 |
| Monthly | -13 | -9 | -8 | -7 | 9 | 10 | 11 | -7 | 1 | 4 | 9 | 2 |
| Others | -21 | -29 | -22 | -33 | -39 | -43 | -37 | -25 | -40 | -41 | -39 | -40 |



Questions 5-7 asked teachers how often they created resources — text, presentations, animation (eg., simulations) and multimedia resources. This set shows a larger number of *weekly* as well as *monthly* users. Time constraints can be high for a full time teacher. Teachers have reported during the interviews about the absence of steady access to computers; and also the lack of access at schools.

Questions 8-9 asked if teachers shared resources on the STF-KOER. Teachers have been sharing a variety of finds — weblinks, web pages, documents, presentations and question papers, almost anything they find interesting. The responses to these questions bear it out — a significant drop in *monthly* and *others*; particularly in *others* for Q9 (51 to 11). Teachers have found that participating in the STF is very convenient and useful.

Questions 10 – 12 sought to know if teachers used these resources in the classroom. Again one notices a significant drop in *daily* users and an increase in *weekly* and *monthly* users. Teachers interviewed have pointed to the absence of ICT facilities in school. Overall, the ICT schools are also low.

Teacher-educators from DIETs and CTEs have also been trained on KOER, the concept of OER, its processes, the KOER architecture (wiki), structures etc, but their actual participation has been very low. Though, to be fair, it is too early to expect increased participation. The DIET faculty have only had a limited exposure to this in the last year of 2013 – 14. They have been trained only for 5 days and the DIET faculty trained (120 in numbers) is a much smaller number as compared to teachers. There can be several reasons for lower participation — much lower (compared to teachers) familiarity and comfort with digital technologies, lack of actual classroom teaching participation for a long time, primary role as programme managers/administrators rather than as academics, lack of institutional support, multiplicity of tasks/roles etc.

However, there are faculties who have engaged more enthusiastically with the STF-KOER approach to TPD and teacher support.

Quality Assurance

The “write” access to KOER portal (to add/modify/remove resources) is presently restricted to teachers who have received formal training (through workshops) on the idea and principles of OER. These teachers have been selected by DIETs and the parameter for their selection includes “subject matter expertise”. Resources are uploaded from the STF mailing group by teachers and ITfC team after a preliminary review of the matter to exclude materials that seem meaningless or offensive or in violation of copyright. Thus if the material seems to be basically relevant to the subject, factually correct and non-offensive, it is uploaded, without applying any other lens of “quality” to it. This is based on a premise that quality derives from usefulness as seen by the teachers in their local context, and that materials created by practising teachers would factor in local contexts and needs to a greater extent than materials prepared by experts removed from these geographies and interactions with these age groups.

Secondly, the choice of a wiki platform for KOER makes refinement/revision by others possible. Histories of such revisions are also available. Together the group can improve the resources. A review of the histories would also be a QA process in itself. However this process is not yet institutionalised.

Teacher peer review and feedback along with review by ITfC team is the primary method of QA. However, RMSA-DSERT have plans to establish a formal process of review through the formation of a formal State Resource Group that would have subject-wise experts from among teachers and teacher-educators, providing the structure for a formal QA process.

Specific processes of QA such as review, feedback, refinement, identification of lacunae etc., is important from the point of presentation of content on a public portal and provides it an official stamp of approval. However the programme has a deeper objective of creating participatory, transparent processes, which explicitly establishes a non-threatening environment for the participating teachers and educators. In fact, the programme considers this as a means to strengthening the teachers’ self-belief and consequently enhancing the contribution of the teachers

to the overall improvement of quality. Keeping both of these apparently opposing desires in context and driving the right balance would be essential to nurture the forums. The choice of a wiki platform and the constant reemphasising of democratic ideals have significantly contributed to the current levels of participation.

Discussion of the Findings

Overall, the interviews, the mail statistics and the shared resources on the KOER taken together indicate a growing interest among teachers. Participation on the forums is steadily increasing. While new members are joining in continuously, the density of mails is also increasing, suggesting increased participation. The total number of mails across these lists has crossed 35000 over three years.

The KOER repository has so far received 549,541 page views (as of September 30, 2014). The STF-KOER, while different technically, are part of a single programme intervention. Teachers who have become active in STF and have begun to share resources are now slowly inducted into KOER. KOER can be treated as a curated subset of the STF resources. About 150 teachers have “write” privileges and these teachers are directly creating resources on KOER. This list is also growing.

The KOER repository is not getting populated to the extent and in the manner envisaged. The assumption was that teachers will be able to create materials once the opportunity and space are created. This has not happened yet. There is a growing awareness that this process involves helping teachers examine their own content understanding, their skills of self-learning, skills of participation and expression, besides making time and overcoming constraints.

The effect of the participation beyond the forums is difficult to gauge. KOER is still a new interface. While some of the enthusiastic ones contribute to it, it is yet to become a place to seek resources from. The STF directly delivers the attached resources, being essentially a mail transaction. Hence what the teacher does with this resource and how many of the teachers do such things are difficult to infer.

However teachers interviewed did indicate a broader understanding of resources for teaching learning, eagerly attempted to create and share their creations and even attempted their use in the classrooms. The enthusiasm at celebrating the creations was also high.

The use cases themselves do not reveal the teacher critically examining the resource, vis-a-vis its potential use in the class. Perhaps it is too early to expect such changes. The novelty of a richer variety of alternate resources has to wane off. At present, the personal adventure with the resources will prevail over its use in the classrooms.

Setting up a community of teachers was perhaps the easier part to help them engage in a variety of conversations, mainly concerning their professional lives. The teachers interviewed reported that not many of their fellow colleagues joined the forums. What can be inferred straightaway is the relatively low traffic — about 3500 teachers of mathematics and science making about 400 submissions together over a month. However, this needs to be understood by locating it in the ICT context in which the project operates. The community generally, as would perhaps be the case across the country, except in some urban pockets, relies very little on ICT as a means of communication. Mobile infusion, primarily as a telephone would emerge as the most predominant use.

In the school, ICT appears in the form of a few computers, mostly contained in an ICT laboratory¹⁵, more often, *not* connected to Internet. Again, very few schools can boast of even this infusion¹⁶. In general, the community remains untouched by ICT. The fact that computers and computing is not a part of the standard equipment also means that the teachers' time allocation for ICT will have to be found outside the regular timetable. Interviewed teachers went to great lengths to make their class interesting — downloading resources, creating them and burning the midnight oil in a way are indicative of a healthy personal commitment to improving their professional space.

Personal initiative and awareness have prompted many teachers to acquire personal devices — laptops and increasingly smartphones. However, the novelty and convenience of the latter has also prompted parallel conversations using various Messenger apps outside the STF. For a teacher, the conversation is more significant than the means, STF in this case¹⁷, although, two of the interviewed teachers reported that some of the interesting conversations and resources are repurposed onto the STF. This cross-posting is also noted in the STF mails analysed.

However, within the group of participating teachers, the nature of the traffic points to the progress on the paths the programme has taken. The forums are increasingly being used for asking questions or seeking help, responding to fellow teachers' queries or providing feedback to their submission and engaging in discussions, however short-lived.

The resource sharing, particularly those that are created by the teachers themselves are also noteworthy. These outnumber outside resources being pointed to. For a resource-challenged system, the urge to *pick up and hoard all the goodies* from the web should have been enticing. There is also an attempt to pick up a shared resource and revise it. Teachers interviewed also indicated the formation of small interest groups (still very few and far between, but significant in its import) which help them in understanding, critiquing and improving each others' contributions.

It is too early to attempt to conclude on the potentials of STF-KOER OER repository emerging into a sustainable model of resource creation, though it is clear that resource sharing is being increasingly seen by STF teachers as a regular academic activity, or even responsibility.

Impact Assessment

The study attempted to examine the development of OER and the influence it would have on the teaching learning practices of teachers. The context of the programme being studied provided an interesting departure from the conventional practice of OER production emerging out of experts. The programme seeks to engage teachers in a process of critical self-examination feeding back not only into teachers' awareness of their professional self but also take back ideas and resources from the collective to feed into their classroom practice.

¹⁵ This is the general design across the country; except that there may be a few personal devices too.

¹⁶ About 13.75% schools as per data cited at the beginning of this document.

¹⁷ Hence the emergence of the Whatsapp and Hike Messenger groups mentioned earlier.

The largest stumbling block to the process has been the very low penetration of ICT devices and connectivity, inhibiting the emergence of an ICT culture. In the absence of this environment, the teacher participates through a greater investment of time, effort and energy; something that she finds it difficult to sustain beyond the workshops, training programmes and other such contrived possibilities.

The second major stumbling block is the inability of the state to integrate ICT into the overall workings of the schools. Financial resources will continue to dissuade such investments and continue to nurture a disconnect between what happens in a classroom and what the teacher in the forum perceives as the newer possibilities. Such frustrations on the forums are becoming common.

Why would a teacher venture out to use ICT for teaching learning? Behind all the perceived goodies offered on the Internet, there is a painstaking effort required in locating, retrieving, curating, integrating, and finally showing it in the class. The negotiation of hardware, time and support environments to do this is still difficult. A teacher interviewed stated, rather as a matter of fact, that she does not use ICT in her 10 grade classes. Why would an otherwise quite motivated teacher, who even champions technology use in ICT on the forums and training programmes, reach this threshold of diffidence? The perceived intrinsic value of the resource to the teaching learning context, the perceived ease with which a teacher can use it, and the perceived gains it results in, create a set of factors, which mostly inhibits a willing fence sitter. Only when one of these three clearly over compensates for the other two, should we expect teachers to use the resources in the class.

The state on its part is forced to keep the curricular process — textbooks, examinations, etc., insulated from ICT. Even hyperlinks to sources of information on the web cannot be put into the textbooks, without apprehensions of contributing to unequal distribution of access to education. How can it ask children to use the web, when it cannot ensure connectivity in its classrooms?

Interviewees have also mentioned that they immediately look up every mail alert on their mobiles, therefore the STF as a push mail reaches its targets. However, the same mobile interface makes it difficult to respond back. The consequence is a short immediate response or no response at all. The space for a considered response to the query or argument is reduced. Sustaining a discussion therefore is more difficult (as is borne out by the data). At the same time, it would be difficult to infer a lower interest among teachers. Some teachers reported parallel direct conversations with new friends found on the STF. So, interestingly, while the STF serves one of its primary purposes, viz., networking, the benefits of the networking will have to be seen outside the forums.

Conclusion

The programme's objectives of bringing together teachers show clear signs of fructifying and the interactions when nurtured will result in a professionally aware group of teachers, willing to and adequately informed to take on their rightful roles of arbitrating the curriculum and schooling processes.

OER in the context of this programme ranged from individual media objects performing the function of teaching aids to viewpoints of teachers supplementing the growing discourse on education in the local context.

The growth of this library of resources, the quality of the curation process and its increasing use by teachers for their own self development or enriching their classes would constitute a proof of the idea. However, this does not appear to naturally bring the teachers together and engage them in the conversations.

It would be tempting to consider a supply of a pre-curated, expert-validated tranche of resources. While the teachers' own choices may not be the best, given that they may not have encountered the best — and this would always be the case, this begs for the objective of developing teacher capabilities to critically view the resources and an editable platform. As their exposure grows, they would revisit and improve collections continuously and the critical voices of the group would be honed all the time. This would help the teachers take charge of their professional lives. The hopes of OER enthusiasts would then have been met.

Though it is relatively early to conclusively establish, the STF-KOER programme holds promise, of a sustainable model of OER ACCP that can influence educational outcomes, reclaim teacher agency through participatory processes and nurture the creation of contextualised digital open learning resources.

Chapter 3 Open Textbooks: Liberating the Classrooms

~ KC Li, KS Yuen and Alex JW Wong

Abstract

In 2012, the Open University of Hong Kong obtained funding from a charity through the support of the Hong Kong government for a project to develop an open textbook system for Hong Kong. This case study reports on the project's progress by summarising its background, the main features and the milestones crossed during development. While the project includes open textbooks for all levels of education (primary, secondary and tertiary), the analysis in this report focuses only on the impact and effects in the initial use of the open textbooks for primary and secondary schools.

Introduction

The Open University of Hong Kong (OUHK, formerly the Open Learning Institute of Hong Kong) has provided a substantial quantity of open learning resources since its establishment in 1989, due to its use of self-instructional learning materials through its formal distance learning courses. Following its mission to make higher education available to all in Hong Kong, the OUHK has been making its quality learning materials freely available since its inception. The University's complete sets of printed and multimedia course materials have always been made available in Hong Kong's public libraries for the public's reference, and television programmes with contents related to its courses are broadcast through a free local TV channel every Sunday morning. The University joined *iTunes U* (a delivery channel of Apple) in August 2010, and provided free courseware for download by people around the world. Also, it offers 150 modules of *Free Courseware* which are units of its distance learning courses, at its Knowledge Network (<http://kn.ouhk.edu.hk>). Concerned over the escalating cost of textbooks, especially at the pre-tertiary level, the OUHK developed a proposal and obtained funding through the Chief Executive's Community List to develop *Open Textbooks* under a Creative Commons license that will permit teachers in classrooms and others outside classrooms to reuse, revise, remix and redistribute the contents of the books, with attribution to the University. Such open textbooks will not only be made available *freely* to teachers, students and the rest of the community but also permit users to update and contextualise the information in the books regularly to suit particular times and clientele.

Background to the Project

Both the government and teachers in Hong Kong generally agree that textbooks play a crucial role in the teaching and learning process in schools (Education Bureau 2009, 25).

The high cost of textbooks has been a perennial problem for Hong Kong with annual increases far exceeding inflation before 2009 (see Appendix I). It has been the policy of the Government of Hong Kong not to provide textbooks to teachers; textbooks are mostly published by commercial enterprises which invest heavily in producing high quality print based materials. By and large, a panel of specialist teachers in each and every school does the selection of a textbook for use in named subjects.

Teachers do so from a Recommended Textbook List (RTL) issued by the Education Bureau (EDB), on the basis of a number of criteria (see guidelines from Education Bureau, 2014a). The inclusion of the book in the RTL, which indicates compliance with the EDB curriculum/syllabus requirements, is an informal requirement for the choice of a book for use in a school. In the past, publishers provided teachers with copies of textbooks and associated teaching materials free of charge, very similar to pharmaceutical companies giving medical practitioners sample drugs. Not surprisingly, this has led to practices which are deemed unhealthy for a variety of reasons including the fear of compromising the basis by which books are chosen.

Continuous pressure on government to intervene in the pricing of textbooks led to some minor adjustments to policy implementation and a few major adjustments have led to policy innovations. The minor adjustments included the following:

1. Freezing of prices in 2009 (Consumer Council, 2012)
2. Keeping annual increase in prices to below inflation
3. De-bundling the cost of textbooks from that of supplementary materials such as worksheets, quizzes, multimedia classroom aids and other items given “freely” to teachers by publishers whose books are recommended (Education Bureau, 2014b)
4. Reducing the frequency of new editions, where revisions are minor and imposing an additional condition that revisions be done once every five years (Education Bureau, 2009). [The downside of this condition is datedness of content in an era where new information and knowledge is refreshed so rapidly.]

The major adjustment included a consideration of the use of digitised textbooks to replace the printed books. Since the beginning of the last decade, electronic versions of print-based textbooks have been available in Hong Kong; however commercial publishers were averse to making available electronic versions for fear of “piracy” amongst purchasers of such textbooks. A Consumer Council Report (2001) highlighted this issue, which was subsequently taken up by the Government in 2008 (Hong Kong Government 2008, para. 51). It led to the government policy that e-learning resources should move beyond playing a supportive role and be mainstreamed. To follow up, the EDB in May 2012 launched the E-textbooks Market Development Scheme (EMADS, see Education Bureau 2012), which provided subsidies to non-profit-making organisations to develop e-textbooks for schools at a price lower than that for printed textbooks. The scheme also aimed to establish a “Recommended Textbooks List for e-textbooks” (e-RTL).

e-Learning and OER in Hong Kong

Although the government of Hong Kong has begun promoting the adoption of e-textbooks and e-learning as a way to tackle high prices of printed textbooks, it has yet to formulate a policy on open educational resources (OER), as a feasible and effective approach to go hand in hand with the promotion of e-learning. This policy vacuum has to be addressed at some point as e-textbooks become more popular and users begin to demand greater freedoms to manipulate and adapt content to suit (micro level) classroom conditions. With the establishment of the Creative Commons Hong Kong Chapter in 2008 (Creative Commons n.d.), Hong Kong's resource-sharing culture, or the offer by the rights holders of the use of their copyrighted materials free of charge, is starting to spread slowly amongst the educational community.

The EDB recognised the role for e-learning resources in education. For a long time, the EDB itself has been operating the wholly owned Hong Kong Education City (<http://www.hkedcity.net/>) providing abundant digital teaching and learning resources in all school subjects to teachers and students. Teachers are encouraged to use these materials in their teaching in schools; however, these web contents do not indicate the exact license rights teachers are entitled to have for revision, reproduction or distribution. A formal policy on OER is hence useful for e-learning development in Hong Kong.

The project described below, which is very much a work in progress, has been designed to provide a solution in a policy vacuum around OER, and in an environment where the costs of published printed textbooks are escalating annually, public unhappiness with the increase in textbook prices is palpable, and e-learning resources are finding favour amongst policymakers and consumers of textbooks. Those undertaking this project expect that their findings will offer answers for some if not all of the abovementioned challenges.

The Project

The “Open Textbooks for Hong Kong” project (<http://www.opentextbooks.org.hk/>) aims to establish a sustainable system which provides quality open textbooks for adoption and adaptation at minimal cost for students and teachers at primary, secondary and tertiary levels in Hong Kong, and any others across the world.

Perceived Benefits of Open Textbooks in the Hong Kong Context

As in the case of other open textbooks around the globe, the “Open Textbooks for Hong Kong” offers many advantages. Those particularly relevant to schools in Hong Kong are:

1. The price of the printed textbooks is greatly reduced. With the use of the Creative Commons license on the textbooks, teachers, parents and students only pay for basic printing costs for the printed copies, through our recommended on-demand printers. We estimate that our open textbooks will cost about 30% of an average textbook in the market. (See Appendix II for a comparison of the anticipated prices of open textbooks with textbooks produced by commercial publishers.)

2. The e-versions of the textbooks are free of charge. Since the e-textbooks can be downloaded and are also easily accessible online, they are in the best position to support active and flexible learning. The digital form and multimedia elements of the content enrich students' learning experience.
3. Where necessary, rapid revisions and timely updates of the contents of the textbooks can be made efficiently. If online versions are used, then any changes made by teachers can be accessed instantly by students.
4. Teachers are able to select and customise the open textbooks to cater for the specific needs of particular groups of students.

The Project Team believes that open textbooks will not only help to keep the price of textbooks down, but it is also an appropriate strategy for Hong Kong to engage in effective e-learning, which this city has been talking about for more than a decade but has not seen substantial development. With open textbooks, teachers are empowered with appropriate resources to develop e-learning in the classroom.

Funding of the Project

The Project received funding, of about HK\$17 million, from the Jockey Club of Hong Kong to cover the following cost items:

1. Setting up the platform (including hardware, software and system development)
2. Staffing for the management and administration of the project, including the initial investigative studies
3. The development cost of the open textbooks and associated teaching materials for 12 textbooks at primary and secondary levels
4. The development of e-versions of course materials for seven core subjects in a secondary-level programme called Yi Jin (<http://www.yijin.edu.hk/eindex.html>)
5. Searching for open textbooks at degree and sub-degree levels, and the adaptation of the materials
6. Promotion and marketing of the open textbooks system
7. Initial awareness and training for teachers to use the system.

The development of the “Open Textbooks for Hong Kong” platform was estimated to take 32 months to complete, from 1 January 2013 to 31 August 2015.

Scope of Work

The project is being carried through three phases: (1) a pre-project study of teachers' views, attitudes and experience in using printed and digital resources, (2) designing and creating the open textbooks, and (3) testing of the use and reuse of open textbooks by teachers and students. Each phase is summarised below.

Phase 1: Teachers' Views and Experience in Using Commercial and Open Resources

In order to understand the attitudes and expectations of teachers in their use of commercial and open textbooks, a survey was conducted from August to October 2014. There were 167 respondents in total, of whom 76 were primary teachers, 83 were secondary teachers, and eight were teachers teaching at both primary and secondary levels. The survey was designed to find out:

1. The awareness of teachers on OER and open textbooks, and their readiness to use and contribute to open textbooks
2. Teachers' experiences in using commercial printed textbooks, and how satisfied they are with them; and
3. The critical factors in deciding what textbooks are used in their schools.

A copy of the questionnaire used in the study can be found at:

<http://www.opentextbooks.org.hk/resources>.

Awareness of OER and Open Textbooks, and Readiness to Use and Contribute to Open Textbooks

Among the 167 respondents, only 62 (37.1%) said they were familiar with OER, with the others being barely familiar with it or even having no idea of what it is. Details are shown in **Figure 1**.

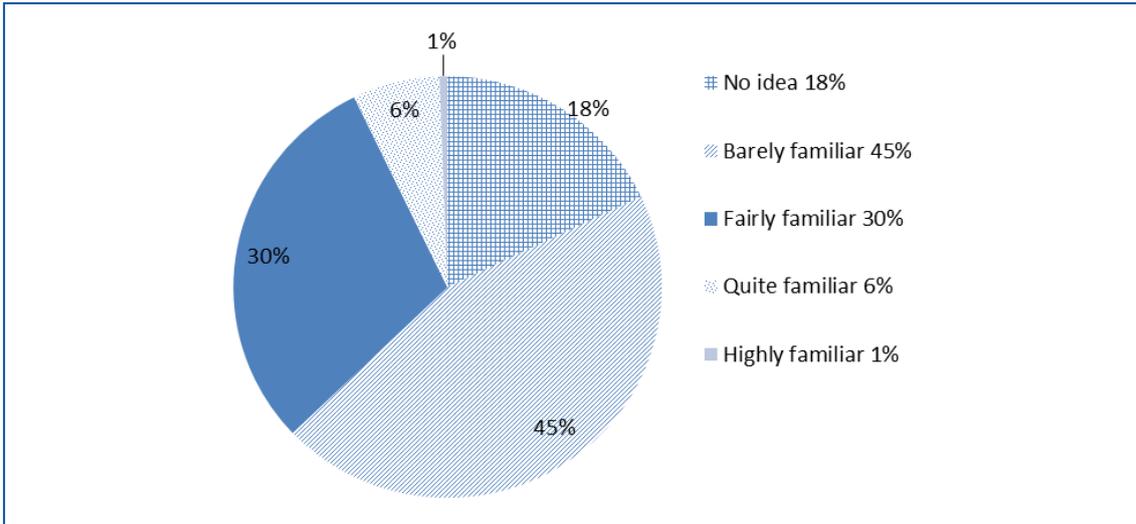


Figure 1 Familiarity with OER

Only 39 teachers (23.4% of the respondents) had experience of using open textbooks or open access materials in their teaching (**Figure 2**). A much smaller percentage of them had contributed (to revising existing OER or creating new ones) OER before (**Figure 3**).

Such information provides the baseline figures of open textbooks awareness and usage, which is useful for our subsequent consideration of provision of training and capacity building in teachers in the adoption and subsequent adaptation of open textbooks.

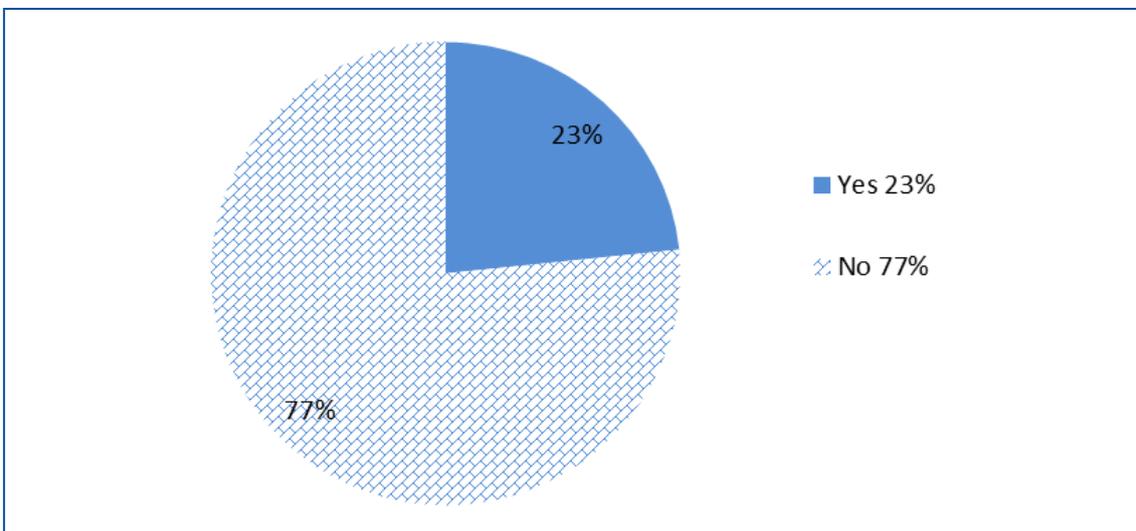


Figure 2 Experience of using OER or open textbooks

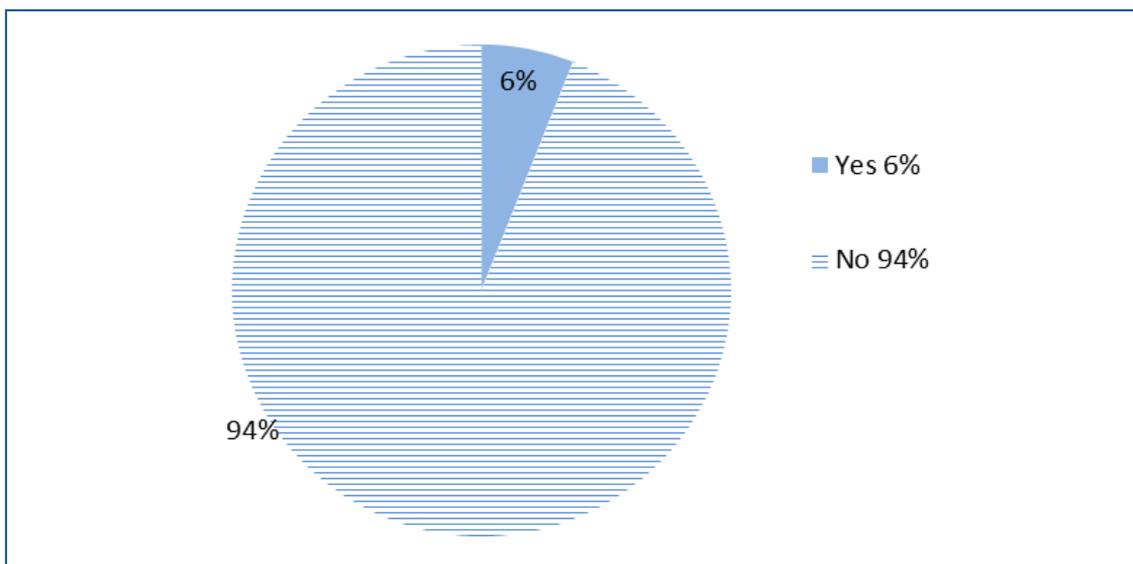


Figure 3 Experience in contributing to OER

If the teachers are to use open textbooks in the future, 67.1% of them said they would use the online version, 63.5% would use the printed version, and 61.7% would adopt only selected parts for teaching. Of the respondents, 40.7% would use the open textbooks in parallel with other textbooks; and only 24.6% would revise and redistribute open textbooks (i.e., to contribute or share revised contents online). The relevant data are shown in **Table 1**. The figures are of importance for our planning of capacity training workshops for teachers.

| Ways of using open textbooks | No. of teachers | Percentage |
|---|-----------------|------------|
| Online version | 112 | 67.1% |
| Printed version | 106 | 63.5% |
| Adopting only selected parts | 103 | 61.7% |
| Using them in parallel with other textbooks | 68 | 40.7% |
| Revising and redistributing open textbooks | 41 | 24.6% |

Table 1 Ways of using open textbooks by the teachers

Note: Participants could choose more than one option.

The factors influencing the teachers to use open textbooks were measured. A list of factors was presented and the teachers were asked to indicate the importance of each. Again, a scale ranging from ‘not at all useful’ (1), ‘barely useful’ (2), ‘fairly useful’ (3), ‘quite useful’ (4) and ‘highly useful’ (5) was adopted for measurement. The results are shown in **Table 2** in descending order of usefulness.

| Factors influencing the teachers' decision to use open textbooks | Mean |
|--|------|
| Academic quality of the materials | 4.33 |
| Availability of supplementary materials | 4.27 |
| Hardware and software to facilitate use | 4.26 |
| Time to find, review, and select open access materials | 4.14 |
| Knowledge about open access materials | 3.96 |
| Desire to reduce cost to students | 3.88 |
| Environmental concerns | 3.71 |

Table 2 Influencing factors of the teachers' decision to use open textbooks

The results show that quality control of the open textbooks should be emphasised to encourage their adoption. The findings also indicate that training in the hardware or software to facilitate the use of open textbooks, and effective ways to find, review and select open access materials, are necessary to increase teachers' desire to use open textbooks.

Experience and Satisfaction of Teachers' Use of Existing Textbooks from Commercial Publishers

Questions were asked to understand the teachers' experience and satisfaction in using existing textbooks from commercial publishers (including the supplementary materials provided by textbook publishers). In their responses regarding the adequacy of commercial textbooks in fulfilling their teaching objectives, most teachers thought their existing textbooks are adequate for their teaching purposes, as shown in **Figure 4**.

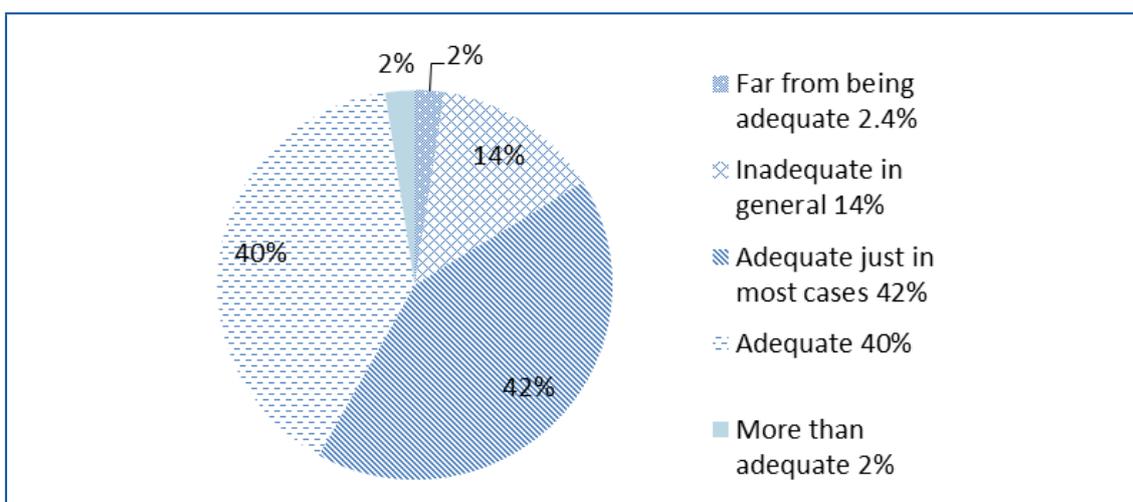


Figure 4 Adequacy of existing textbooks in fulfilling teachers' teaching objectives

When asked how often they wish to tailor the textbooks themselves for the specific needs of their classes, responses as shown in **Figure 5** suggest a general need for textbook-tailoring by teachers. It was noted that no one chose the option ‘never wish to tailor the textbooks’.

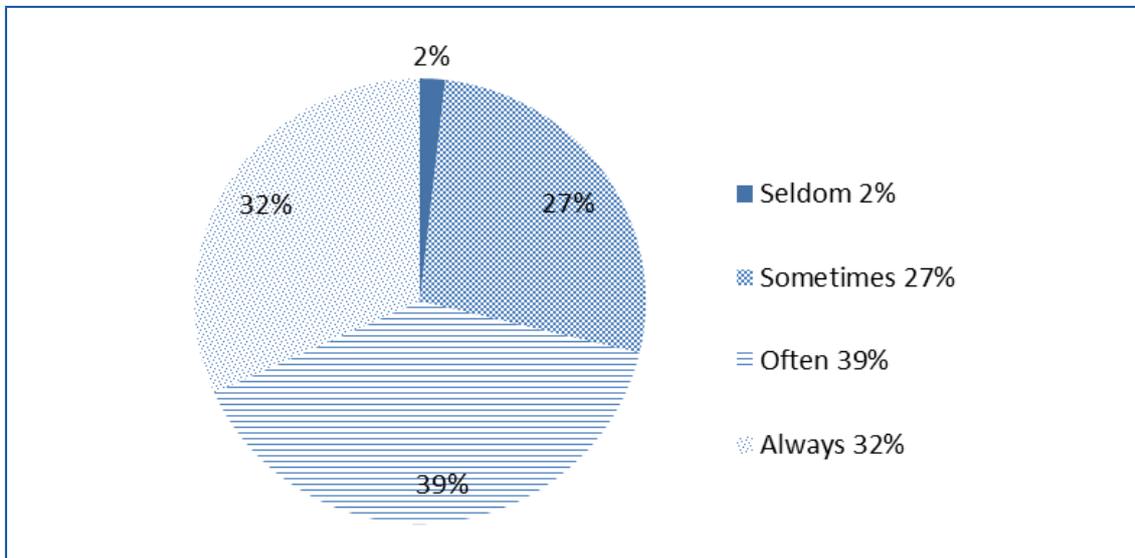


Figure 5 Teachers’ tendency to tailor the textbooks/teaching materials to suit the specific needs of their classes

When teachers need to prepare customised instructional teaching materials, the resources they mostly used are listed in **Table 3**. The reason for teachers’ preference for Internet materials is probably due to it being less time-consuming to search and obtain a softcopy for adaptation and adoption. So, if OER or open textbooks have quality materials stored in an organised system, teachers will probably be ready to use OER.

| Resources used to prepare customised teaching materials | No. of teachers | Percentage |
|---|-----------------|------------|
| Resources available on the Internet | 145 | 86.8% |
| Teaching packages provided by textbook publishers | 121 | 72.5% |
| Materials from other colleagues | 84 | 50.3% |
| Materials from HKEdCity or the Education Bureau | 51 | 30.5% |
| Materials from students | 28 | 16.8% |

Table 3 Resources that teachers use to prepare customised teaching materials for their own use
Note: Participants could choose more than one option.

Critical Factors in Deciding which Textbooks to be Used

In Hong Kong, who in a school decides which textbooks are to be used? It is found that the teachers and the subject panel chair are more likely to make the choice. Relevant data are shown in **Figure 6**. This is useful information for the promotion of open textbooks — teachers are the ones to be convinced to adopt the textbooks.

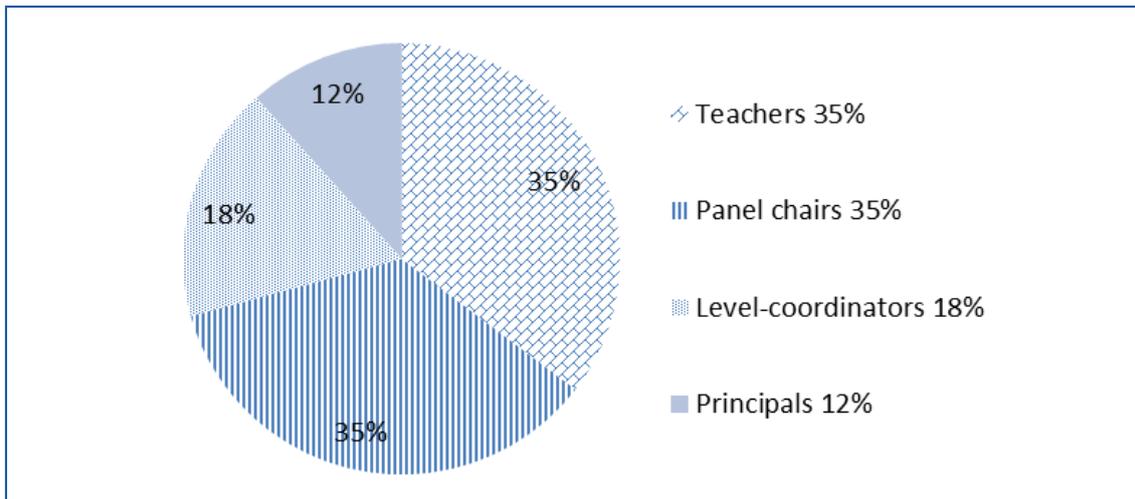


Figure 6 Persons choosing the textbooks

The teachers were asked about the level of importance of the common factors to consider in selecting textbooks, with a scale ranging from ‘not at all important’ (1), ‘barely important’ (2), ‘fairly important’ (3), ‘quite important’ (4) and ‘highly important’ (5) for measurement. As shown in **Table 4**, the results suggest that textbooks need to satisfy many requirements before they are being adopted.

| Important factors in selecting textbooks | Mean |
|---|------|
| Quality of content | 4.73 |
| Effectiveness of application in teaching and learning | 4.64 |
| Level of difficulty | 4.61 |
| Provision of support resources | 4.51 |
| Support from publishers | 4.19 |
| Design in editing and printing | 3.98 |
| Textbook prices | 3.73 |

Table 4 Important factors in selecting textbooks

Conclusion on Attitudes and Expectations of Teachers

The survey allows us to understand teachers' readiness for OER. This information is useful for us and for Hong Kong's education planners.

We found in the survey that most of the Hong Kong teachers are not familiar with OER, so we have the huge task of promoting OER ahead of us in terms of awareness campaigns and trainings on the adoption and adaptation of OER.

Teachers interested in using open textbooks will mostly use both the online and the printed versions, adopting selected parts, and using them in parallel with other textbooks and learning resources.

This means that we have to accept that teachers will not rely totally on our books in their teaching. A small percentage of them will revise the content before they use the textbooks. The implication is that in our initial offering of the open textbooks, our emphasis can be on the adoption of the books as they are, and training for the adaptation of the content can be carried out at a later stage.

Regarding factors to consider in adopting a textbook, the teachers indicated that they place emphasis on the teaching functions more than the learning functions for students. The crucial factors in deciding to use a textbook are: its academic quality, and the availability of supplementary materials associated with the book, as well as the hardware and software to facilitate usage. We also noted that the books' price reduction is the second last (the last being environmental concerns!) consideration of all the factors for textbook selection. For our textbooks to be chosen by teachers, we therefore have to ensure the quality, and the availability of associated materials. We know our system has an advantage because OER will allow collegial contributions of open resources and so the growth of such materials will be quick and large in quantity.

While the majority of teachers felt that the existing commercial textbooks are adequate to fulfil their teaching objectives, most of them often wish to tailor the textbooks and teaching material to improve teaching of their classes. Open textbooks will meet their need in this regard.

The findings from the survey suggest that our open textbooks project basically meet the needs of Hong Kong teachers, and point out the appropriate direction in which the project should proceed.

Phase 2: Development of Open Textbooks

In Phase 2, the necessary infrastructure such as an online Open Textbook platform, a course design and development team, and quality management protocols were established. Out of the HK\$17 million project funding, about HK\$3.4 million was used for building the platform, and HK\$4.0 million and HK\$5.7 million were respectively used for the writing and publishing of the primary and secondary textbooks (including the fees for authors, designers, editors, web support and so forth). Detailed breakdown is given in Appendix III.

Platform Development

A platform has been developed according to schedule as a Drupal-based content management system (CMS). The platform includes functionalities for managing open textbooks and user accounts. Functions for hosting and extracting ePub files are complete and the platform is being fine-tuned for enhanced performance to support the online ePub reader. With the online ePub reader integrated into the OTB platform, users can read ePub files and do the interactive exercises online. Data such as bookmarks, annotations and students' answers can be saved and retrieved through the platform. Both the contents and the online ePub reader have been tested on various platforms and devices. Teachers and students can use them with major browsers in desktop computers, and iOS and Android tablets. The platform has the following functions:

1. There is a repository in which textbook contents, courseware, teaching materials and resources are hosted. Users can choose the textbook contents and teaching resources they need and adapt the materials for their use.
2. A two-way process is supported in the system where users can utilise the platform interactively. They can browse, download, revise and recreate the materials, and also upload materials to the same site. This structure allows an ongoing growth of the content with the bottom-up involvement of the users, stakeholders and volunteers.
3. Users can download as well as print out the chosen textbooks and adapted materials, even for mass printing.
4. The electronic versions of the selected courseware and materials can support online and mobile learning, which enables schools and teachers to produce their individual websites to host the adapted textbooks and materials.

Textbook Design and Development

Open textbooks at tertiary, secondary and primary levels are made available on the platform. The complete set of 12 open textbooks at the primary and secondary school levels for the English Language subject according to the curricula set by the EDB and relevant teaching and learning materials is the key development part. Besides it, there are over 100 open textbooks at undergraduate and sub-degree levels; e-versions of course materials for seven subjects in the *Yi Jin* programme; and over 100 units of degree-level courseware of the OUHK's courses.

The set of textbooks developed for primary and secondary schools has been given the title, *Open English*. They are produced using OUHK's course development model of a textbook development team consisting of an author (the chief subject specialist), an instructional designer, and co-authors (subject experts, who also take the role of peer reviewers). There is also a team of specialist technicians and technologists, such as multimedia and mobile learning technologists, programmers, Web designers and illustrators, who assist in the production of the print and e-versions of *Open English*. The multimedia and mobile learning technologists oversee the overall programming work: building the editor; developing the conversion process for XML structured contents; converting DITA content into various formats (viz. HTML, eBook, ePub and PDF); maintaining and enhancing the conversion and export process; developing interactive activities by mobile programming codes using ePub; and developing the online ePub Reader. The programmers

follow the pre-set programme codes, convert the text from different sources into Word format and upload text (final version) to the platform. The Web designers are responsible for the actual formatting and layout work; and the illustrators provide illustrations and create cartoons in electronic format.

Quality Assurance

In order that *Open English* is actually used by primary and secondary schools, the contents have been designed to be closely aligned to the syllabi set by the EDB. The books will encourage active and flexible learning and we are mindful of students’ interests, needs and expectations. The open textbooks are not only restricted to traditional print or digital formats but they also include interactive learning contents with useful online resources selected and hyperlinked (e.g., QR codes on the printed texts) for students’ further enrichment.

A quality assurance mechanism was set up and overseen by a team of subject experts, editors and technologists to monitor the development process, review every item admitted to the platform and assess its quality. They are the “gate-keepers” for performing internal quality procedures. Also, the contents of the platform are continually reviewed, updated, improved and enriched on the basis of the responses received.

Phase 3: Testing the Use and Reuse of Open Textbooks

In phase 3, we began our testing of both the platforms as well as the sample open textbooks that were ready for use. Nineteen primary and 24 secondary schools joined in this trial of the textbooks since September 2014. A total of 81 primary school teachers and 1,530 primary students, and 95 secondary school teachers and 3,590 secondary students participated in this trial (see **Table 5**).

| | Teachers | Students | Schools |
|-------------------|----------|----------|---------|
| Primary schools | 81 | 1,530 | 19 |
| Secondary schools | 95 | 3,590 | 24 |

Table 5 Number of teachers and students participating in the “tryout” scheme

In November 2014, 16 teachers from six of the schools who had used the textbooks for one and a half months were asked to participate in a study of their usage of the books and the impact after use, either in a small group using a face-to-face mode, or individually by telephone. Six short quantitative questions were asked about the way they used the books, and the initial effect after their use. All respondents were asked to elaborate on their responses. The six questions used in the telephone interviews and group interviews can be found at:

<http://www.opentextbooks.org.hk/resources>.

Preferred Formats of the Open Textbooks Used by Teachers and Students

Teachers were asked what formats (print, PDF, eBook, ePub and Web versions) of the books were used. In three schools, teachers used only print, while in the other schools, teachers also used the e-versions, mostly by themselves. Most teachers did not introduce the e-versions to their students.

The teachers gave many reasons why the e-versions were not introduced to students. The most common reasons were:

1. The school does not have enough iPads for each student; and teachers feared that students might use iPads to do things unrelated to the subject matter during the class when they use the e-textbooks.
2. The school has not promoted the use of e-textbooks.
3. Not every student possesses an iPad.
4. Internet access in the school is limited.

When asked how they used the e-versions of the textbooks in the classroom, one teacher said she showed some PowerPoint slides using screen captures from the e-textbooks, and projected them in her class. Others indicated they would use the online (Web) version of the textbook for projection. A teacher from a special school said she played the songs included in the e-textbooks, as a reward for good performance by her students.

The extensive use of the printed format, with occasional and gradual extension into the various e-versions of the open textbooks, both for teachers and students, is in line with our expectation of how e-learning can be promoted. e-Learning should be a gradual and changing process, and any abrupt change to another medium can hardly be feasible in schools.

Impact of Open Textbooks on Pedagogical Practices

Teachers were asked to compare the way they used the open textbooks with the way they taught before. By and large, teaching practices structured around open textbooks were not seen to be much different from that of using commercially published books. The majority of the teachers (13 out of 16) indicated that there was not much difference in their teaching strategies when they used the open textbooks. One teacher said she had to make some modifications to the open textbooks to suit her needs. Another mentioned that she had to search for more pictures and photos and other resources to supplement the books in her teaching.

Students' Performance

Eleven out of the 16 teachers said it was too early to say anything about the impact of the textbooks on the learning outcomes of students — after all, students had used the books for less than two months when the interviews were conducted. However, anecdotal comments from some of the teachers regarding the open books' effect on students' learning were quite favourable. Five of the teachers' remarks are listed as follows:

1. There seemed to be some improvement in students' performance. Students made fewer errors in the exercises, and their referring skills seemed to have improved. This might be attributed to the arrangement of the text and the diagrams, which allow students to find the answers more easily; nevertheless students get the answers right more often, and this surely enhances their interest in learning English, as well as their confidence in the subject.
2. I can see positive effects on students. The supplementary exercises have provided more opportunities for students to practise handling different types of tasks, and they could find answers more easily. They learned more vocabulary, and this increased their confidence in the English language.
3. I can see some improvement. Students learned faster in catching up with the vocabulary.
4. Students in the above-average class can use the vocabulary and language structures learned in writing.
5. The students have broadened their theme-based vocabulary because open textbooks provide different sets of target words from the existing textbook.

Impact on Teachers: Their Evaluation of the Open Textbooks

Most of the teachers surveyed said they did not find much difference in using the open textbooks to teach compared with the commercial textbooks they had been using. Those who offered evaluative comments on the open textbooks were positive. Their comments are listed as follows:

1. My initial impression is that the resources for composition are well placed and well integrated.
2. The steps in writing (production guide) are clear, and teachers find it easy to use when the steps are followed.
3. As the topics for compositions are relevant to real life, students find it easy to write.
4. The open textbooks are better in terms of the difficulty level (the open textbooks are pitched at a more suitable level), the layout and characters used in the texts.
5. The open textbooks suit the school's needs, and fit the level for our students.
6. There are now more teaching resources, and teachers can spend less time preparing for them.

7. The books are in colour (compared with the teacher-developed materials), and are more attractive.
8. There are more vocabulary suggestions, so students can have more choices of words in their writing.
9. Some units are not used in the class, and students can use them for their self-learning.
10. We can now make use of the various formats of the textbooks, so the teaching is now more varied in form.
11. Students have more chances to get in touch with English through self-instruction using the ePub textbooks.
12. The coloured texts can increase students' motivation to learn.
13. The materials in ePub format are easy to use for the higher ability students for self-learning, so the teachers can look after the less able students.
14. The teaching matrix aligns well with our school's syllabuses for other subjects, which helps with teachers' lesson planning.
15. We like them because they differ from the commercial textbooks in that we teachers can make changes in them as we like and we can keep and use the modified textbooks which better suit our needs.
16. Yes, we need more vocabulary in the books.
17. The books are in colour and attractive.
18. The books are published in module booklets; students are more motivated to complete the units.

User Experience in Comparison to Their Expectations

In the interviews, teachers indicated they either adopted the open textbooks to replace the existing textbooks, or they only made use of a part of the books in their teaching. In view of their responses about how they used the open textbooks in their classes, and whether they made any changes to their teaching strategies, we can conclude that the open textbooks basically meet their expectations. Teachers using the trial versions of the books were seen to be comfortable using them in the way they preferred. The transition into using a new textbook seemed to be smooth.

Summary of Impact on Students and Teachers

Most teachers said it was too early to say anything on whether the open textbooks had a positive impact on students' learning outcomes, compared with the commercial textbooks they had been using. Anecdotal comments from the teachers are, however, quite favourable.

Other than learning outcomes, one teacher noted that students are happy to have the books because they are free — this is a strength of the open textbooks which should not be overlooked.

More than half of the teachers said they did not find much difference in the open textbooks compared with the commercial textbooks they had been using. This in a way reflects the ease and comfort of the teachers in using the open textbooks for the first time. The major difference we found is that the open textbooks differ from the commercial textbooks in that the teachers can make changes to them as they like and they can keep and use the modified textbooks which suit their needs better. This sense of “ownership” of the open textbooks is exactly what the open textbooks project wishes to instil in teachers. It is only when teachers see themselves as the owners of the open textbooks that they will start to get involved and collaborate in further enhancing the open textbooks for the teaching community to share.

Many teachers praised the strengths of the textbooks in terms of content, layout and other features. We believe with more contributions from teacher users, the quality can be further improved. We also found that our open textbooks were specifically welcomed by the special needs school, which had found them most useful for their teachers in tailoring learning materials for special needs.

Looking Ahead

By the middle of 2015, we should be ready to launch the beta version of Open English for the use of students from primary to upper secondary schools. To be acceptable as a textbook, the material has to receive approval from the EDB. We expect to be successful in our bid and also confident the open textbooks will be used by 10% of the primary and secondary schools in Hong Kong.

Looking ahead, for the sustained development and maintenance of the books, we will need financial assistance from multiple sources including realising some revenue from the books themselves through sale ranging from printed versions of the books to audio versions and extra study aids associated with the textbooks; donations from individual users and major foundations, such as the Hong Kong Jockey Club, and even online advertising on the open textbooks website.

Conclusion

This pilot project will surely enable the provision of inexpensive printed textbooks and free e-textbooks to teachers, parents and students. Teachers very much wish to tailor teaching materials to suit the need of their classes and open textbooks can meet this demand. Also, while the EDB has been promoting school-based learning resources, it has proved to be very difficult for teachers to develop their own quality digital teaching materials. Open textbooks would satisfy this need as they offer a good starting point for teachers to create their school-based learning resources.

In the impact study, we found that teachers would search for more pictures and other resources to supplement the open textbooks. This is evidence that teachers are “led” to move towards e-teaching. With the open textbooks, teachers and students find it convenient to reuse, revise, remix and redistribute the content. Hence, teachers are empowered to move confidently to e-teaching and e-learning.

We are still waiting to see if the open textbooks bring improved, or at least a similar level of, students’ learning outcomes when compared to the traditional commercial textbooks. All anecdotal comments we have obtained are favourable.

As regards to students’ feedback, again only indirect and qualitative comments are available. The general impression is that the reception of our open textbooks is at least as good as or comparable to existing commercial textbooks.

Confident as we are about a future for open textbooks in Hong Kong, we are also mindful of the barriers and challenges ahead. Some uncertainties that come to our mind as a result of this project include the following:

1. *Open textbooks are free of charge, but for how long?* Since the start of development of the open textbooks project, we have received approval from initial users. As we are moving towards the second phase of the project, the “adoption phase”, we need to ask ourselves: how can we have available a continuous stream of resources that enables us to continue to offer and to update the free materials? The completion of the development and offering of the open textbooks is an initial but just a first step in the success of the project. The project can only be deemed successful if and when the open textbooks are well received and adopted for use in more schools.
2. *How do we maintain the quality (accuracy, currency and interest) of later versions of the textbooks?* We have a quality assurance mechanism in the production of the initial versions of the textbooks, but as more inputs are provided by the users, the maintenance of the quality of the later versions will become an important issue for us to attend to.
3. *Will teachers be willing to contribute to updating the open textbooks?* Our study shows that teachers mostly tend to adopt the open textbooks directly for use in the classroom, rather than revising and remixing with other OERs. This will not be conducive to maintaining a sustainable development of the OER-based textbooks.

4. *Are the open textbooks easy to acquire and to use?* There are a couple of considerations about usage. First, the open textbooks offer print and many electronic versions for teachers and students. Users acquire these textbooks in quite different ways compared to the traditional textbooks! Traditional textbooks are listed in a book list and students or their parents buy them in a bookshop. Printed open textbooks are printed and distributed differently from commercial textbooks, as they are not normally sold in a bookshop. Special arrangements have to be made on how the books are printed by a printer and distributed to users. Second, electronic versions are downloaded by the users. However, how the various versions, with all the different functions and tools built-in, can be effectively used for teaching in the classroom and learning at home is a challenge for all users.
5. *Are teachers/students/parents ready to use open textbooks?* Open textbooks and OER are a new concept in Hong Kong. In the promotion of our project, we have gained some support from school principals and teachers. Whether this will be well received by most parents, teachers and students, is not known yet. We are aware that even a view such as “reading an ebook through a PC tablet screen will hurt the child’s eyes” will become an inhibitor to the open textbooks project.

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Appendix 1

Comparison of CPI increase and textbook price increase 2005–2009

| Year | Composite CPI* | Average textbook price rise (overall) | | Source | Link |
|------|----------------|---------------------------------------|-----------|-----------------------------|---|
| | | Primary | Secondary | | |
| 2009 | 1.0% | 1.6% | 1.0% | Choice #393 (July 15, 2009) | http://www.consumer.org.hk/website/ws_en/news/press_releases/p39307.html |
| 2008 | 5.6% | 6.6% | 7.4% | Choice #381 (July 15, 2008) | http://www.consumer.org.hk/website/ws_en/news/press_releases/p38102.html |
| 2007 | 2.8% | 6.8% | 5.0% | Choice #369 (July 16, 2007) | http://www.consumer.org.hk/website/ws_en/news/press_releases/p36903.html |
| 2006 | 2.0% | 4.2% | 5.2% | Choice #357 (July 14, 2006) | http://www.consumer.org.hk/website/ws_en/news/press_releases/p35704.html |
| 2005 | 1.0% | 3.0% | 3.7% | Choice #345 (July 15, 2005) | http://www.consumer.org.hk/website/ws_en/news/press_releases/p34503.html |

*Figures of the Composite Consumer Price Index (CPI) are obtained from Annual Reports on the Consumer Price Index (2013 Edition).

Source: <http://www.censtatd.gov.hk/hkstat/sub/sp270.jsp?productCode=B1060002>

Appendix 2

Comparison of the anticipated prices of open textbooks with textbooks produced by commercial publishers (2014)

| Level | Publisher | Edition | P1 (in HK\$) | P2 (in HK\$) | P3 (in HK\$) |
|------------------------|-------------------|--------------------------|--------------|--------------|--------------|
| Primary Key Stage 1 | A | 2008 | 171 | 171 | 182 |
| | B | 2010 | 187 | 187 | 187 |
| | C | 2009 | 204 | 204 | 204 |
| | Open Textbooks | 2014 (OD) 2014 (Bulk) | 87 36 | 87 36 | 87 36 |

| Level | Publisher | Edition | P4 (in HK\$) | P5 (in HK\$) | P6 (in HK\$) |
|------------------------|-------------------|--------------------------|--------------|--------------|--------------|
| Primary Key Stage 2 | A | 2008 | 182 | 193 | 193 |
| | B | 2010 | 199 | 199 | 199 |
| | C | 2009 | 220 | 220 | 220 |
| | Open Textbooks | 2014 (OD) 2014 (Bulk) | 84 44 | 84 44 | 84 44 |

| Level | Publisher | Edition | S1 (in HK\$) | S2 (in HK\$) | S3 (in HK\$) |
|--------------------------|-------------------|--------------------------|--------------|--------------|--------------|
| Secondary Key Stage 3 | A | 2010 | 328 | 328 | 328 |
| | C | 2012 | 336 | 342 | 348 |
| | D | 2012 | 326 | 326 | 326 |
| | Open Textbooks | 2014 (OD) 2014 (Bulk) | 125 48 | 137 51 | 162 52 |

| Level | Publisher | Edition | S4 (in HK\$) | S5 (in HK\$) | S6 (in HK\$) |
|-----------------------|----------------|--------------------------|------------------|--------------|--------------|
| Secondary Key Stage 4 | A | 2009 | 312 | 312 | 312 |
| | D | 2009 | 328 for S4 to S6 | - | - |
| | E | 2009 | 272 | 272 | 136 |
| | Open Textbooks | 2014 (OD) 2014 (Bulk) | 162 52 | 175 52 | 44 13 |

Note:

Publishers A to E are the more popular publishers for English language in Hong Kong.

P1 = Primary 1; S1 = Secondary 1 and so on.

OD = On demand printing; Bulk = Printing in bulk volume, e.g. 1,000 copies; the distribution of the textbooks will be handled by an agent.

Appendix 3

Estimated expenses for the development of Open English (the set of open textbooks produced in the project)

| | Platform Development | Amount (HK\$) | Total (HK\$) |
|---|--|---------------|------------------|
| 1 | Hardware | 253,000 | |
| 2 | Programmers | 3,140,000 | |
| | Subtotal | | 3,393,000 |
| | Primary Textbooks (P1 – 6) | | |
| 1 | Content developers/writers | 360,000 | |
| 2 | English specialist | 1,140,000 | |
| 3 | Instructional designers | 939,000 | |
| 4 | Reviewers | 131,000 | |
| 5 | Illustrators/cartoonists | 720,000 | |
| 6 | Editors/layout | 360,000 | |
| 7 | Technicians for multimedia productions | 100,000 | |
| 8 | Mobile App programmers | 280,000 | |
| | Subtotal | | 4,030,000 |

| Secondary Textbooks (S1 – 6) | | | |
|-------------------------------------|--|-----------|-------------------|
| 1 | Content developers/writers | 2,400,000 | |
| 2 | English specialist | 1,140,000 | |
| 3 | Instructional designers | 675,000 | |
| 4 | Reviewers | 280,000 | |
| 5 | Illustrators/cartoonists | 248,000 | |
| 6 | Editors/layout | 240,000 | |
| 7 | Technicians for multimedia productions | 120,000 | |
| 8 | Mobile App programmers | 560,000 | |
| | Subtotal | | 5,663,000 |
| | Grand total | | 13,086,000 |

Chapter 4 Enhancing Quality in the Classroom using Open Educational Resources

~ Sanjay Jasola

Abstract

National Programme on Technology Enhanced Learning (NPTEL)¹ is a national effort at producing and making available open courseware in Science, Engineering, Technology and Mathematics for reuse in the nation's academically weak colleges of engineering and technology, especially in rural areas. Full courses in the aforementioned subjects are produced and licensed as OER by a family of India's world-renowned Indian Institutes of Technology (IIT). This case study analyses the reuse and adoption of NPTEL courses in three selected institutions. These are IIT, Roorkee² (IITR), NIT, Kurukshetra³ (NITK) and Graphic Era Hill University (GEHU), Dehradun⁴. These institutions are different in terms of the quality of their student intakes, faculty resources and infrastructure, resulting in varying costs and time spent in adopting the NPTEL courseware. The study presents the context, infrastructural environment, support and resources used for adoption and use of the courseware in these institutions. The selected institutions follow different funding model, different infrastructure and resources with different size of user populations. NPTEL courseware has been used differently by these institutions. The analyses of difficulties and barriers to widespread adoption of NPTEL open courseware as mainstreamed courses in engineering curriculum are explored. Impact in terms of costs, time expended in the adoption processes, experience of staff and students as well as an assessment of the learning outcomes is also measured using available secondary and primary data collected through surveys, interviews and focus group interactions.

Situational Context

Concerned over the poor and eroding quality of engineering education in many semi-urban and rural engineering colleges both public and private, the Government of India (GOI) embarked on a bold plan to use the world class academic talent populating the family of Indian Institutes of Technology as well as the Indian Institute of Sciences (IISc)⁵ to create, develop and distribute under a Commons license many of the courses required for sound engineering education.

¹ www.nptel.ac.in

² Indian Institute of Technology, Roorkee retrieved on 8 December 2014 from <http://www.iitr.ernet.in/departments/HY/news/Admission%20Brochure%202014-15.pdf>

³ National Institute of Technology retrieved on 8 December 2014 from <http://www.nitkr.ac.in>

⁴ Graphic Era Hill University retrieved on 9 December 2014 from <http://www.gehu.ac.in/dehradun/academic>

⁵ Indian Institute of Sciences retrieved on 9 December 2014 from www.iisc.ac.in

In total, the nation's more than 3,500 Engineering colleges and Universities with approximately 1.5 million engineering students⁶ are expected to benefit from these free OERs. This case study aims at critically evaluating and comparing the adoption and use of NPTEL open courseware across three such institutions which offer undergraduate and postgraduate engineering degree programmes and these are:

1. IITs which are the nation's premier technical institutions
2. NITs (National Institute of Technology), and
3. Central and state government institutions and universities that also offer engineering and technical degree programmes.

Besides the three, there are many other private engineering colleges and private universities which also offer engineering courses which make up about 90% of engineering and technical students in the country.

Engineering and technical degree programmes such as the Bachelor of Engineering or Bachelor of Technology are four-year degree programmes, while most other undergraduate degree programmes are of three-year duration. The first year of the four years is devoted to foundation courses in Science and Engineering and from the second year onwards, courses specific to the different branches of engineering are taught. There is no uniform curriculum for engineering degree programmes and Universities are free to design their own curriculum and appropriate courses to support it. Admission to Engineering institutions is highly competitive (especially to institutions at the top end) and subject to securing a very high rank in a demanding entrance examination (Joint Entrance Examination) following twelve years of schooling as shown in **Table 1**. Students who join IITs are considered extremely bright and academically sound. Those who are not selected in IITs but are almost equally academically sound and able opt for NITs. The remaining students study in private universities, engineering colleges and other institutions.

| Institution | Number | No. of Seats | Joint Entrance Examination Ranking |
|--------------------|--------|--------------|------------------------------------|
| IITs | 10 | 9,800 | Up to 10,000 |
| NITs | 30 | 15,500 | Up to 50,000 |
| Other institutions | 3345 | 1,474,000 | Beyond 50,000 |

Table 1 Ranking for admission into Engineering institutions in India

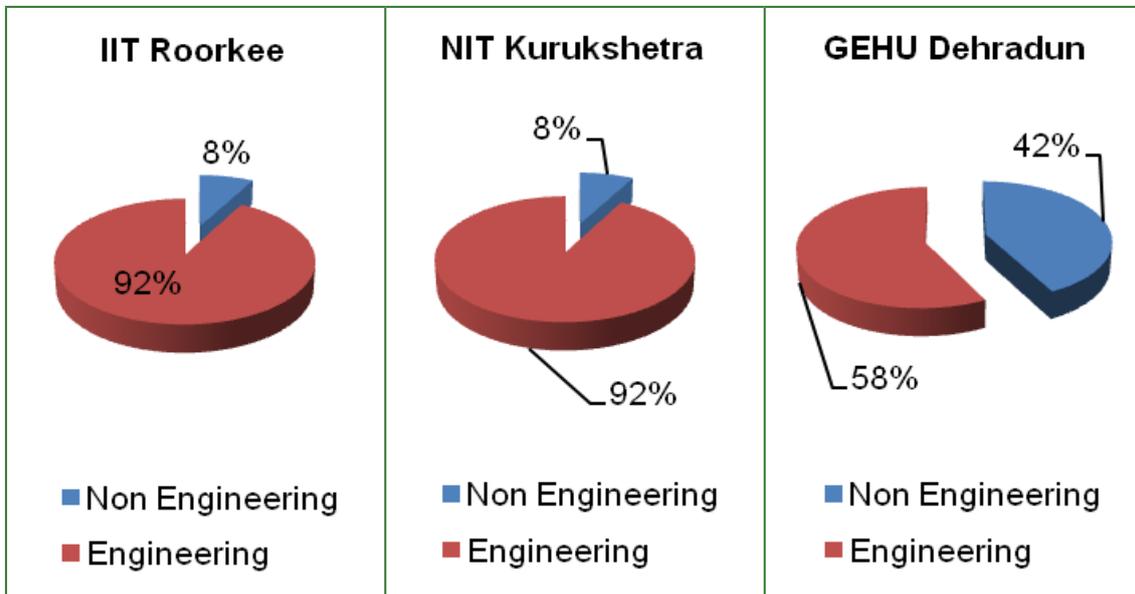
The rationale of selecting IITR, NITK and GEHU for the case study was to compare the extent of use and adoption of NPTEL courseware among different types of engineering degree-awarding institutions. Each type of institution has its own characteristics with reference to quantity and quality of students, teachers, infrastructure and other resources. The data related to students and faculty in these institutions is given in **Table 2**.

⁶ Subbarao, E C (2013) India's higher engineering education: opportunities and tough choices, *Current Science*, 104, no. 1

| Name of Institution | Ownership Status | Type of Degree Program | No. of Degree Programs | No. of Students | No. of Faculty | Faculty/Students Ratio |
|---------------------|------------------|--|------------------------|-----------------|----------------|------------------------|
| IIT Roorkee | Central Govt. | Ph.D. | | 1445 | 398 | 1:20 |
| | | Master of Technology | 42 | 1502 | | |
| | | Other Masters Programmes (MBA, M.Sc, Integrated M.Sc/ MCA) | 14 | 664 | | |
| | | Bachelor of Technology | 12 | 4481 | | |
| | | TOTAL | 68 | 8092 | | |
| NIT Kurukshetra | Central Govt. | Ph.D. | | 141 | 212 | 1:21 |
| | | Master of Technology | 19 | 761 | | |
| | | Other Masters Programmes (MBA, MCA) | 2 | 345 | | |
| | | Bachelor of Technology | 8 | 3191 | | |
| | | TOTAL | 29 | 4438 | | |
| GEHU Dehradun | Private | Ph.D. | | 4 | 114 | 1:30 |
| | | Master of Technology | 2 | 58 | | |
| | | Other Masters Programmes (MBA, MCA) | | 260 | | |
| | | Bachelor of Technology | 6 | 1954 | | |
| | | Other Bachelors BSc/AVE IT/ Maths/Phy/ BA/B Com/ BJMC/BBA/ BCA/LAW | 14 | 1224 | | |
| | | TOTAL | 22 | 3500 | | |

Table 2 Basic data of students and faculty members

In each of these three institutions, majority of students are in engineering programmes. Please refer to **Table 2** and **Graph 1** drawn from the data of **Table 2** indicating percentage of engineering students.



Graph 1 Students enrolled in Engineering courses

In IITR and NITK, the percentage of engineering students is more than 90% and about 58% in GEHU as indicated in **Graph 1**. In the future, this ratio of engineering students at IITR and NITK will remain almost the same as these institutions have the mandate by government of India to focus on engineering and technology programmes but in GEHU, this ratio will decrease as more and more programmes other than Engineering will be introduced. Formal face-to-face classes are conducted by teachers and students are required to attend the lectures. There is a shortage of qualified and experienced teachers in most of the engineering institutions in India. The faculty profile of three institutions is tabulated in **Table 3**.

| Name of Institution | Status of Ownership | Faculty Types | Numbers | Graph |
|---------------------|---------------------|---------------------|---------|-------|
| IIT, Roorkee | Central Government | Professor | 142 | |
| | | Associate Professor | 96 | |
| | | Assistant Professor | 160 | |
| NIT, Kurukshetra | Central Government | Professor | 73 | |
| | | Associate Professor | 31 | |
| | | Assistant Professor | 108 | |

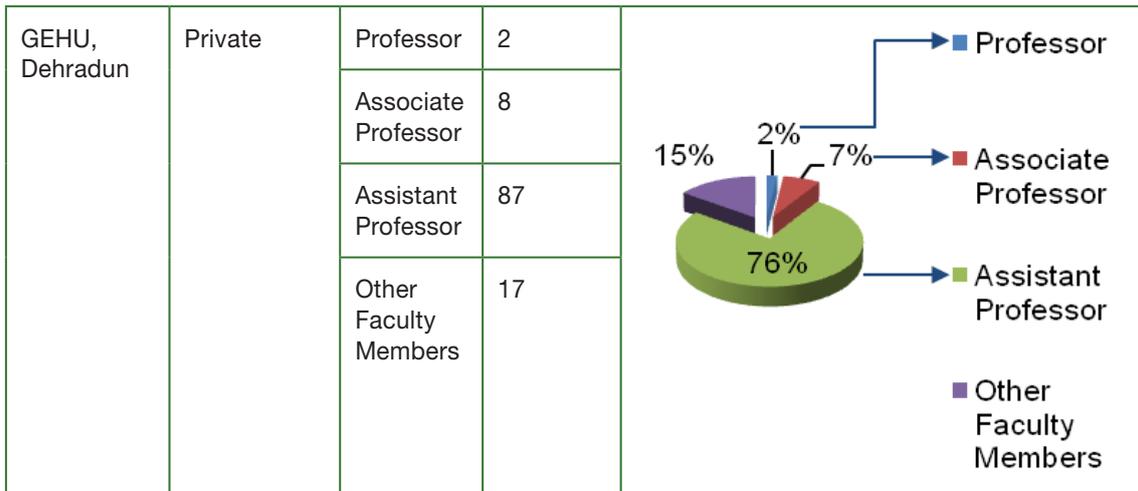


Table 3 Faculty profile

Of the three institutions selected for this study, only IITR is involved in the development of NPTEL courseware which includes animation, visuals, illustrations, video lecture and demonstration, assignments, quizzes, problems and their solutions. This case study will examine the processes of OER course creation and development at the IITR and in terms of reuse and other aspects of adoption in the other two institutions.

NPTEL

NPTEL is funded by the Ministry of Human Resource Development (MHRD), GOI. Its main objective is to enhance the quality of engineering education in India by developing curriculum-based video and web courses. This is being carried out by seven IITs and IISc Bangalore, as a collaborative project. Initially in phase one, NPTEL courseware was developed for five branches (Civil, Computer Science, Electrical, Electronic and Mechanical) of engineering. Later on in phases two and three⁷, the NPTEL courseware has been developed for other branches of Engineering, Management, Humanities, and Basic Sciences etc. From 2003 – 2012, in three phases, about Rs. 120 crores⁸ (US\$22 million) have been spent on developing modular video and web courses. The maximum amount of Rs. 44 crores was incurred on content development which is 46% of the total allocation. Presently, there are more than 1250 courses⁹ in the above areas available through NPTEL. The details of these courses and their format are given in **Table 4**. Very recently, NPTEL has begun offering eleven courses online with industry associations.

⁷ Project proposal 2nd and 3rd phase (2009) retrieved on 9 December 2014 from [http://nptel.ac.in/pdf/Final%20proposal March032009%20final.pdf](http://nptel.ac.in/pdf/Final%20proposal%20March032009%20final.pdf)

⁸ Minutes of PIC meeting (2013, 2014) retrieved on 9 December 2014 from
a. <http://nptel.ac.in/pdf/picmeeting/June%202022-23%202014.pdf> and
b. <http://nptel.ac.in/pdf/picmeeting/Nov%202024%202013.pdf>

⁹ Courses by discipline at NPTEL retrieved on 9 December 2014 from <http://nptel.ac.in/courses.php>

| S. No. | Major Discipline | Total no. of courses | Video | Web |
|--------|---|----------------------|------------|------------|
| 1 | Aerospace Engineering | 49 | 22 | 27 |
| 2 | Computer Science & Engineering | 94 | 57 | 37 |
| 3 | Chemical Engineering | 93 | 43 | 50 |
| 4 | Electrical Engineering | 77 | 44 | 33 |
| 5 | Mechanical Engineering | 163 | 77 | 86 |
| 6 | Ocean Engineering | 29 | 22 | 7 |
| 7 | Automobile Engineering | 2 | 0 | 2 |
| 8 | Electronics & Communication Engineering | 103 | 63 | 40 |
| 9 | Civil Engineering | 131 | 59 | 72 |
| 10 | Engineering Design | 14 | 5 | 9 |
| 11 | Mining Engineering | 2 | 1 | 1 |
| 12 | Textile Engineering | 28 | 7 | 21 |
| 13 | Biotechnology | 35 | 17 | 18 |
| 14 | Management | 50 | 25 | 25 |
| 15 | Basic Courses (Semesters 1 and 2) | 38 | 21 | 17 |
| 16 | Humanities and Social Sciences | 70 | 33 | 37 |
| 17 | Chemistry and Biochemistry | 57 | 30 | 27 |
| 18 | Metallurgy and Material Science | 54 | 28 | 26 |
| 19 | Physics | 73 | 36 | 37 |
| 20 | Environmental Science | 4 | 1 | 3 |
| 21 | Mathematics | 75 | 36 | 39 |
| 22 | Nanotechnology | 11 | 6 | 5 |
| 23 | Atmospheric Science | 6 | 5 | 1 |
| 24 | General | 5 | 4 | 1 |
| | Total | 1263 | 642 | 621 |

Table 4 NPTEL courses and their format

Resources Used in Creation, Use and Dissemination

In different phases of NPTEL, more than 84 courses (web and video) have been developed by teachers of IITR. A budget of Rs. 893 lakhs (about US\$1.5 million) was given to IITR and Rs. 420 lakhs (which is 47% of total budget) is spent to produce these courses. There are infrastructure development, upgradation and other costs associated with creation of these courses.

There are about 400 teachers in IITR and about 86 are involved in the development of NPTEL video lectures. A team of subject matter experts (SME) is formed and the curriculum for a particular course is decided based on the inputs of teachers of other technical universities to avoid duplication of efforts by SMEs. This faculty team then gets its video lectures recorded. For each course in video format, 40 lectures of one hour duration are recorded. Currently NPTEL videos are available in English only and in some cases, text of video is also available.

There are different modes for dissemination of course content, in which video is the primary form. National policy on OER has helped in the dissemination of NPTEL courseware. There is no legal support required as NPTEL courseware is covered under CC BY-SA 4.0 license. Institutions have been conducting workshops for teachers to make them aware about NPTEL courseware.

There are different ways to access NPTEL content i.e., through Internet, DVD and hard disks. Anyone can use Internet to access NPTEL courseware. DVDs can be requested from NPTEL by individuals after paying a small sum of Rs. 200 (about US\$3.2). Institutions which are interested to obtain the entire NPTEL courseware will send hard disks of (4+3) terabytes to NPTEL. After transferring all video lectures and web courses, NPTEL returns these hard disks to the requesting institutions.

Three institutions have also helped in promoting the usage of NPTEL courseware. Users of IITR and NITK have been provided with good Internet access with government funding but in GEHU, Internet access is not very good. Downloading of video lectures usually takes a lot of time and users lose interest. GEHU has considered this fact and opted for alternatives which are available such as distribution of content through DVDs and hard disks using Intranet of the institution. Several teachers at GEHU who had earlier downloaded these videos from NPTEL or YouTube also share them with their peers and students.

OER Adoption and Use — Major Users

The OER in use at the institutions were taken from an externally-developed pool, which is developed by the NPTEL as part of a federal project. The prime users of the NPTEL courseware are students (including research scholars and alumni), teachers and senior management of these institutions. IITR and NITK have good quality and well-qualified teachers but they suffer from shortage of teachers. A study has indicated that 37% of the faculty posts are lying vacant in IITs and 28% in NITs¹⁰. In IITR, it is almost 50%¹¹. Other types of engineering and technical institutions like GEHU struggle to find the required number of well-qualified teachers. For appointment in any IIT or NIT, a PhD degree is a basic requirement¹², whereas in other institutions, a postgraduate is qualified to teach¹³.

| Name of Institution | Type of Degree Programs | No. of Degree Programs | No. of Students | No. of Faculty | % of student users | % of faculty users | Use by programmes (in %) |
|---------------------|--|------------------------|-----------------|----------------|--------------------|--------------------|--------------------------|
| IIT Roorkee | Ph.D. | | 11 | 86 | 4.8 | 21.36 | 33 |
| | Master of Technology | 14 | 234 | | | | |
| | Other Masters Programs (MBA, M.Sc, Integrated M.Sc/ MCA) | 3 | 21 | | | | |
| | Bachelor of Technology | 6 | 61 | | | | |
| | TOTAL | 23 | 327 | | | | |
| NIT Kurukshetra | Ph.D. | | 3 | 19 | 7 | 9 | 38 |
| | Master of Technology | 6 | 161 | | | | |
| | Other Masters Programs (MBA, MCA) | 1 | 4 | | | | |
| | Bachelor of Technology | 4 | 124 | | | | |
| | TOTAL | 11 | 292 | | | | |

¹⁰ Vacant faculty positions in Central universities retrieved on 11 December 2014 from <http://www.thehindu.com/news/national/40-pc-faculty-posts-vacant-in-central-varsities/article6656243.ece>

¹¹ IIT face faculty shortage retrieved on 6 December 2014 from <http://timesofindia.indiatimes.com/home/education/news/IITs-face-37-faculty-shortage-Study/articleshow/45391151.cms>

¹² Qualifications for faculty position at IITs, NITs retrieved on 9 December 2014 from <http://www.iitgn.ac.in/pdf/IITGN-faculty-advdt.pdf>

¹³ UGC regulations for qualifications of teacher's (2010) retrieved on 9 December 2014 from http://www.ugc.ac.in/oldpdf/regulations/revised_finalugcregulationfinal10.pdf

| | | | | | | | |
|------------------|--|----------|------------|----|----|----|----|
| GEHU Dehradun | Ph.D. | | 1 | | | 28 | 36 |
| | Master of Technology | 1 | 15 | | | | |
| | Other Masters Programs (MBA, MCA) | 1 | 13 | | | | |
| | Bachelor of Technology | 4 | 254 | | | | |
| | Other Bachelors BSc/AVE IT/ Maths/Phy/ BA/B Com/ BJMC/BBA/ BCA/LAW | 2 | 44 | | | | |
| | TOTAL | 8 | 327 | 32 | 10 | | |

Table 5 Use of NPTEL courseware by students and faculty members and programmes

At this point in time, the incidence of use of NPTEL courseware by students is just more than 10% in GEHU, 7% in NITK and 4% in IITR, while the use by faculty ranges from 21% in IITR to 28% at GEHU as indicated in **Table 5**. The scope for use of NPTEL courseware is immense (if planned and executed properly) because more and more courses of different streams other than pure engineering are being added.

Patterns and Purpose of Use

The NPTEL courseware is used to supplement teaching and learning process by teachers as well as by students. The basic purpose at all three institutions is to explore beyond the existing knowledge which is generally imparted in classrooms at these institutions. In the case of GEHU and NITK, it is virtual access to renowned experts and the best faculty available in the country free of cost. In the case of IITR, it is 24-hours availability of resource which is available during face-to-face lecture at a scheduled time. NPTEL courseware has been used in four different ways. It has been reused as it is by students and teachers at all three institutions, and remixed by teachers with their lectures at IITR and GEHU. Students have also been remixing NPTEL courseware with books and other modes of study. In some cases, NPTEL courseware like assignments, quizzes etc., have been revised at NITK and GEHU. **Table 6** illustrates the ways in which NPTEL has been used.

| Institution | Reuse | Remix | Revise | Redistribute |
|-------------|-------|-------|--------|--------------|
| IITR | 240 | 12 | 4 | Nil |
| NITK | 160 | 8 | 2 | Nil |
| GEHU | 280 | 25 | 7 | Nil |

Table 6 NPTEL usage

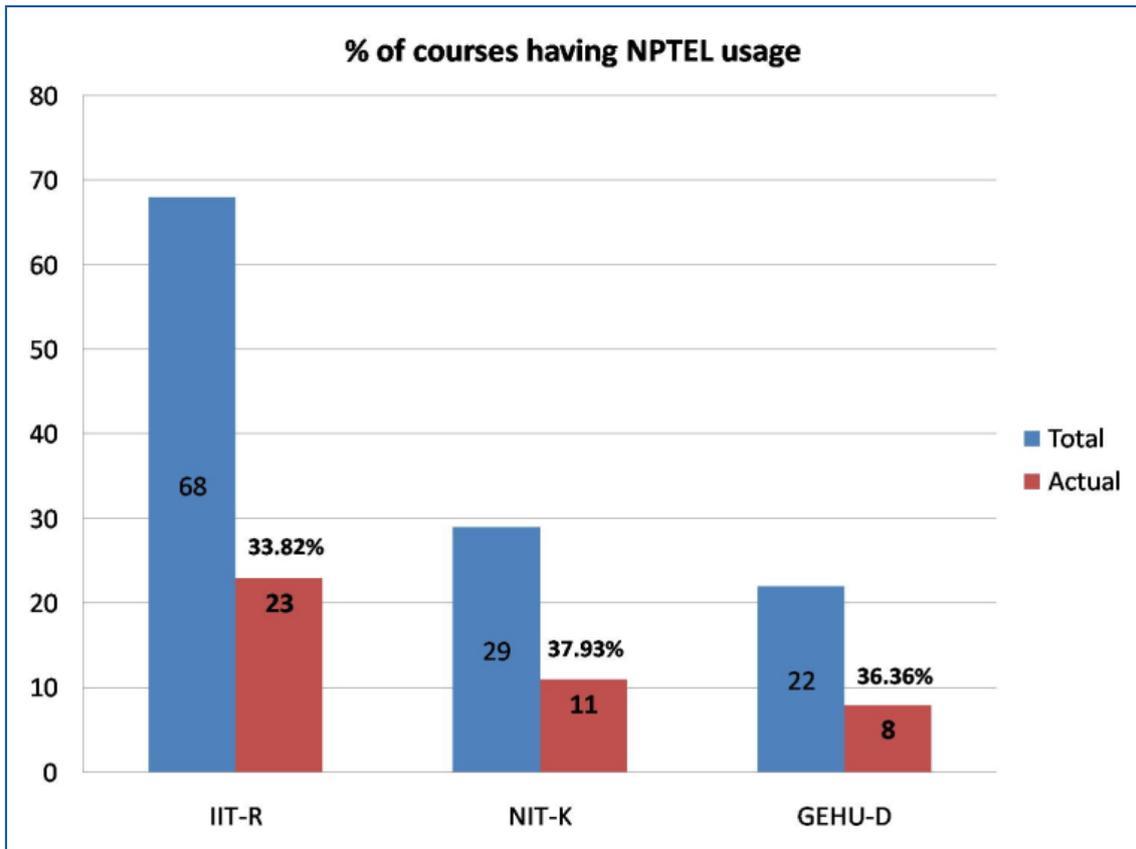
The incidence of remixing at all institutions was done by combining these OER contents with the subject inputs shared by the teachers in their own face-to-face sessions. Adding assessment items like quizzes and assignment to the OER was carried out by the users, as the video lectures developed by NPTEL have very little assessment component in the revision. The element of redistribution in a sense was not evident as all the remixed and revised material was used by individual teachers for their own class and was not widely shared with other faculty/students in other classes.

Institutional Programme Objectives for Use

Capacity building of faculty in OER use was stated as the common objective of all three institutions. During the individual and focused group interactions, it has been stated by faculty members that faculty capacity building in use of open educational resources and NPTEL courseware was the intended purpose. The objective at IITR is to encourage more and more teachers to develop NPTEL courseware in areas which are still untouched. At NITK, the objective is to motivate teachers to contribute in creating NPTEL courseware. At GEHU, the objective is to improve quality of course content and delivery as well as to supplement teaching material being provided to the learners. Another stated objective was to encourage the learners to explore concepts and topics beyond their stated curriculum.

Mainstreaming

As can be seen from **Table 5**, the incidence of use by faculty and students as the core subject material in any given course is not a mainstreamed practice as yet. NPTEL courseware is largely being used as supplementary material (to supplement the gaps in the content shared by teachers; to provide a more advanced treatment of a given topic or to share additional practical examples) or complementary material (to add additional value to the material already taught in the classes). As shared in **Table 5**, only some courses in a limited number of programmes make use of the NPTEL courseware.



Graph 2 Courses having NPTEL usage

Graph 2 indicates the use of NPTEL. Usage is almost the same in these institutions. Though in GEHU, it is around 36% but if we see the percentage of use in engineering courses in GEHU, it is about 80%. So it clearly indicates that NPTEL is utilised by its intended users.

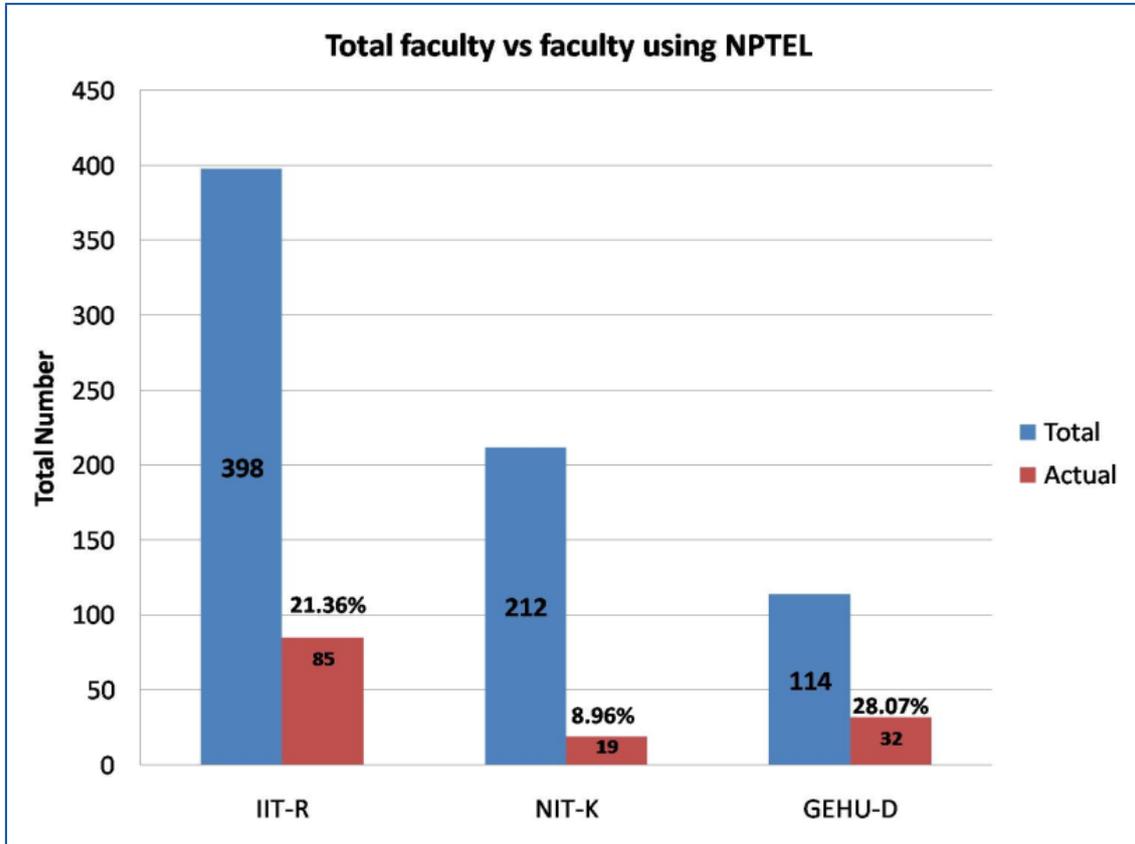
The incidence of use is expected to grow over a period of time as workshops by internal and external experts for spreading awareness are organised in these institutions. In IITR, MHRD-funded workshops are conducted for teachers and students. In GEHU, three workshops were conducted for teachers of GEHU and other nearby engineering institutions. The unique thing about the workshops at GEHU was that teachers paid for attending these workshops.

NPTEL usage is supported at IITR and NITK, by providing fast Internet access to their students and teachers for 24 hours daily. Students are encouraged to view these videos at a time and place that is convenient to them. Teachers at three selected institutions have been using social networks like Facebook, WhatsApp, etc., besides using their departmental websites for spreading the message about NPTEL to their students and alumni.

At GEHU, specific infrastructure has been put in place by way of special high-end multimedia classrooms for teachers and students to view these video lectures during the official timing of the university. Special computer labs with Internet and intranet facilities have been provided to teachers and students to access these video lectures and web courses. Specific time slots are assigned in the class timetable to view these videos.

Adoption and Usage Processes

The usage by teachers was found to vary among institutions. **Graph 3** indicates the usage of NPTEL by faculty. The users at three institutions have indicated that due to limited technical support and required manpower, no repurposing of the content was undertaken, and the use was primarily in the form of reuse with minor revision and remixing.

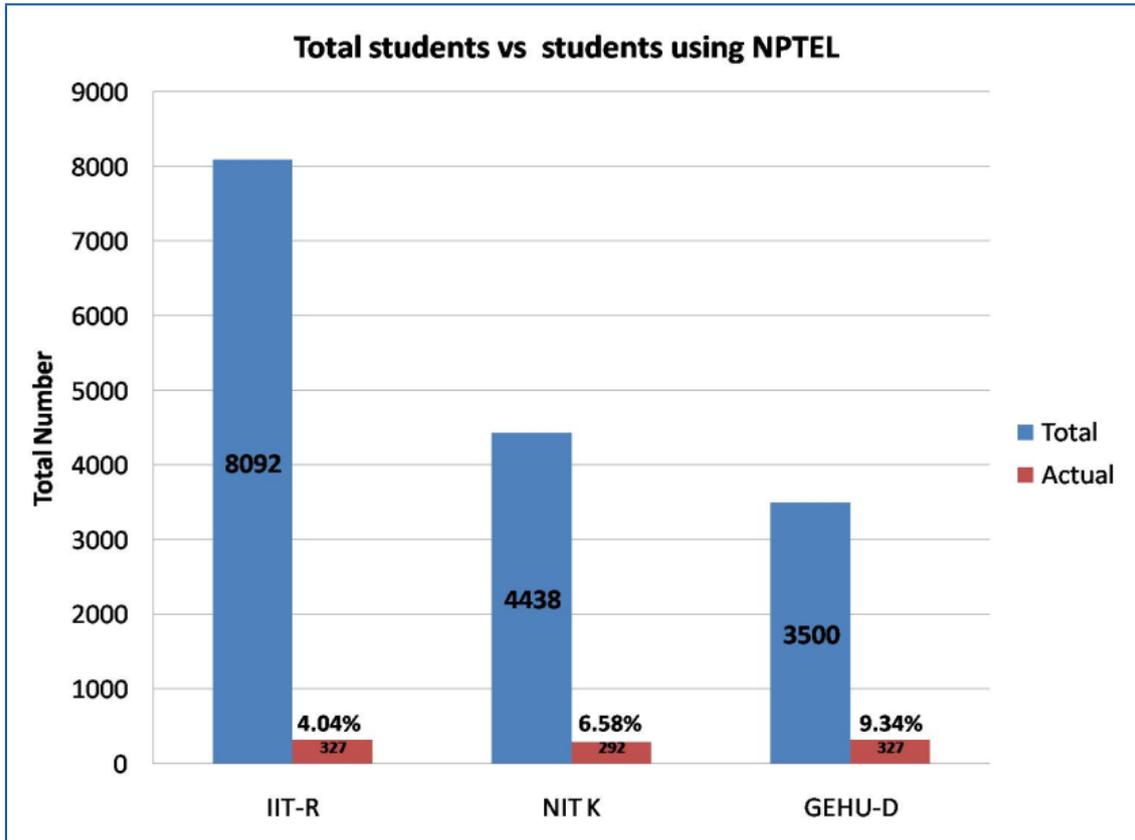


Graph 3 Faculty using NPTEL

Being an institution directly under the control of MHRD and a partner in creation of courseware from the beginning, awareness and use by teachers at IITR is higher as reflected in **Graph 3**. Professors who have so far not developed the content for NPTEL use it to see the format for content presentation and for creation of their own courses. In terms of usage at the institution, limited use of the content was made to supplement or complement the face-to-face teaching at IITR though NITK is also under the direct control of MHRD and the teachers are well qualified. Initially NITs were not associated with the development of courses for NPTEL, so there is less awareness and interest among teachers which is reflected in **Graph 3**. Very recently, they have been asked to create courses for NPTEL.

GEHU being a very young University faced a shortage of well-qualified teachers. It has appointed fresh postgraduates (with or without experience) as teachers. These fresh-baked but enthusiastic teachers who are self-motivated or have participated in OER awareness workshops and want to follow good teaching practices looked for such videos from NPTEL and also used the NPTEL courseware as learning tool for supporting their own learning and extending their knowledge of

concepts. It can be seen in **Graph 3** that the percentage of faculty members using NPTEL is higher than the other two institutions. These teachers gave assignments and conducted quizzes based on these video lectures. Others used this courseware in developing the curriculum for their engineering programmes. These teachers have been providing synchronous and asynchronous support to the students.



Graph 4 Students using NPTEL

Usage of NPTEL content by students varies from 4% in IITR to 9% in GEHU as shown in **Graph 4**. Students at these institutions have been using NPTEL video lectures and web courses individually and in groups to learn new topics and to clear their doubts. At IITR, students tend to access the video if they missed the face-to-face class. In other cases, when a course is being taught by a junior faculty at IITR, students viewed videos of senior professors from other IITs. At NITK, students use NPTEL courseware to understand a topic, learn advanced topics which are not covered by their own teachers and also prepare for competitive examination of different companies and national level government engineering and other administrative services. In GEHU, percentage of use is high as students use it to enhance their subject knowledge, to clear their doubts, to get inputs for assignments and their solutions besides learning advanced topics in specialised areas. After a topic in a subject is taught by a fresh faculty member, students prefer to refer to these video lectures. Students use it to prepare for job interviews, to clear GATE (graduate aptitude test in engineering) examinations for admission into Masters programme at IITs.

Senior management also use NPTEL courseware at these identified institutions as they are required to reply to questions from state or government departments, or ministries on the issues related to the use of technology, OER, digital literacy etc. They want to keep abreast of the latest

happenings in this domain. In IITR, senior management is part of the core committee of NPTEL and they are required to participate in meetings which are attended by very senior officials of MHRD and other IITs. In GEHU, being a private university, it is necessary to keep pace with the latest technology, making use of the best resources available to maintain leadership role of the university in region. With more and more senior administrators becoming aware of the NPTEL courseware and national policy on OER in place, it is expected that usage by students and teachers will be more prolific.

GEHU, NITK and IITR are not using resources from commercial providers, but they use similar type of resources from other sources like MIT-OCW or any other OER repository. The procuring of resources from commercial providers for e-learning by these institutions is non-existent. In the particular domain of engineering and technical courses, there are a number of OER efforts worldwide and there are a number of freely available resources, which are used by the students and teachers of these institutions.

User Experience: Institution/Faculty/Students

The user data was collected through focus group interactions with about 15 students and 11 teachers individually as well as in groups, and 3 senior administrators of three institutions. A survey¹⁴ was also conducted for 46 users of NPTEL courseware to gain insight on the impact of it on teaching learning processes. These users were different from those who were interviewed for focus group interactions. The documented institutional experience in the form of feedback of students at GEHU was used to understand the need to have something more than classroom teaching.

Students at GEHU, IITR and NITK have given feedback on different aspects of NPTEL varying from design of interface to the quality of video. Most of the students said that NPTEL had given them opportunity to know how teachers teach in IITs. They also found that the level of teaching in these videos was higher and to understand the topic fully, they had to take external support either through their teachers, other websites or their peers. Access to these resources was an issue to students at GEHU who were trying to access them from their homes. In GEHU, they were also exploring the possibility of initiating a club where they could share their experience and motivate other students to follow these links and enrich themselves.

Impact on Faculty Motivation

The teachers at GEHU were excited to have access to NPTEL courseware as majority of them are less experienced and they are still learning how to teach better in the classroom as one faculty member said “the video lecture started with reference to the earlier topic for about 5 minutes, followed by current topic and at last, the professor summarises what he has taught in the video lecture”. He liked it and has started following it in his classes. Other faculty member is impressed with the smooth transition from one topic to another. He adds “the transition is so simple that we did not know that a new topic has started”. Others said:

1. *Access to good resource; it keeps you updated.*

¹⁴ Survey data retrieved on 9 December 2014 from https://www.surveymonkey.com/analyze/pN54qVzUx1zZ0lcci82_2BuDZD7UPt3R93RltunvshUBE_3D

2. *Practical aspects covered in videos are not generally found in books.*
3. *Numericals are also of good standard as it helps in gradually raising the level of students.*
4. *Have access to latest topics for which books are not available and mostly these are part of the research. In these videos, professors are able to link research to classrooms.*
5. *In some cases where curriculum is contemporary, dynamic in nature and cannot depend on one book, these video lectures are a great resource.*

NITK teachers commented that:

1. *In courses where the content remains static and only covers concepts and principles, the NPTEL is a very good resource as it has been created by experienced professors, so these can be followed as it is.*
2. *For majority of the cases, especially the teachers of NITK are also very confident that “we also teach equally well to our students or even better as we know our students better and we go to their level to make them understand the concept”.*

Barriers and Difficulties

One of the questions asked in survey and focus group interactions was: “What were the difficulties faced while using the NPTEL courseware?” The result of this survey and focused group and individual interaction has been compiled in a tabular format in **Table 7**.

| Issues | Findings of the Survey | * Focus group Interactions |
|--|---|--|
| Network Issues | 31% respondents shared that the lack of Internet connectivity/ net speed led to the inability to download or buffer the video lectures. | <ul style="list-style-type: none"> • Internet connection was too slow and it took too much time for buffering. • When videos and large data are downloaded, they come in big file size which needs at least 3G connection at home, which requires me to spend more. |
| Content & Content Delivery Issues | <ul style="list-style-type: none"> • 16% respondents faced issues such as content not being available as per requirement/ need/format which was a hindrance given the OS platforms the respondents used • 4% respondents felt that the content could be better explained by means of visual effects such as diagrams/ examples. | <ul style="list-style-type: none"> • Less diagrams and examples were provided. • Basic topics are not covered in the video lectures. • Content in some of the video lectures is very tough to understand, not able to generate interest and ultimately becomes boring. • The topics are covered at higher level in these video lectures. • Classroom lectures which are recorded are not very effective where the professor is shown writing on board with his back facing the students. Eye contact and interaction with users is poor in such videos. |

| | | |
|-------------------------------------|--|--|
| <p>Usability Issues</p> | <p>14% respondents felt that the NPTEL website had a poorly designed interface. Some of the issues raised were:</p> <ul style="list-style-type: none"> • Lack of a search panel making it difficult to find courses. • The courses have not been segregated as per the disciplines but are all clubbed together making it difficult to navigate/find courses. • The size of the files is too big which makes it difficult to download and access. • Non-availability of videos in their domain. | <ul style="list-style-type: none"> • No search option is provided in the website for searching a particular topic. • Sometimes I have difficulty in finding the exact content required. • A number of links are missing in a few web and video courses and the courses are not complete. • A lot of data is pushed into a web page. • Lectures are too lengthy. • The quality of audio is poor. • There is no clarity of speech in some videos and we need to refer to pdf or view them several times to understand. • A few videos are not properly recorded. |
| <p>Reciprocity Issues</p> | <p>14% respondents faced reciprocity issues as listed below:</p> <ul style="list-style-type: none"> • Lack of interaction at times made it difficult to grasp a particular concept. Furthermore any doubts arising could not be cleared. • Language barrier/ MTI (mother tongue influence) made it difficult to understand what was being stated in the video lectures. | <ul style="list-style-type: none"> • Sometimes comprehending the language is difficult. • Some doubts arise while watching the lectures. • There are some queries which could not be answered on the spot during the lectures because of no interaction. |
| <p>Personal Issues</p> | <p>10% respondents stated lack of time and lack of recognition/ credit as the reason for facing difficulties in using NPTEL resources.</p> | <ul style="list-style-type: none"> • Time problem • Lack of recognition |
| <p>Accessibility Issue</p> | <p>2% respondents felt that absence of a mobile hosting platform made it difficult to access lectures easily.</p> | <ul style="list-style-type: none"> • Some of the tabs are not supported on mobile. |
| <p>Infrastructure Issues</p> | <p>2% respondents who had been taught by his/her respective faculty using NPTEL resources stated that the infrastructure should be present in colleges such as good quality and high resolution projectors and screens for effective learning.</p> | <ul style="list-style-type: none"> • Use projectors for effective learning. |

Table 7 Difficulties faced while using NPTEL courseware

*ONLY some of the comments have been selected from the survey conducted and focused group and individual interaction with students and faculty members of IIT-R, NIT-K and GEHU to highlight the difficulties faced by the respondents

How was Quality Ensured?

The quality of NPTEL courseware which is adopted and used by engineering institutions is ensured by the team of NPTEL itself. The lectures delivered by the course team including SMEs are peer reviewed at least two times and feedback from students is also taken. IITR being the premier institution in the area of engineering and technical education, enjoys a very good reputation. Moreover, NPTEL is funded by the MHRD, Government of India which is another indication that content originated from NPTEL will be of good quality.

The feedback from users at three institutions through field surveys and focused group interactions indicate that only for a few cases, quality of teaching and presentation in these videos is exceptional. Other videos are average and some are below average in terms of content and overall presentation. This inconsistency in quality should be avoided by NPTEL.

Policy

India has a national OER policy in place since 1st May 2014¹⁵. The National Knowledge Commission (NKC) in 2007 in its recommendations to the Government of India recognised the role of OER in the knowledge economy and to upgrade the quality of education.

At that time, India was the first country in the world to have recognised the potential of OER and Open Access. NKC recommended creation of a National Educational Foundation to develop a web-based repository of high quality educational resources as OER through a collaborative process. Accepting the recommendations of NKC, the ministry of HRD, GOI funded OER development across a range of subjects and degree/certification levels since 2009 through National Mission of Education using ICT (NMEICT). NPTEL has been funded under NMEICT by MHRD. NPTEL Courseware is released under open licensing regime CC BY-SA 4.0¹⁶ which permits users to share (copy and redistribute) the material in any medium or format, and adapt (remix, transform, and build upon) the material for any purpose, even commercially. National policy on OER will have its impact on developing a culture of sharing, reuse and adoption of NPTEL courseware in educational institutions. This policy will also provide guidelines to help educational institutions in developing their own OER policy.

The institutions selected do not have an institutional OER policy till date. IITR and NITK do not have their institutional OER policy but these institutions follow MHRD guidelines and its OER policy. In the case of GEHU where there is no policy to use OER but the senior management keeps on encouraging teachers and students, they have started to use NPTEL content in their teaching learning process. Though there is no formal HR policy to encourage the use of OER, there are instances in GEHU where management encourages the use of NPTEL as innovation by teachers in the teaching learning process and this is considered as a parameter in their annual performance appraisal and due incentives are given. In IITR and NITK, involvement with OER is also considered as an innovation and due recognition is given to faculty members.

¹⁵ MHRD OER Policy (2014) retrieved on 9 December 2014 from: http://www.nmeict.ac.in/Document/OER_Policy.pdf.

¹⁶ Creative Commons (n.d.) About creative commons retrieved on 8 December 2014 from <http://creativecommons.org/licenses/by-sa/4.0/legalcode>

Impact

The impact of the use of NPTEL courseware is expected to be arrived at through:

1. A comparative analysis between costs for delivering lecture in face-to-face mode at these institutions as compared to the use of NPTEL courseware. Majority of the institutions offering Engineering programmes run in face-to-face mode in India. The costs associated with delivery of lectures in classroom include costs for developing classrooms as per the specifications of the regulator, furniture, other infrastructures, and salary of teachers.

Assuming that other costs remain more or less the same, it is the salary which will be different depending upon the qualifications and experience. It comes out to be about Rs. 500 for each class in most of the private institutions whereas it is about Rs. 1500 for IITR and NITK.

2. NPTEL presently is not used as a replacement of day-to-day teaching in any institution, but to supplement lectures. To estimate the cost saving of using NPTEL courseware, we can make an estimate of time saved by the faculty if he/she had to develop the resource on his own and then translating this time saved into man hours saved and cost it on an average salary of the faculty member. Considering the case of GEHU where on an average, 10 lectures have been supplemented in three Engineering streams, a faculty member would have spent at least twice the time he/she would spent for preparing his/her lectures and adding evaluation tools like assignments and quizzes. So it can be said that for an average of 10 lectures, a saving of about Rs. 10,000 is achieved in each course in institutions like GEHU.
3. To get an overall generic estimate if all engineering institutions in India start using NPTEL courseware for only one course (out of about 45 courses), which can be taught through these videos, therefore the entire cost of production of this resource (Rs. 120 crores) can be recovered in one and a half years, resulting in a cost saving of Rs. 41.6 crores per semester. The course can be related to environmental studies or disaster mitigation and management which every engineering student in India is required to study as per the instructions of regulators like University Grant Commission or All India Council for Technical Education. Later on, elective courses which are offered in the third and fourth year of the engineering programme can be taught through NPTEL. This will have a huge cost benefit for all engineering institutions in India.
4. Impact on time related efficiencies: Teachers in these three institutions agree that time related efficiencies are not achieved. For the IITR professor, it was a huge time effort of eight to nine months to create one course and in the course, they still prefer to take face-to-face classes at IITR. For teachers of the other two institutions, it takes more time as they have to refer to books in addition to these videos for preparation of lectures. The students also say that it takes more time to search and use appropriate resources. Students at IITR still prefer to attend class lectures of the professor.

5. Assessment of faculty capacity building: Being part of NPTEL since its beginning, faculty members at IITR have been developing and using NPTEL courseware and now they are excited to contribute in development of new resources. At NITK, teachers want to be part of the development process. For the teachers of GEHU, they are learning how to teach better. They feel empowered. Some of them are confident that given a chance, they can also create such resources.

6. Teaching learning processes: NPTEL courseware has its positive impact on the teaching learning process. Students are now not dependent only on his/her teacher but have access to vast resources. They use technology for their benefit. Some students viewed these videos in advance and come prepared so they focus on interacting with their teacher for clearing their doubts in the class rather than understanding the topic. A few students have also started going beyond NPTEL and registered for massively online open courses (MOOC) through Coursera. They have been successful in clearing the courses and getting the certificates from different universities which are offering their courses through Coursera.

Teachers are also exploring and experimenting with new ways of teaching. After getting a cue from NPTEL, one faculty member motivated students to create a street play on financial inclusion (about savings, insurance, education of girl child etc., in the rural areas) which was showcased in nearby villages as a corporate social responsibility (CSR) activity. It was liked by villagers and students learnt many concepts with ease.

7. Teaching quality: NPTEL videos have certainly helped teachers of other institutions learn how teachers at premier institutions deliver lectures. Teachers at non-IIT institutions are inculcating to bring the best teaching practices in classrooms which were reflected through positive feedback by students on teaching quality during focus group interactions and also teachers admitting that they are using more application-oriented examples and numericals in their classes.

8. Impact on increased access: Based on the focus group interactions with students as well as teachers, it has been observed that some impact has been created by the NPTEL courseware for the disadvantaged group. The students of NITK and GEHU would not have been able to listen and view a lecture by an IIT professor. Before NPTEL, those who could not get into IITs were only wondering what is taught inside IIT classrooms. Distribution of NPTEL courseware through DVDs and hard disk has also enabled a large number of users who have poor Internet access to have access to courseware. It also provides cross-disciplinary learning independent of time, geography and social need for anyone who is interested.

Lessons Learned

1. Demand: The demand picture reflects high and not so high demand. In institutes where the faculty is modest and student experience is poor, NPTEL finds a high value. In the case of faculty, they derive benefits from the greater insight of the knowledge of professors and in the case of students, it supplements what they hear from their lectures. However, NPTEL is not in high demand for undergraduate courses in institutes where the faculty is strong and students are smart. It has been observed that even in these institutes, demand is high for postgraduate courses. There could be a number of reasons. Postgraduate students derive benefits out of competitive examination.
2. Cost benefits: In the case of institutions like GEHU, the demand for NPTEL is highest in engineering and science courses by the students. The demand is equally high from the national perspective. The investment made per lecture through the creation of NPTEL courseware when extrapolated nationwide can bring the cost of that to a fraction of what it would cost to establish a faculty in that field in institutes.
3. Quality: By and large in many of the poorly populated institutions, there is not a curriculum which is structured according to national or international standards. What NPTEL does is that it brings that element of structure in curriculum. While quality is not measured by arbitrary standards, it can be measured by the value NPTEL provides to engineering courses in the institutes which lack the capacity to design their own programme and curriculum.
4. Learning outcomes: NPTEL courses are not reused in their entirety to measure their impact on the learning outcomes of the student. What institutes do is to extract objects from NPTEL courseware that has the value to them and then remix them with their own content. In an assessment of outcomes, we are unable to isolate specifically the outcomes based on the NPTEL intervention.
5. Being a collaborative project of best engineering institutions, it was expected that the video lectures will cover all aspects of teaching and learning including pedagogy but there is an instructional poverty in these videos.

Replicability and Conditions for Successful Replication

1. Proper planning on every aspect of the project should be done and then it should be implemented meticulously. The basic training on instructional design and pedagogy, video presentation and production of video should be given at least to those Professors who are creating these videos.
2. Best practices which are being followed worldwide should be used in content creation and delivery. Smaller duration of video, provision of interactivity and a proper platform for delivery should be considered.
3. Target audience should be considered while developing courses. More than 90% of engineering students are graduating from non-IIT/NIT institutions where the quality of students is not so good and this high quality material is not being used effectively by the intended students.

4. Institutional policy and dynamic leadership are critical to the effective adoption and use of NPTEL resources in the engineering institutions.
5. In this era of Internet when technology and social media has taken over, the teachers must understand that their role is changing from “sage on the stage to guide on the side”. To bring this change, there is a need to organise faculty development programmes at national level which can be conducted through NPTEL.

Chapter 5 Open Educational Resources: Development of e-Learning Professionals

~ *Theeraroungchaisri, A. and Suwannatthachote, P.*

Introduction

The Office of the Higher Education Commission (OHEC), Ministry of Education is responsible for the governance of the country's higher education. An added responsibility of the OHEC is to also take responsibility for the nation's e-education strategies during the 2nd phase of the Information Technology Policy or IT2010 (2001 – 2010)¹ as well as the National Education Plan (2002 – 2016)². These ambitious undertakings require talented academic staff as well as the adoption of newer methods of instruction, both of which is in short supply across Thailand. These problems are not unlike similar challenges being confronted by many other developing countries of Asia³.

In pursuit of the abovementioned policies, in 2002, the OHEC established the Inter-University Network or UniNET as a central administrative hub interconnecting twenty four public universities to major public and commercial IPs. By 2013, this network had expanded and connected to all public universities and is currently well on its way to link with major secondary schools in all of Thailand's 76 provinces. It has also since been renamed the National Education Network or NEdNet connecting more than 7,544 educational institutions in Thailand⁴.

This network system serves as an important information technology infrastructure system, the sharing of educational resources, supports distance education services and communication among universities for teaching, learning, research and sharing a number of academic services. To further progress with the country's e-education plans, in 2005, the OHEC established the Thailand Cyber University Project (TCU) to create, promote and support the needed cooperation among educational institutions in distance education management via Thailand's information network systems (Office of the Education Council, 2007)⁵. The main function of the TCU is to act as one massive portal through which Thai citizens can access e-learning courses from all participating public Universities.⁶

¹ National Information Technology Committee Secretariat (2003): Information Technology Policy Framework

² Office of the educational council, Thailand (2003): the National Education Plan (2002 – 2016)

³ World Bank (2000): Higher Education in Developing countries: Perils and Promise

⁴ Office of Information Technology Administration for Educational Development (2015)

⁵ Office of the Education Council (2007)

⁶ TCU website, <http://www.thaicyperu.go.th>

Thailand Cyber University Project (TCU) (Sombuntham, 2008)

One of the barriers to teaching in the e-learning mode is the very high cost of courseware development. To facilitate the migration to e-learning, TCU has established strong cooperation among universities to share curricula, courseware and contents. This method can help the universities to save costs by preventing them from creating redundant content. In addition, encouraging the sharing of educational resources is a strategy to minimise the educational quality gap. TCU has provided funds to major universities to develop quality courseware on popular topics or for courses, which are in demand. The quality courseware from the major universities will be collected in an educational resources repository (the so-called TCU LMS) and shared with all universities (Sombuntham, 2006). The educational resources repository will not only support university lecturers preparing to teach, it will also be used by university students for learning.

Educational Resources Sharing and OER in Thailand

Open Educational Resources (OER) as a concept is relatively recent in Thailand, that is, in 2006. According to POERUP (Policies for OER Uptake), there was no formal policy on the sharing of educational resources before year 2008, but the initiative from the Office of Higher Education Commission (OHEC) to fund major universities to produce and share courses, and the continued momentum of the Thailand Cyber University Project (in sharing educational resources) have produced significant results. A total of 811 learning courseware items have been created and are freely accessible on the Thailand Cyber University project repository (TCU LMS). Statistics from the TCU LMS showed that 194,690 people have signed up as members and the course registration rate was as high as 398,945, which means that on average, one user registered for two courses. The total visit rate (hit rate) of the website was 17,153,868 as of January 12, 2015. The data available for 2012 gives the breakdown of learner participation by age, occupation and programme types as in **Table 1**. Typically participation rates are highest for younger age users who access undergraduate programmes and who are probably studying as full time students in the country's many universities. OER courses which are available at any time serves both as supplementary and revision materials. There are, in all probability, many lurkers who do not declare both their occupations and levels of programmes they are interested in.⁷

⁷ Theeraroungchaisri, A (2013): Country Report on OER use in Thailand, Paper Presented at the Asia Regional Open Courseware and Open Education Conference 2012, Jan 21, 2013.

| Distribution of users of TCU by Age, Vocation and Programmes (N=128331) | | |
|---|------------------------|------------|
| Age | Age Group | Percentage |
| | • 0 – 19 | 10 |
| | • 20 – 26 | 29 |
| | • 27 – 39 | 38 |
| | • 40 – 46 | 10 |
| | • 47 – 57 | 09 |
| Occupation | Category | Percentage |
| | • Students | 31 |
| | • Civil Servants | 28 |
| | • State Enterprises | 02 |
| | • Self-employed | 03 |
| | • Unemployed | 02 |
| | • Others | 23 |
| Programme types | • Primary | 03 |
| | • Secondary | 10 |
| | • Vocational | 02 |
| | • Diploma | 03 |
| | • Undergraduate | 32 |
| | • Graduate Diploma | 01 |
| | • Masters | 11 |
| | • Higher grad. Diploma | 01 |
| | • Doctoral | 01 |
| | • Unknown | 01 |
| | 35 | |

Table 1 A profile of registered users in TCU programmes

Copyright, Fair Use and OER in Thailand

Thailand has continuously improved its laws and regulations with regard to copyright infringement and has enacted the Copyright Act B. E. 2537 (1994). Copyright laws cover literary works, dramatic works, artistic works, musical works, audiovisual works, cinematographic works, as well as sound recordings and video broadcasting works. According to the act, literary works include books, pamphlets, articles, printed matter, lectures, sermons, addresses, speeches as well as computer programs. Sections 27 – 31 in Part 5 of this Act cover all the infringements that the laws protect authors from. Part 6 lists exceptions to the infringement of copyright. These exceptions allow a person other than the author of a work to create, reproduce, adapt, communicate the work to the public, allow copies to be sold, distribute, or import such work for personal benefit, non-profit research or study, comment, criticism, reporting, the benefit of judicial and administrative proceedings, teaching purposes, as well as when used as questions and answers in examinations. Teachers and institutions have to be aware of the fair use of a copyrighted work as per Part 6 in usage for teaching. The quantity of a creative work reproduced, or copies to be sold and/or distributed must not conflict with the normal exploitation of the copyrighted work by the owner of the copyright and should not unreasonably prejudice the legitimate rights of the owner of the copyright.

Open Educational Resources (OER) terms and concepts were not well established in Thailand until 2012. On September 7, 2012, TCU and MERLOT (Multimedia Educational Resources for Learning and Online Teaching) together launched an event named “TCU-MERLOT Collaboration for Promoting Open Education Resources” to create awareness among teachers, university lecturers and academic staff about OER (Ministry of Education 2012). In addition, the Thai version of the 2012 OER Paris Declaration has been available on the UNESCO website since 2013.⁸

OER in Thailand

As mentioned above, Part 6 of the Copyright Act B. E. 2537 (1994) lists exceptions to the infringement of copyright. These exceptions allow a person other than the author of a work to create, reproduce, adapt, communicate the work to the public, allow copies to be sold, distribute, or import such work for personal benefit, non-profit research or study, comment, criticism, reporting, the benefit of judicial and administrative proceedings, teaching purposes, as well as when used as questions and answers in examinations⁹. While fair use is permitted, those claiming these rights have to be aware that the quantity of a creative work reproduced, or copies to be sold and/or distributed must not conflict with the normal exploitation of the copyrighted work by the owner of the copyright and should not unreasonably prejudice the legitimate rights of the owner of the copyright. In 2012, TCU and MERLOT (Multimedia Educational Resources for Learning and Online Teaching) together launched an event named “TCU-MERLOT Collaboration for Promoting Open Education Resources” to create awareness among teachers, university lecturers and academic staff about OER (Ministry of Education 2012)¹⁰. In addition, the Thai version of the 2012 OER Paris Declaration has been available on the UNESCO website since 2013¹¹.

The TCU e-Learning Professional Development Programme while not explicitly labelled as an OER, it nevertheless contains all of the freedoms, such as the 4Rs expected of an OER-designated educational resources. Within Thailand, any institution or individual, both public and private has the freedoms to access and reuse the contents as it suits them with appropriate attribution to the original creator of the content; and many have done so.

⁸ <http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/open-educational-resources/what-is-the-paris-oer-declaration/>

⁹ Thailand law (2013)

¹⁰ TCU-MERLOT EVENT (2012)

¹¹ Paris OER Declaration (2012)

The TCU Project: e-Learning Professional Programme

Rationale

The 2006 report on e-learning readiness indicated some problems in the e-learning development in Thai higher education institutions (Laohajaratsang 2006). Another research study further indicated a digital divide and the lack of knowledge about e-learning among instructors (Lertchalolarn 2006). In addition, the difficulty in making changes was found to be a factor in instructors being reluctant to use e-learning. The e-learning method of teaching and learning is somewhat different from the experiences of teaching and learning which teachers and students have become used to. In e-learning, a teacher needs certain e-learning teaching competencies and in the same way, a student also needs Internet competencies for learning (Lertchalolarn 2006). Based on the needs of higher education and the mission of the Thailand Cyber University Project to disseminate knowledge on e-learning as a new pedagogical tool for education, an online training programme entitled “e-Learning Professional Programme” was set up by TCU to enhance the knowledge and competencies of instructors and technical staff in the education and private sectors conducting e-learning.

Aims of the Project

The e-Learning Professional Programme has two main objectives:

1. To provide knowledge and skills to school teachers, university lecturers, courseware developers and administrators in all sectors of education, and to enhance competencies in one of the three roles in an e-learning project team (or a combination of them), namely, “e-learning teacher”, “e-learning courseware developer” or “e-learning project manager”; and
2. To create the curriculum, content and learning activities for use in the programme, as well as to provide them to learners for use and adaptation in their teaching practice in order to accelerate the distribution of e-learning knowledge and grow more e-learning human resources.

As mentioned earlier, OER as a term as well as practice is relatively recent in Thailand. Therefore, even though Thailand Cyber University had a clear policy to share the curriculum, contents and learning activities in the e-Learning Professional Programme as openly accessible content that allow for reuse, revision, remixing and redistribution, TCU did not label the courses in the programme as “OER” and it also did not license the courses under a Commons license. Notwithstanding the labelling, the free reuse of the course, at least within Thailand was unrestricted.

Scope of Work

Twelve courses were developed in the first phase of the e-Learning Professional Programme. Specific combinations of these yield three certificate tracks that are called (1) Certificate in e-Learning Teacher (2) Certificate in e-Learning Courseware Developer, and (3) Certificate in e-Learning Project Management (details are provided in the next section).

The e-Learning Professional Programme is an online training certificate programme. The programme is conducted as an open and fully online course similar to a Massive Open Online Course (MOOC). All teaching and learning activities are conducted via the Internet without any face-to-face classrooms or meetings. Once the learners have passed all the required courses in a given track, they can apply for a comprehensive face-to-face examination to get a certificate.

Programme Development

In late 2005, fourteen experts in the educational technology, measurement and evaluation, engineering, and information and communication fields from various universities in Thailand, which included Chulalongkorn University, Silpakorn University, Rajamangala University of Technology Krungthep, and King Mongkut's Institute of Technology Ladkrabang, were recruited as members of the curriculum committee. Later one more additional expert was recruited from Sripatum University. Some experts from this committee were assigned as subject matter experts and instructors in courses related to their expertise. The curriculum development committee agreed to design this fully online training course by using collaborative learning and project-based learning as its pedagogical framework, and teachers were recruited to develop the course materials. The courses that make up this programme are presented in **Table 2**.

To create the curriculum, the curriculum development committee looked for good practices by international academic providers. Some good practices were found in 2005; for example, the "Certificate in e-Learning Professional"¹² from The Training Foundation, University of Warwick, United Kingdom, and "The Distance Education Professional Development Programme"¹³ from the School of Education/Outreach, University of Wisconsin-Madison, United States of America. Both of those curricula were reviewed and combined with the practices of the curriculum committee to become the e-Learning Professional Programme curriculum.

¹² University of Warwick

¹³ University of Wisconsin

| Course | Certificate tracks in: | | |
|--|------------------------|---------------------------------|----------------------------|
| | e-Learning Teacher | e-Learning Courseware Developer | e-Learning Project Manager |
| 1. Principle of e-Learning | core | core | core |
| 2. e-Learning Methods and Skills | core | core | elective |
| 3. Monitoring e-Classrooms | core | elective | elective |
| 4. Designing e-Learning Courseware | elective | core | elective |
| 5. Designing Effective Websites for e-Learning | elective | core | elective |
| 6. Evaluation of e-Learning Courseware | core | core | elective |
| 7. Evaluation Methods and Techniques in e-Learning | elective | elective | elective |
| 8. e-Learning Delivery System | core | core | core |
| 9. e-Learning Project Management | elective | elective | core |
| 10. Organisational e-Learning Policy and Strategy | elective | elective | core |
| 11. Innovative Technology in e-Learning | core | core | core |
| 12. Quality Assurance in e-Learning | core | core | core |

Table 2 The curriculum structure of the e-Learning Professional Programme

*Core is a core or compulsory course for each certificate track

**Elective is an elective course which learners can choose to take in addition to core courses (not compulsory)

The e-Learning Professional Programme trained three batches of learners between the years 2006 and 2011. A total of 580 learners registered in the programme. There was no registration fee.

Funding of the Project

In 2006, the Thailand Cyber University received 3,600,000 Thai baht (approximately US\$105,882¹⁴) from the OHEC to develop the curriculum, courses, courseware and contents of the e-Learning Professional Programme. The first subject was developed and delivered fully online via the TCU learning management platform (TCU-LMS) in 2007. The curriculum consisted of twelve courses. Each course contained courseware and learning activities for 45 hours of learning time and cost about THB 300,000 (approximately US\$8,823.53). The budget for development included the following items:

1. Curriculum development
2. Courseware production
3. Administration cost

Thailand Cyber University allocated another THB 1,000,000 (approximately US\$29,411.76) for hosting three batches of learners (with a total of 580 learners) during the years 2007 – 2011 (**Table 3**). The delivery costs covered teacher per diem, teacher assistant per diem, the server cost, network bandwidth and also payment to technical staff to handle technical problems.

The cost per learner in the e-Learning Professional Programme was US\$234.47 calculated by adding development cost per learner ($\text{US\$}105,882 / 580 = 182.56$) with delivery cost per learner ($\text{US\$}29,411.76 / 580 = 50.71$)

In conclusion, the budget for operation includes the following items:

1. Platform and delivery system development
2. Server and network bandwidth (shared cost with other TCU projects)
3. Technical staff (shared cost with other TCU projects)
4. Teacher and teacher assistant per diem
5. Academic support staff
6. Administration cost

¹⁴ Exchange rate: US\$ 1 equivalent to THB 34

The comparison of cost structure between the e-Learning Professional Programme and other online training courses is shown on the table below.

| Categories | e-Learning Professional Programme (1) | Other TCU online training programmes (2) | Difference (1) – (2) |
|---|--|--|----------------------------|
| Development cost per course (45 hours of learning time) | THB 300,000 (US\$8,823.53) ¹⁵ | THB 450,000 (US\$13,235.29) | THB 150,000 (US\$4,411.76) |
| Delivery cost per time of course opened* | THB 25,000 (US\$735.29) | THB 25,000 (US\$735.29) | 0 |
| Total number of learners enrolled in the programme | 580 | 80 – 120 | 460 – 500 |

Table 3 Estimated cost structure of the e-Learning Professional Programme compared to other TCU's
*Each course was opened several times during the programme operation period. The cost is THB 25,000 (US\$ 8,823.52) each time.

Exact figures are not available to draw a comparison between this programme which had used OER in some of its courses and others which did not. However, a comparison of development costs between courses within the e-Learning Professional Development programme indicates that the cost per learner is considerably less (>30%) of courses using OER than those that did not use OER (see **Table 4** for courses with OER culled from various sources).

Learning Material Development

The subject matter experts of each course researched and authored the learning materials by themselves. For some courses that have very new and fast-changing content, for example, course no. 8 *e-Learning Delivery System* and course no. 11 *Innovative Technology in e-Learning*, the subject matter experts decided to use Open Educational Resources to complement and/or supplement their own learning materials. It was then that the concept and utilisation of OER within the Thai education spectrum officially emerged. The breakdown of the OER use and non-use in each course is presented in **Table 4**.

¹⁵ Exchange rate: US\$ 1 equivalent to THB 34

| | Course | Instructor's own content * | OER ** | Open access content | Ratio of own content/OER | Sources of OER |
|----|---|----------------------------|--------|---------------------|--------------------------|----------------|
| 1 | Principle of e-Learning | 22 | 0 | 7 | n/a | |
| 2 | e-Learning Methods and Skills | 25 | 0 | 5 | n/a | |
| 3 | Monitoring e-Classrooms | 18 | 0 | 5 | n/a | |
| 4 | Designing e-Learning Courseware | 31 | 0 | 4 | n/a | |
| 5 | Designing Effective Websites for e-Learning | 28 | 0 | 1 | n/a | |
| 6 | Evaluation of e-Learning Courseware | 17 | 0 | 0 | n/a | |
| 7 | Evaluation Methods and Techniques in e-Learning | 18 | 0 | 0 | n/a | |
| 8 | e-Learning Delivery System | 26 | 8 | 10 | 3.25 | (1), (2) |
| 9 | e-Learning Project Management | 10 | 1 | 8 | 10 | (2) |
| 10 | Organisational e-Learning Policy and Strategy | 28 | 0 | 1 | 10 | |
| 11 | Innovative Technology in e-Learning | 48 | 18 | 13 | 2.66 | (1), (2) |
| 12 | Quality Assurance in e-Learning | 20 | 0 | 8 | n/a | |

Table 4 Number of open educational resources (OER) that were used in each course

*Instructor's own content means content that was written by the instructor but may reference both copyrighted and OER

**OER means the learning resources are available in the public domain which declares open licenses at the least reuse level (1) Youtube's content, and (2) Wikipedia's content

OER which was used as supplementary and/or complementary learning materials in the course numbers 8, 9 and 11, save the cost and time of the subject matter expert and also the production team. Roughly calculated, using OER has saved an amount of US\$7,523.23 in the e-Learning Professional programme. The cost calculation is presented in **Table 5** below.

| | Course | Instructor's own content * | OER ** | Open access content | Total number of content |
|----|---|----------------------------|--------|---------------------|-------------------------|
| 1 | Principle of e-Learning | 22 | 0 | 7 | 29 |
| 2 | e-Learning Methods and Skills | 25 | 0 | 5 | 30 |
| 3 | Monitoring e-Classrooms | 18 | 0 | 5 | 23 |
| 4 | Designing e-Learning Courseware | 31 | 0 | 4 | 35 |
| 5 | Designing Effective Websites for e-Learning | 28 | 0 | 1 | 29 |
| 6 | Evaluation of e-Learning Courseware | 17 | 0 | 0 | 17 |
| 7 | Evaluation Methods and Techniques in e-Learning | 18 | 0 | 0 | 18 |
| 8 | e-Learning Delivery System | 26 | 8 | 10 | 44 |
| 9 | e-Learning Project Management | 10 | 1 | 8 | 19 |
| 10 | Organisational e-Learning Policy and Strategy | 28 | 0 | 1 | 29 |
| 11 | Innovative Technology in e-Learning | 48 | 18 | 13 | 79 |
| 12 | Quality Assurance in e-Learning | 20 | 0 | 8 | 28 |

Table 5 Cost calculation for each type of learning material

Programme Implementation

All 12 courses were implemented and delivered in a fully online environment (similar to MOOCs). Each course took 8-10 weeks and teaching-learning strategies were designed using collaborative learning and project-based learning. Each course required at least one teacher and one teacher assistant. The learning management system (LMS) used in the first phase of this programme was TCU-LMS, which was the learning management system created by the Thailand Cyber University Project. After six months, the curriculum committee made the decision to migrate to Moodle, an open source LMS, which has more features needed to support effective online teaching and learning. One academic support staff from TCU was assigned to coordinate between teachers and students. There were administrative tasks such as registration, recruitment, training, monitoring of teacher assistants' work and teacher assistant payment. Two technical support staff from TCU were assigned to support programme implementation, which included LMS administrator and help desk tasks.

Quality Assurance

To maintain the integrity of the content of each and every course, each commissioned course writer is given a Guideline on TCU requirement.¹⁶ The quality of each course was reviewed by a team of subject matter experts. Each course was reviewed at several subject matter expert meetings. After a course structure was validated, a revised version of the course structure and content was developed into the course materials, which included documents, video clips and courseware based on the instructors' preferences. There were peer review sessions for internal quality control in every course. Also, the contents of each course were continually reviewed, updated, improved and enriched on the basis of the responses received. When each course ended, a survey of the learners was conducted.

Students who completed all the subjects in a given track were required to undergo a comprehensive face-to-face oral examination. The programme committee set up the comprehensive oral examination sessions and handed out certificates to those who qualified. In the face-to-face oral examination process, students were required to present a project that demonstrates their application of knowledge obtained from the programme in a real situation. In each examination cycle, TCU conducted a survey to collect data from students, instructors and administrators. Programme implementation was improved based on the results of the surveys.

Output

The e-Learning Professional Programme opened for registration in three separate batches viz. 2007, 2009 and 2010. A total of 580 learners from various occupational levels enrolled in the programme. The learners were from higher education institutes, vocational education institutes, basic education institutes, colleges, community colleges, state enterprises and private companies (e.g., airlines). They came from various locations in the country. The programme was operated during the years 2006–2011. Only 34.8% of the learners completed the courses and received the certificate in the specific track that they applied for. About 40% did not complete the courses required (especially the core courses), so they did not qualify to apply for the certificate, and 9.1% failed to pass the comprehensive face-to-face oral examination. The dropout rate was about 16.1% as shown in **Table 6**.

| Stage of completion | Person | Percent |
|---|--------|---------|
| Total registered | 580 | 100.0% |
| Dropout | 93 | 16.1% |
| Did not complete the required courses | 232 | 40.0% |
| Completed the required courses but did not pass the face-to-face oral examination | 53 | 9.1% |
| Completed, passed the face-to-face oral examination and received certificate | 202 | 34.8% |

Table 6 Output statistics for the e-Learning Professional Programme

¹⁶ <http://www.thaicyperu.go.th/index.php?lang=en-us>

The first phase of the e-Learning Professional Programme project ended in 2012. Various aspects of the programme were evaluated occasionally. The opinion of learners, instructors and administrators regarding the positive and negative aspects of the programme was obtained by interviewing, and conducting surveys and focus groups (Lertchalolarn et al. 2012)

| Batch | Learning track | | | Total registered |
|------------------------------------|--------------------|--------------------------------|----------------------------|------------------|
| | e-Learning Teacher | e-Learning Courseware Designer | e-Learning Project Manager | |
| | No. registered | No. registered | No. registered | |
| 1st | 59 | 143 | 74 | 276 |
| 2nd | 99 | 75 | 45 | 219 |
| 3rd | 23 | 39 | 23 | 85 |
| Total | 181 | 257 | 142 | 580 |
| Received Certificate ¹⁷ | 66 (36.5%) | 70 (27.2%) | 66 (46.5%) | 202 (34.8%) |

Table 7 Completion rate in each learning track*

*Note: The figures in **Table 7** show the number of learners who completed and received a certificate in one or more tracks. Some learners may have registered in more than one track but may not have successfully completed all the tracks they registered for and hence the difference in numbers of those who received the certificates.

Follow-Up Evaluation

The follow-up surveys of successful graduates of the programme reported their satisfaction with the programme. Further evidence of successful learning outcomes was also indirectly evident by a review of websites where the TCU graduates of these programmes initiated their own e-learning activities in various organisations and institutions. Some examples given below in many ways demonstrate whether they had applied the knowledge and skills gained to their teaching practice, either to develop an e-learning course or to conduct e-training.

1. E-learning websites and online courses that were developed, operated or taught by learners who graduated from the programme include:
 - a. An e-learning website and courseware for training architecture students (<http://www.praphantpong.com>),
 - b. An e-learning website and courseware for teaching ICT in vocational education (<http://www.pongsak.com/elearning/>),
 - c. An e-learning website for Thai Life Insurance Public Company to train their insurance representatives (<http://elearning.thaillife.com/elearning-legacy/>).

¹⁷ Learners who completed all the required courses and passed the face-to-face oral examination and received a certificate

2. Many training programmes, courseware development courses and online learning courses in public and private universities, vocational schools, secondary schools, as well as public companies like:
 - a. Somapa Group (<http://www.somapagroup.com/th/>)
 - b. Thai Airways (<http://www.thaiairways.co.th/>)
 - c. Thai Life Insurance (<http://www.muangthai.co.th/web/>)
 - d. Kasikorn Bank (www.kasikornbank.com/en/)
 - e. IBM Thailand (<http://www.ibm.com/th/en/>)

3. Learners who graduated from the Project Manager Track initiated changes in their respective educational institutions. Successful changes were made in the Ramathibodi School of Nursing¹⁸, the Pilot Preparation Programme of Thai Airways International and the Thai Telecentre Academy Programme¹⁹ (Lertchalolarn et al. 2012).

Moreover, success can also be seen in the pedagogical area of this e-learning programme since it shows significant collaborative learning among learners. Discussions and the exchange of ideas among peers provide for better understanding of knowledge being learnt. However, the report shows several areas in the programme that should be improved, such as the number of courses and their relationship to competency-based learning, learning assessment methods, periodically set up comprehensive examinations and the limited time that volunteer instructors had (Lertchalolarn et al. 2012).

Recently, TCU started phase 2 of the e-Learning Professional Programme. According to the new roadmap of education reform in Thailand, teacher reform and capacity building are emphasised as one of the five pillars in the education reform framework (Ministry of Education 2015). The new e-Learning Professional Programme aims to provide teachers with the necessary skills of planning, communicating, analysing learning and development needs, providing meaningful learning activities, assessment of learners, and evaluation of programmes, by utilising information and communications technology. They should also be able to manage their own professional development and contribute to organisational development. The programme committee revised the competency of e-learning teachers. The revised competency will be used for developing the new e-Learning Professional Programme which will include some new and updated topics. The new e-Learning Professional Programme will start in 2015.

¹⁸ <http://rama4.mahidol.ac.th/nursing/tcu/index.php>

¹⁹ Thai Telecenter Academy website located at <http://164.115.25.108/>

Impact on the Capacity Building of e-Learning Professionals in Thailand (Lertchalolarn et al. 2012)

Learners who graduate from the programme are very likely to become qualified e-learning professionals in their institutes/organisations throughout Thailand.

The curriculum, learning materials and learning activities that were created and used in the e-Learning Professional Programme were totally open for access by learners, and surveys found that learners shared the resources with their colleagues. Learners reported that they reused the resources from the programme in their own teaching practice (see the section on “OER Usage and Adoption in the Project”). Instructors in the programme also reported that they reused the learning resources in other courses that they taught.

In addition, the courses in the e-Learning Professional Programme have been referred to, and adopted by graduate programmes such as the Master of Education (M.Ed.) in ICT in Education which is run by Surindra Rajabhat University.

Impact on Open Education in Thailand (Lertchalolarn et al. 2012)

Following the policy to operate the programme as an open educational programme, TCU charges no tuition fees and provides open access to anyone who is interested in the programme and would like to enrol. TCU also makes an active effort to awaken the interest of administrators, practitioners and scholars from various organisations, including state universities, private universities, elementary and secondary schools, and the business sector, both in Thailand and abroad, to apply for this programme. Other universities such as Khon Kaen University²⁰ and Chiang Mai University²¹ have also adopted similar programmes. They have initiated open education programmes for academic faculty development in small universities and for schoolteachers in their region.

The programme has led to TCU receiving the “UNESCO King Hamad Bin Isa Al-Khalifa Prize for the use of Information and Communications Technology in Education” in 2010 for its outstanding contribution to the theme “Teaching, Learning and e-Pedagogy: Teacher Professional Development for Knowledge Societies” and for promoting the use of ICT to achieve quality education for all.

OER Usage and OER Adoption in the Project

OER usage and adoption in the e-Learning Professional Programme are discussed from two angles, the instructors’ angle and the learners’ angle. From the instructors’ angle, the ways in which instructors adopted OER practice both by using open content for teaching their courses in the e-Learning Professional Programme and also the sharing of “the programme OER” with others are discussed. How learners adopted OER practice and used the OER in their own work or teaching, and shared their own content as OER, are also discussed.

²⁰ Khon Kaen (<http://www.kku.ac.th>)

²¹ Chiang Mai (<http://www.cmu.ac.th>)

A group interview with nine subject matter experts (who were also instructors in the course) provided interesting insights, which are summarised in **Table 8**.

| Finding | Process | Main driver |
|--|---|---|
| Subject matter experts used public OER only to supplement their self-developed content. | Subject matter experts developed learning materials as per the agreed upon course outline and then search for public OER to supplement content. | Desire to add value to the programme's OER Content on evolving topics like the use of Google apps available only as open source online material. The appeal of animation and graphics in OER for learners. |
| Search, identification and incorporation of public OER into the programme's OER were time intensive. | Subject matter experts on search and identification of public OER accounted for up to three hours per week, and incorporation for one hour per week, using up a total of 32 hours. | Lack of experience to evaluate quality of OER and also experience to identify the CC regime. |
| Some courses in the programme did not use public OER. | Course 5, course 7 and course 10 did not make explicit use of OER. | Subject matter experts wanted to rely only on self-developed materials and intended to use these materials for their academic promotion. |
| Legal and copyright issues were considerations in the use of public OER. | Understanding of CC licences is not widespread; referencing is done through the use of URLs. | Thailand's fair use guidelines are applied rather than CC to avoid legal issues. |
| Criteria applied for search and identification of public OER. | Criteria applied for search: <ul style="list-style-type: none"> Resources have content which supplements the programme's OER. Multimedia and animation as well as video clips are more preferable public OER. Resources should be from trusted organisations/institutes. Resources are allowed for open access without the requirement for registration or login. | Main reliance on self-developed materials and public OER applied as value addition. |
| Willingness of SMEs to allow reuse varied widely. | While TCU has a policy of open sharing, SMEs expressed varying degrees of openness in allowing reuse, remixing or revision — 25% were willing to allow reuse as such while 50% were open to the idea of allowing revision and remixing. | Reuse of the programme's OER as teaching material in own classes. |
| SMEs actively promoted the use of OER among learners. | Active encouragement provided by over 50% of the respondents to learners to search for, use and share OER. | Let learners understand and have positive attitude about OER to become an OER adopter. SMEs should act as role models in OER to learners. |

Table 8 Instructors' use of OER materials — a survey

While the above summary of interview feedback does not avail itself to quantitative statistical analysis, nevertheless it illustrates how course developers at TCU viewed the value and use of OER. For instance:

1. Not every academic felt the need to access and reuse OER.
2. The use of OER was influenced by the appropriateness of the context.
3. A need to have better skills to search and reuse OER.
4. An uncertainty about the legal use of CC in the absence of a comprehensive understanding of the matter.
5. A preference to rely on Thailand’s fair use provisions.
6. Those institutions/staff using OER were somewhat uncertain about their own institutions’ willingness to redistribute.

OER Adoption: Attitude and Behaviour of Learners in the Programme

An online survey (via email) of learners was carried out between late October and November 2014 to investigate the usage of learning materials and OER in the programme. There were 94 respondents in total, with 51 (54%) higher education instructors, 14 (15%) government officers, 13 (14%) basic education teachers (most were secondary school teachers), 8 (9%) from the private sector, 6 (6%) vocational teachers, and 2 (2%) ran their own business. The survey studied:

1. Learner’s experiences in the use of learning materials, and how they shared these to others.
2. How the learning materials were used and how learners adopted the idea of OER in their practice.

| Aspects of Sharing and Reusing | Responses |
|--|--|
| Sharing (Distributing) Original Course content | <ul style="list-style-type: none"> • Individual used 65% • Shared with colleagues 64% • Shared with others (public) 33% |
| Reusing Content | <ul style="list-style-type: none"> • Not used at all 29% • Reused without revision 30% • Reused with revision 28% • Remixed content with other content 42% |
| Sharing Revised Content with Others | <ul style="list-style-type: none"> • Does not permit 47% • Permit with revising 49% • Permit with remixing 51% |
| Sharing Self-developed Material | <ul style="list-style-type: none"> • Does not permit 46% • Permit with revising 42% • Permit with remixing 40% |

Table 9 Survey to assess learners’ attitudes to aspects of sharing, reusing, remixing and redistributing

The survey findings in **Table 9** are illustrative of attitudes of learners, who are e-learning professionals and themselves beneficiaries of courses enriched by open access materials. For instance:

1. More than half were willing to redistribute materials to programme colleagues who may not be course colleagues but the lonely two-thirds were prepared to do the same with others (i.e., not course or programme mates).
2. About 70% reused course materials in their own jobs, some reused as is, others reused with revision and yet others remixed with other content. Less than 30% did not reuse content at all.
3. Among those are learners who revised and remixed the original content while all were willing to redistribute less than 50% of the permitted remixing or revising.
4. Many of our learners also created their own materials. Among such learners, about half of them were willing to share their materials with others while others were not willing.

In-depth interviews were conducted with five learners (three in face-to-face mode, one via telephone and one via video conferencing) to understand more about their usage of the shared learning materials in the programme. The following responses were obtained (**Table 10**):

| Interview question | Learner response |
|--|--|
| How do you use the learning material from the programme? | L1: "The educational resources sharing in the programme is wonderful; I used them as resources for teaching and instruction. New and interesting knowledge helped me to prepare for my class." |
| How does it benefit you? | L3: "It decreases the time and cost required to prepare the content, especially the multimedia content." |
| Do you have any problems using educational resources shared over the Internet? | L4: "The problems are that I do not know how to evaluate the quality of the resources and whether I am allowed to use the resources or not, unlike the educational resources from the e-Learning Certificate Programme that I am confident to use." |
| What did you learn about OER in the programme? | L1: "I was amazed with the ways that the instructor of the Innovative Technology for e-Learning course used Internet resources and combined them with other content to produce the course content. It is really practical and saves time, and I feel that it is interesting because of the variety of the content and style of presentation." L2: "From communication with peers during the learning activities in the class, I learned that there is a lot of good content available for use on the Internet. In fact, our students can learn by themselves even if a teacher does not directly teach them." L5: "I have some techniques to find good OER from my teachers and friends in the class, which are very helpful." |

Table 10 Benefits derived from the programme's OER

In summary, the majority of learners in the e-Learning Professional Programme reported that they have been OER users and have shared OER in their own work and/or teaching. It was shown that learners found the quality of OER from the e-Learning Professional Programme to be good and they have developed an adequate understanding about the concept of open education resources, open licensing and regulations related to sharing. In addition, the instructors' behaviour influenced them. Ultimately, the learners gained a positive attitude on OER adoption and have become OER adopters to some extent.

Impact and OER Adoption from the Project

The Adoption of the e-Learning Professional Programme by Surindra Rajabhat University (SRRU)

In 2012, SRRU adopted the whole curriculum of the e-Learning Professional online training programme (ePro) in their graduate degree programmes. The collaboration between TCU and SRRU has been managed and coordinated. All courses of the programme were adopted, including the curriculum and learning materials. In the initial phase of course implementation, some instructors of the programme were invited to teach at SRRU and used learning materials from the programme as learning resources.

The adoption of these courses has been carried out under the Thai Copyright Law, especially part 6, which has exceptions from infringement of copyright that allow for the reuse of all materials by referring to the author or owner. Some resources in the course materials (which were produced in 2006–2011) have been perceived as “very helpful and up-to-date resources” (Prachit Intaganok 2014).

Although the e-Learning Professional Programme learning materials were not explicitly declared as OER (enabling reuse, revision, remixing and redistribution — the four R's), the policy of the host organisation and the aims of the project to develop human resources as well as to share learning materials, thus enabling all four R's, were announced to the public (Thailand Cyber University, 2005). Therefore, the request from Surindra Rajabhat University (SRRU) to reuse the curriculum and learning materials confirmed the success of the programme and was evident that the e-Learning Professional Programme is one of the projects which has significantly driven OER adoption and implementation in Thailand.

Moving Forward: Learning Resources Sharing in Thailand

After the success of the e-Learning Professional Programme (ePro), Thailand Cyber University (TCU) initiated OER strategic planning and has implemented several key projects to widen learning resources sharing in Thailand. One major project being carried out is a collaboration with the California State University, USA, to promote the idea to the learning community in the same way that the MERLOT project has been doing successfully for over a decade (Ministry of Education 2012). In addition, TCU has organised several conferences specifically on OER and learning resources sharing at the national and international levels, for example the 4th Asia Regional Open Course Ware and Open Education Conference (AROOOC) in January 2013, to raise the awareness of the stakeholders, especially those in the academic field.

TCU has also been working closely with leading universities in all regions throughout Thailand to promote the creation and sharing of learning resources. To strengthen the process, TCU also acts as a medium in interconnecting the Thai resource sharing databases with international repository providers, including the GLOBE (Global Learning Objects Brokered Exchange)²² network. By having this connection, everyone can search for shareable materials throughout the world using a specially created portal at <http://globe2.thaicyberu.go.th>, which has a filter for searching for materials with an open license and Creative Commons' explicit declarations.

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Chapter 6 Open Educational Resources: Improving Quality and Reducing Cost

~ Madhulika Kaushik

Abstract

This institutional study presents a critical analysis of OER use and impact at Wawasan Open University across 3 schools of studies through 3 courses developed. All courses were developed using OER but applied different approaches to development and adaptation resulting in varying cost and time-related efficiencies as outcomes.

The study presents the context of use of OER in terms of the policy and infrastructural environment, support available and resources used for OER development, dissemination and use in all three situations. The study also presents a narrative on the types of resources used in the selected courses, the sources of the OER used as well as the nature of licence the resources carried with them. The courses forming the subject of study are at different levels, with different sizes of user population. The case study is thus able to present comparative scenarios within the same policy and infrastructural environment. Motivations for using OER, processes for promoting OER use and institutional capacity building are shared.

Available and collected data has been used to arrive at an assessment of the lessons learned and understanding of pitfalls to avoid in order to enable better efficiencies from OER use.

OER Use and Impact: A Case Study of Wawasan Open University — Situational Context

Higher education in Asia, including Malaysia, has seen exponential growth in the last two decades which has been characterised by escalating upsurge in the number of aspirants for higher education, rising costs and multiple constraints on resources available for higher education including public finance, infrastructure and faculty expertise.

Malaysia today has a Gross enrolment ratio of about 34% in tertiary education. In terms of global comparison¹, Malaysian higher education sector is ranked 14th (out of 142 countries). The national expenditure on education shown as public expenditure as percentage of Gross Domestic Product (GDP) was 5.9% in 2011². Public expenditure per pupil as a % of GDP per capita has been recorded as 60.9%³. The state has allocated 8% of total governmental expenditure or (RM11.3 billion) to education. Malaysia allocates 2.7% of its GDP to higher education. This relatively high percentage is due to the subsidisation of tuition and often, on-campus accommodation. The actual expenditure on education at current prices was recorded at RM37,281 million in 2012⁴.

¹ World Economic Forum's 'Global Competitiveness Report 2011/2012'

² <http://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS>

³ <http://data.worldbank.org/indicator/SE.XPD.TERT.PC.ZS>

⁴ http://emisportal.moe.gov.my/emis/emis2/emisportal2/doc/fckeditor/File/Quickfacts_2012/quickfacts2012.pdf

The Education National Key Economic Area (NKEA) has targeted to more than double the total gross national income to RM60.7 billion by 2020 from the current RM27.1 million seen in 2012. The education sector of Malaysia has been the subject of a renewed focus for the government as well as from private investors both in Malaysia and abroad⁵.

Malaysian Higher Education system represents a fairly well-developed system, comprising universities, university colleges, foreign branch campuses colleges, polytechnics and community colleges. The system, at present, comprises 20 public universities, and 6 university colleges, 414 private colleges, 37 private universities, 20 university colleges and 7 foreign branch campuses nationwide to date,⁶ all under the purview of the Ministry of Education. This growth has to be seen against the historical figure of just one university in existence at the time of independence.

This rapid growth has however created its own challenges, in terms of paucity of quality faculty as well as the quality of instruction.

While there has been a lot of academic discussion and great deal of excitement around open education resources among both national policymakers and OER champions in the country, OER use in Malaysian universities has not been very pronounced. Some universities have participated in the creation of OER and contributed to OER repositories. As per a survey conducted by the Ministry of Education in 2012, at least 5 public universities are members of OCW.⁷ Instances of active use in teaching and learning as a mainstream practice in the universities are sparse. At an individual faculty level, however, 70% of the Malaysian faculty respondents for an IDRC-supported study on OER use in Asia suggested that they had made use of OER in their teaching at some point. Incidences of inter-institutional cooperation in producing or using OER were found to be rare⁸.

Among the active users and champions of open education resources in the region, Wawasan Open University (WOU), Malaysia, has been promoting the use of OER in higher education in the region and began its own OER initiative in the year 2010. The University set up an OER Asia portal and made a major contribution by developing and sharing, the OER Training Toolkit, a highly useful resource for beginners in the OER arena. Though there is no national policy relating to open education resources, WOU adopted and implemented an institutional OER policy to “promote and implement the creation, reuse, remix, repurpose and redistribution of Open Educational Resources (OER) within an Open Licensing framework”.

This institutional case study is aimed at analysing the implementation and use of OER at Wawasan Open University for three courses across three schools of study. All courses were components of named degree programmes of the University and the OER content developed was used as the core course material delivered to the learners of the courses. User data in the form of learner-related feedback and evaluation statistics as well as focus group data from faculty, tutors and other stakeholders are presented to validate the inferences drawn in the study.

⁵ MOE Report of Review of the National Higher Education Strategic Plan “Higher Education Leads Malaysia’s Future,” Ministry of Education, Putrajaya, 2014

⁶ MOE, 2013

⁷ Accessed from http://www.mohe.gov.my/portal/images/penerbitan/JPT/Pengurusan_Pembangunan_Akademik/Open_Educational_Resources_in_Malaysian_Higher_Learning_Institutions.pdf

⁸ Ishan Sudeera Abeywardena, Gajaraj Dhanarajan and Chooi Khai Lim, ‘Open Education Resources in Malaysia’ in Commonwealth of Learning (2013) *Open Educational Resources: An Asian Perspective*, Perspectives on Open and Distance Learning, Vancouver.

Wawasan Open University is Malaysia's first and to date only, not-for-profit, private university. The university was set up in 2006 and started offering academic programmes in 2008. The university was established with an objective of enhancing access to affordable, quality higher education for working adults in Malaysia through technology supported open and distance learning. In its 8th year of operation, the University, today, offers 43 ODL and 2 on-campus programmes across 4 Schools of study and has an active student enrolment of about 5,000 learners⁹. The programmes include undergraduate and postgraduate degree programmes, graduate and postgraduate diploma programmes and research degree programmes. Almost all learners in its ODL programmes are working adults.

Subject Matter of the Case Study

Three courses, out of some 323 on offer at the university, amongst the earliest exemplars of OER adoption at the Wawasan Open University were identified as the subject of this case study on use and impact of OER. The courses were *ICT in Education* (M.Ed Programme); *Microeconomics* (BBA programme) and *Programming Fundamentals with Java* (B.Tech Programme). The courses selected were at different levels: one a masters level core course, the second, a level 1 core course of the undergraduate programme in business, and the third, a level 1 undergraduate course in engineering and technology, all with different sizes of user populations. The case study is thus able to present comparative scenarios within the same policy and infrastructural environment. All three courses were developed using OER almost entirely and these form the core content in each case. A brief description of each course is given in **Figure 1**.

EED 501/05 ICT in Education is a 5-credit, one semester, compulsory course designed for students who are enrolled in the Masters in Education programme offered by WOU. This course is organised into five units addressing topics of Information and Communication Technology (ICT) in Education. The course seeks to enhance learner skills in using ICT in education and aims to enable them to select and organise materials, equipment, and technological tools needed to conduct instruction. Being a Masters level course, the weightage for assessment between continuous and term end assessment is 40:60.

BBM 102/05 Microeconomics is a 5-credit, level 1 course within the Bachelor of Business Administration (BBA) programme. It is a core course and must be taken by all students wishing to complete their BBA degree. The course comprises five study units. Learners are required to complete two assignments as part of their continuous assessment and appear for a term-end examination to attain the credit for this course. The weightage for assessment between continuous and term end assessment is 50:50.

The course aims to introduce learners to economic problems and show how private and government agents deal with these problems. It covers economic efficiency and resource allocation, market versus command economy, product and factor markets, and causes of market failures.

⁹ At the university, the term programme is used to denote a certification bearing suite of courses, duly accredited as a named certificate/diploma/degree. Each named programme consists of a prescribed number of 3 or 5 credit courses, determined by the required credit value of that programme under the Malaysian qualifications framework. Most courses in the WOU undergraduate degree programmes are 5-credit courses, while the postgraduate courses may bear 3 credits (1 credit = 40 hours of learner workload). Credits are earned upon successful completion of a course. Following a standardised instructional design framework, each course is presented as a set of 5 study units. Each unit in turn may have about 3-4 chapters or lessons. The units are presented following WOU's instructional design template benchmarked against international best practices in ODL design.

TCC 121/05 Programming Fundamentals with Java is a 5-credit, level 1 course for the Bachelor of Technology programme at the SST. The course is designed to provide a structured and stimulating environment in which learners can learn computing fundamentals using the object-oriented paradigm (model) and Java technology.

The course comprises five study units. Learners are required to complete two assignments as part of their continuous assessment and appear for a term-end examination to attain the credit for this course. The weightage for assessment between continuous and term-end assessment is 50:50.

All the above courses require about 18 weeks to complete. 1 credit at WOU is equivalent to 40 notional hours of learner workload. A five credit course would generate about 200 hours of learner workload including time spent of studying the units, attending tutorials, performing learning exercises and activities, interacting with tutors, Course Coordinators and peers on the Learning Management System (LMS), preparing assignments, preparing and taking the exams.

Figure 1 OER-based courses at WOU used for this case study

The data used for the case study includes both secondary data from records and primary data from users. The secondary data was accessed from the Course registration and assessment records from the Registry, the Student Information System of the university, the course presentation reports and the external course assessor reports. The primary data was collected through focus group interviews and in-depth interaction with course team members, tutors and learners of the courses selected for the study.

Course Development Process at WOU

Until recently, all the courses developed by the University for its off-campus students were heavily dependent on a prescribed commercially-published textbook around which careful instruction in the form of a study guide was constructed. The study guide comprises five units based on the blueprint, the assessment material and instructions to navigate the textbook. The use of textbooks for a course was hugely expensive; sometimes costing as much as 10% of the tuition fee for the course.¹⁰

Figure 2 presents the course development cycle used at the university¹¹.

¹⁰ Under the initial model of course material provision used at WOU, the university undertook to supply the prescribed textbook along with the prepared course guide to each registered student. Malaysian publishing industry presents a high textbook pricing practice, which in the tertiary sector could range between RM80 – 100.

¹¹ Adapted from 'Assuring Quality of the Learning Support Services — Malaysia's Wawasan Open University', Tat Meng Wong and Teik Kooi Liew; 'Quality Assurance in Distance Education and eLearning — Challenges and Solutions from Asia', Editors: Insung Jung, Tat Meng Wong and Tian Belawati (2013) IDRC, CDRI, Sage: New Delhi. In **Figure 2**, the Education Technology and Publishing unit (ETP) shown, is responsible for providing the services of instructional design, language editing, graphics and multimedia design as well as publishing. ITS denotes Information Technology Services of the university. QA denotes the quality assurance processes.

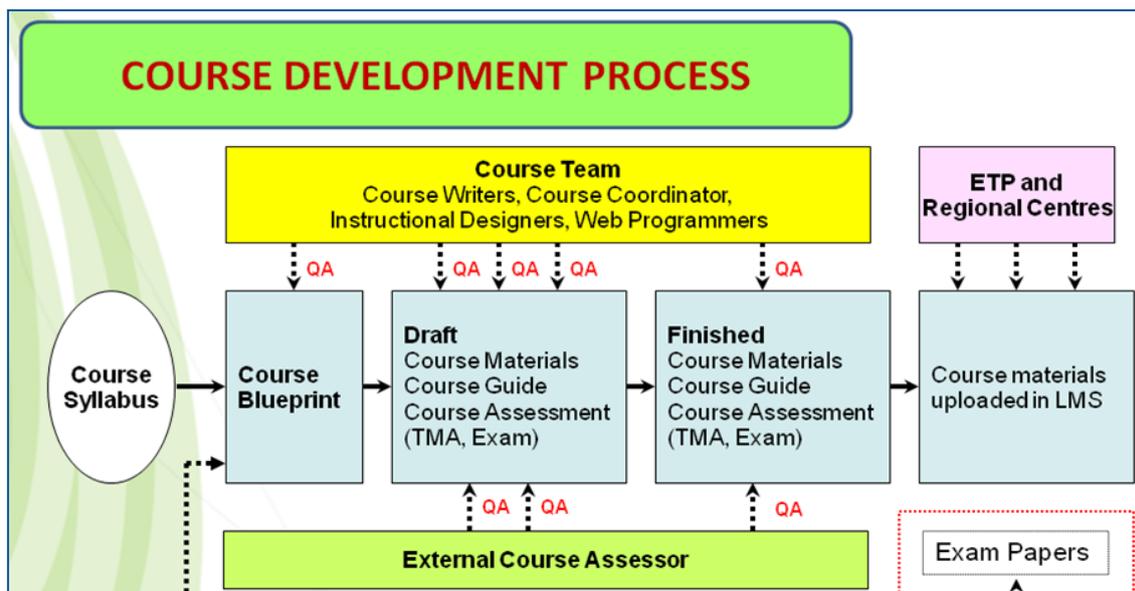


Figure 2 Course development process at WOU

Course development process:

1. Course Blueprint is developed by course team comprising subject matter experts, instructional designers, editors and publishing staff and an external course assessor, based on industry needs and syllabus approved by the Malaysian Qualifications Agency¹². WOU has extensively used external expertise for writing the course content.
2. The Blueprint is shared with:
 - a. **the librarian** to ensure textbook and reference material availability
 - b. **the information technology services** to ensure software support
 - c. **the ECA** for critical review and advice
3. All units are sent to ECA for review and approval, and the revised drafts presented to him/her for final report which is presented to the School Board.

¹² The Malaysian Qualifications Agency is the official agency responsible for quality assurance of higher education for both the public and the private sectors in Malaysia. The Agency was established on 1st November 2007 with the coming in force of the Malaysian Qualifications Agency Act 2007 and resulted from a merger of two existing federal bodies, the National Accreditation Board (LAN) and the Quality Assurance Division, Ministry of Higher Education (QAD). The main role of the MQA is to implement the Malaysian Qualifications Framework (MQF) as a basis for quality assurance of higher education and as the reference point for the criteria and standards for national qualifications. The MQA is responsible for monitoring and overseeing the quality assurance practices and accreditation of national higher education (<http://www.mqa.gov.my/>).

4. Rigorous editing undertaken and the final product sent to the DVC Academic for review before being placed for the Senate's approval for presentation as a course. The entire process takes between 18 to 20 months.

OER Adoption and Use at WOU

The use of OER is actively encouraged at the university for new course development, course revision, course updates or providing supplementary content to existing course material. The major driver for use of OER at WOU was the desire to benefit from a resource that was not going to cost heavily. The university's course development costs were heavily influenced by the policy of providing textbooks in addition to the self-instructional materials to all students. The emergence of OER presented a seemingly effective alternative approach to course material development using free and open content, and the qualitative enhancement of content using diversity of materials from world experts. Time efficiencies in development cycle were the other major driver of OER use.

The three courses were chosen because they represent the first exemplars of OER-based content development replacing the earlier model of using wrap-around text-based material and the quest to provide high quality course material to learners by accessing reputed and carefully chosen open education resources. At this point in time, the incidence of use is a little over 10% of the total courseware development activity at the university. For all the three courses, OER were almost exclusively utilised to develop the core content. Following the university practice in course development, the course blueprints were developed using participative course team approach. These blueprints guided the search and evaluation of open education resources to meet and fulfil the requirements of the course learning outcomes in each case.

For an open university like the WOU, the scope for the use of OER is tremendous as material development cost forms a major proportion of the capital outlay at the university. The initial model of content development adopted wrapped around an existing textbook, has become increasingly unviable in the face of rising textbook costs, frequent editions and recurring non-availability of current editions.

Also, the attraction of using free, high quality open education resources and applying them legitimately to enhance the diversity and overall quality of the content offered to the learners is very potent. Open universities also have internal expertise and experience in instructional design, which augurs well for crafting well-designed courseware using materials from different resources as selected by the academic team, but transforming them to institutional style and embedding the various media and graphic design features as required. The university's future plans involve mainstreaming the use of open education resources to progressively move out of the dependence on textbooks and the inhibiting copyright requirements that go along with that usage.

Objectives of OER Use

In all three cases, the OER content is used as the core course material in a credit-bearing course. Learners use the content as the stand-alone resource material for the courses concerned. In all three cases, no textbooks were prescribed as all the required content was integrated into the study material itself and the online references were provided for additional reading by sharing the related URL.

The institutional objectives for initiating the use of OER were as follows:

1. Improving the efficiency of course development process in terms of cost by getting away from the dependence on textbooks as well as that on commissioned writers for developing content.
2. Enhancing the quality of the course content by accessing quality open education resources from a variety of world experts.
3. Developing faculty capacity in OER use and adoption, and building a cadre of well rounded, motivated academics that could energise such adoption across schools and courses.

The individual course teams in the focus group discussion reported slightly different objectives as shown in **Table 1**.

| Course | Stated objectives |
|---|--|
| <i>ICT in Education</i> | <ul style="list-style-type: none"> • To benefit from a resource that is not going to cost much. • To demonstrate OER use as an alternative to the textbook-supported course development model in use. • To bring about a qualitative improvement in the course materials using content from a diversity of world experts. |
| <i>Programming Fundamentals with Java</i> | <ul style="list-style-type: none"> • To shorten the time taken in course development especially for such technology courses where the rate of change is high. • To improve quality by using work of reputed providers. |
| <i>Microeconomics</i> | <ul style="list-style-type: none"> • To move away from dependence on textbooks and accompanying problems of frequently changing editions, non-availability of current editions and rising costs. |

Table 1 Course-wise objectives for OER Use

The incidence of OER use in course development is slated to progressively grow as the faculty becomes more adept at use and adoption. WOU supports the use of OER by formally putting in place an institutional policy on OER, fairly intensive and widespread training involving both external and internal experts and recognising faculty initiatives in OER use in its performance evaluation processes.

In all three cases, OER-based course materials were created by accessing and adapting externally-developed OER material from world class, recognised experts using OER repositories. In turn, the university created access for its registered learners and tutors by placing the course materials on its online learning management system. In June 2014, the three courses were placed under a CC-BY-NC licence, on the OER repository created and maintained by the university. Public access to these materials has thus been created. **Appendix 2** shows the public usage statistics for these courses.

Patterns of Repurposing and Major Stakeholders for the 3 OER Courses

The use of OER on an “as is basis” has been referred to as “reuse” in OER literature while the use by updating or localising, mixing with other OER or self-created material, and then distributing them have been referred to as revise, remix and redistribution — the 4Rs of reuse, revise, remix and redistribute (Wiley, Green and Soares)¹³.

The use of OER for the three courses under study shows that the 3Rs of revise, remix and redistribute were predominantly applied for these courses. While some components like video materials and graphics were reused as such, these were used in conjunction with OER from a variety of sources to create the complete course material and were supplemented with material produced by the course team to link and integrate the contents from the various sources into a single course.

The prime users and stakeholders of the selected courses and those engaged in the repurposing exercise were course development faculty, learners, tutors involved in course delivery and members of the instructional design, and publishing team as well as the senior management of the university.

The course blueprints guided the search, identification and repurposing of the OER in each case.

All three courses utilised different approaches to repurposing based on the level and nature of the course. **Table 2** lists the patterns of repurposing and the stakeholders involved in the 3 OER-based courses under study.

¹³ [http://wikieducator.org/OER cycle% of 28straw_%29](http://wikieducator.org/OER_cycle%20of%20straw_%29)

| Courses | Course Level, Code and Credits | Pattern of Repurposing | Course Writers | Other Course Team Members | Learners | Tutors | External Course Assessor |
|-------------------------|--|--|---|------------------------------------|-----------------------|--------|--------------------------|
| <i>ICT in Education</i> | EED 502/05 Postgraduate, 5 credits | <ul style="list-style-type: none"> Careful selection of appropriate text resources such as journal articles, book chapters and multimedia materials – videos, audio files, panel discussion clips Creating a dynamic content development platform (EXE) to embed multimedia components Incorporating proprietary materials by obtaining the rights to reuse Assembling variety of resources into a cohesive structure and writing instructions linking these resources in a neat wrap-around format Inserting appropriate interactive elements such as quizzes, SAQ's etc | <p>4 highly experienced senior-most level of the Internal Faculty (3 professors and 1 associate professor)</p> <p>All members are OER champions, their exposure is the major determinant of quality and approaches used</p> | 1 Course Coordinator + 3 ETP staff | 63 (over 3 semesters) | 9 | 1 |

| | | | | | | | |
|---|--|---|---|--|--|----|---|
| <i>Programming Fundamentals with Java</i> | TCC 122/05 Undergraduate Level 1 5 credits | <ul style="list-style-type: none"> Localising the examples to reflect the Malaysian industry practices. Adapting the content to reflect the context and development practices in use Adding material developed by writer to provide for the content not available as OER but required as per the course blueprint | 1 Externally – commissioned course writer | 1 Course Coordinator + 2 ETP staff CC took upon the responsibility of orienting the writer and helping the integration of OER | 287 (over 4 semesters from Jan 2013 onwards) | 21 | 1 |
| <i>Microeconomics</i> | BBM 102/05 Undergraduate Level 1 5 credits | <ul style="list-style-type: none"> Careful selection of text resources to suit the English language and the difficulty level for this basic course Simplifying the discussion and de-Americanising the language to suit Malaysian learners Writing about 38 new linking paragraphs to bring continuity and link resources from different sources Adding local examples to the original examples Inserting in-text assessment items like SAQs and quizzes | 1 senior of the Internal Faculty, his experience in the subject area facilitated OER search and integration | 1 Course Coordinator + 2 ETP staff | 349 (over 2 semesters from Jan 2014 onwards) | 20 | 1 |

Table 2 Patterns of repurposing and number of stakeholders engaged in the OER-based courses at WOU

In the case of *ICT in Education*, for media resources that did not carry a clear open licence, specific permission was sought to use the inputs from the original creators, and to use the same in the public domain. The media resources were considered valuable for the course but were not available as open resources, the course development team therefore had to negotiate the permission to use from the copyright holders with due acknowledgment. This use, as well as the links to URLs provided to e-resources in all 3 courses showcases the use of other e-resources that were not OER but were considered important for inclusion in the course materials. The major issue involved here was seeking and obtaining permission from the third party or original copyright holders.

Institutional Resources Used in Creation, Use and Dissemination

The major resources considered for this discussion were the **people** who formed the “expert system” that created the courses, **the financial resources** involved and the **technical infrastructure** used for creation, use and dissemination.

The people resources used in creation of each course have been reflected in **Table 2**.

ICT in Education:

1. The writing team used up 167 man-hours over 18 months (21 man-days).
2. Editing and instructional design used 60 person-days.
3. Embedding of multimedia resources into a standalone package required specific software identification (EXE software), experimentation and application, with non-OER resources provided as additional links and ePub format is used to publish.

Microeconomics:

1. Course writing took 115 hours of work over one year (14.7 man-days).
2. Editing and instructional design took 25 man-days.

Programming Fundamentals with Java:

1. Course writing took 320 hours over 8 months (40 man-days).
2. Took 25 man-days.

It is interesting to note that different approaches were applied to OER-based course development. In the first two cases, internal writing teams were used, while the *Programming Fundamentals with Java* course used an external course writer. It must also be noted that the OER versions of both *Microeconomics* and *Programming Fundamentals with Java* courses were developed as the revised version of these courses offered earlier as non-OER courses. *ICT in Education* was a new course conceptualised and developed for the very first time. The development thus resulted in different costs as discussed in the next section.

Financial Resources Used for OER-Based Courses and Cost Efficiencies

The total cost has been worked out using the following assumptions.

1. The average salary of the course writing team has been used to arrive at the cost/person day.
2. The workday has been estimated at 8-hour day.
3. For the instructional design and editing effort, the estimates of average time spent on each course and that specifically spent on the OER has been estimated to calculate the editing and ID costs. The average salary figures of the team involved were used to arrive at the cost of ID effort.
4. The cost of the textbook and enrolment figures in each case are used to arrive at the resultant cost saving.
5. The pre-OER versions of *Microeconomics* and *Programming Fundamentals with Java* were licensed from the Open University of Hong Kong and the use of the course materials entailed a royalty payment of USD 11 per learner. The cost saving for OER version uses this estimate for the learner number involved. The current conversion rate of 1USD = RM3.5 has been used.
6. To get an extended cost impact comparison, a five-year projection at current cost and enrolment figures have been presented to provide a rough estimate of savings from extended OER use.
7. Costs of course coordination being common to all courses, OER or non-OER, have not been included.

Table 3 presents the costs resulting from OER-based development for the three courses and **Table 4** presents the cost position that would have resulted had non OER-based course development been utilised and the actual savings that resulted from OER use.

| Courses | Time used for course writing | Time used for editing and instructional design | Course Writing/ Faculty Time Cost | ID/ Editing Time Cost | ECA Cost | Total |
|---|--|---|-----------------------------------|-----------------------|----------|--------|
| <i>ICT in Education</i> | 167 hours over 18 months (21 man-days) | 60 man-days over 12 months (double the time of other courses as software search and experimentation involved) | 10,500 | 10,000 | 1,500 | 22,000 |
| <i>Microeconomics</i> | 115 man-hours over 12 months (14.7 man-days) | 30 man-days | 4,500 | 5,000 | 1,500 | 11,000 |
| <i>Programming Fundamentals with Java</i> | External writer used 320 hours over 8 months (40 man-days) | 30 man-days | 15,000 | 5,000 | 1,500 | 21,500 |

Table 3 Cost of development of the OER-based courses (in RM)

| Courses | Course Writing Cost | Instructional Design/ Editing Cost | ECA Cost | Textbook Cost | Royalty Cost | Total | Savings from OER Use |
|---|---------------------|------------------------------------|----------|---------------------------------------|--------------------------|---------|----------------------|
| <i>ICT in Education</i> | 15,000 | 5,000 | 1,500 | 81,585 (USD37 × 67 enrolled learners) | — | 103,085 | 81,085 |
| <i>Microeconomics</i> | 10,000 | 5,000 | 1,500 | 20,237 (RM59 × 343) | 132,055 (11 × 3.5 × 343) | 168,782 | 146,782 |
| <i>Programming Fundamentals with Java</i> | 15,000 | 5,000 | 1,500 | 18,081 (RM63 × 287) | 110,495 (11 × 3.5 × 287) | 131,995 | 110,495 |

Table 4 Costs that would have resulted if a non-OER version had been developed (in RM)

It is evident from **Tables 3** and **4** that OER use in course development resulted in substantial cost savings in every case. Since these costs involve the direct costs of textbooks and royalty payment in the non-OER model, the larger the number of learners involved, the greater the quantum of actual savings.

Financial Impact Over Time

The assessment of impact on the cost of offering the courses in OER vs. non-OER versions over the next 5-year period is given in **Table 5**.

| Courses | Assumptions | Total Textbook Cost | Royalty | Revision at Existing Rates of Writing + ETP | Total | Cost of the Revision if OER Version is Continued | Potential Savings | Total Savings Including Those in Course Development | Total Text-book Cost |
|---|---|-----------------------|-------------------------------|---|---------|--|-------------------|---|-----------------------|
| <i>ICT in Education</i> | Enrolment at 25 per year, textbook cost at current prices | 97,125 | — | 7,000 (5,000 + 2,000) | 104,125 | 6,833 | 97,292 | 178,377 | 97,125 |
| <i>Microeconomics</i> | Enrolment 325/year, textbook cost at current rates | 95,875 (59 × 5 × 325) | 62,562.5 (11 × 3.5 × 5 × 325) | 6,000 (4,000 + 2,000) | 164,437 | 3,166 | 161,271 | 308,053 | 95,875 (59 × 5 × 325) |
| <i>Programming Fundamentals with Java</i> | Enrolment 70/year, textbook cost at current rates | 22,050 (63 × 5 × 70) | 13,475 (11 × 3.5 × 5 × 70) | 6,000 (4,000 + 2,000) | 42,225 | 6,000 | 36,225 | 168,220 | 22,050 (63 × 5 × 70) |

Table 5 Cost savings in courses offered over 5 years (in RM)

Time Efficiencies

The average time required to complete the development of a new course is estimated at 18 months for the non-OER, textbook-supported model in use at the university. The remuneration for external writers depending on the complexity of the course has been worked at the rate of between 30–45 man-days.

In all three cases, significant time efficiencies were observed in course development as shown in **Table 6**.

| Course | Total time taken for completion of the OER- based courses | Average time taken for development of non-OER based courses | Total man-days used for development of OER-based courses | Man-days expected to be used for non OER-based development |
|---|---|---|--|--|
| <i>ICT in Education</i> | 18 months | 18 months | 21 | 45 |
| <i>Programming Fundamentals with Java</i> | 8 months | 18 months | 40 (Externally – commissioned course writers used) | 45 |
| <i>Microeconomics</i> | 12 months | 18 months | 14.37 | 30 |

Table 6 Time efficiencies in Course Development

Technical Resources

The university makes available a high speed broadband connection to all academic staff at the office as well as a 24/7 access to its library resources. The course team members in all three cases agreed that the available provision was adequate to support the search, identification and use of OER to create all three courses.

The university uses its Learning Management System (LMS) to create access for its courseware for both learners and tutors. The LMS, called *WawasanLearn* is an internally-customised platform based on Moodle. All courses in pdf format are uploaded on the LMS and access to the courseware as well as all learner-support services are provided to all registered students via password-protected access to the LMS. For these three OER-based courses, no additional technical infrastructure was required in terms of usage and dissemination. The *ICT in Education* course, however, used an ePub format to upload the material rather than the pdf format, owing to the multimedia and interactive components embedded in the course material.

Policy Environment and Support at WOU

Malaysia is a signatory to all international conventions relating to protection of intellectual property rights. Malaysia's Creative Commons affiliation was initiated and promoted by the Multimedia Development Corporation (MDEC). MDEC, as the official agency under the ministry, is charged with the responsibility of encouraging and supporting OER use. The country however, does not have a formally-articulated OER policy.

At WOU, at the time of development of the first OER course (*ICT in Education*), there was a policy vacuum in terms of an institutional policy for use or application of OER. The policy development was driven by the need to address issues and concerns of the course team at the time of developing the course on *ICT in Education* as well as the felt need to create institutional facilitation to enable and promote OER integration in a systemic manner. With the establishment of OER Asia initiative at WOU, a certain dynamic had been created for OER use and both exposure to the academic faculty and training followed, but the top management at that stage, did not have a clear buy in the OER potential. The initiative for change in approach to course development

with the *ICT in Education* course drove the policy development on OER which in turn facilitated OER-based development for a number of courses later.

WOU implemented its OER policy at two levels. One, an institutional OER policy was developed, formally approved and implemented. Second, an Open Licence policy was put in place to guide the dissemination of OER resources created at the university. The full text of the policy is attached as **Appendix 1**.

The policy outlines the university's strategic and long-term commitment to OER: "WOU is committed to promoting and facilitating the creation, integration and gradual institutionalisation of Open Educational Resources (OER) to provide high quality and academically-rich learning content to students meeting the needs of a Knowledge Society". The scope of the policy has been made comprehensive to include all academics and the academic support services in its ambit. The policy outlines the commitment to OER at several levels:

1. WOU top management is committed to promote, foster and reward all efforts towards the integration, sharing and re-mix of OER in course design, development and delivery in an e-learning environment for achieving increased quality and cost-efficiency.
2. WOU academic and academic support staff are committed to the philosophy of OER in building capacity and positive attitudes for effective OER creation and integration.
3. WOU academic and academic support staff are committed to planning and implementing suitable academic activities involving the use of OER by learners and helping them acquire competencies required for a knowledge society.

Once the policy was implemented, a fairly comprehensive capacity building effort was initiated to develop academic staff and the academic support staff in OER use and application. While the initiative to reward "all efforts towards integration sharing and remix" has been implemented by recognising effort under the university's reward and recognition policy, the formal articulation of OER-related academic contribution as KPIs in WOU's annual performance assessment is yet to follow.

For its Open Licencing policy, the university decided to adopt the Creative Commons (CC) licences, the most common licences for digital works. It has decided to adopt the Attribution Non-commercial Share Alike (CC BY_NC_SA) as the University Open Licence.

The **advocacy** for OER within the institution was done through involving faculty in successive workshops and conferences, using both external and internal expertise and champions; town hall meetings for awareness and exciting interest as well as enabling participation of faculty in research writing and presentation. Capacity creation in OER has been a major focus in recent years, supported by funding from the development agencies and internal resources.

Adoption and Use Processes

In all three cases, the OER content is adopted as the core course material for credit-bearing courses, which form part of the respective degree programmes of the university. The courses are made available to all registered students and tutors of these courses, through the online learning management system and supported by the learner support services, like all other courses. The user groups involved in the courses is reflected in **Table 2**.

For all three courses, OER form the core learning content; the resources were extensively used by learners and tutors for attaining the course outcomes and enabling the teaching learning process. In all three cases, additional e-learning materials were provided as resource links within the course materials as and where these were considered useful. All these courses are now available for public use at the University OER Repository. The user statistics for the three courses are presented in **Appendix 2**.

User Experience (Learners and Tutors)

User experience data was collected through focus group interaction with learner groups (*ICT in Education*), course team members (all courses) and access to the student information system. Past surveys conducted by the Course Coordinators as well as the course reports generated after each presentation were used to gain insights about the impact on learner performance.

The documented institutional experience in the case of both *Programming Fundamentals with Java* and *Microeconomics* courses showed an improvement in learning outcomes as evidenced by improvement in OCAS (Overall Cumulative Assignments Score) and OES (Overall Examinations Score) over the last two semesters. Learner and tutor feedback from the first cohort after the introduction of the OER version for both courses were used to revise and improve the second presentation. Learner feedback in the case of *Microeconomics* showed that the learners found the materials easier to navigate and understand as the language was more user friendly and the requirement of consulting the textbook was removed. In the case of *Programming Fundamentals with Java* also, learners reported ease of use as a result of not needing to consult the textbook and also found the materials current and up-to-date.

The tutors in both cases expressed greater ease of use and satisfaction with the updatedness of the content.

A focus group interaction comprising 6 learners, the Course Coordinator and one tutor was conducted for the *ICT in Education* course. The learners had interesting feedback to share, some related to the design aspects of the course.

1. *The great advantage is that everything is in one place and is very convenient, compact and informative. Can learn without access to Internet which can sometimes be patchy here.*
2. *It is bulky and I have to reduce it to chunks to be able to navigate.*
3. *Too much of a rich resource, would like to take advantage of all that is provided, but the time and effort is too much, so just use the amount needed for assignments and examinations.*
4. *Embedded videos provide a welcome break from text.*

5. *The course material is definitely very good, coming from a non ICT in Education Resource provided are more than enough, bordering on overload, sort of eye opener.*
6. *PDFs were easier to scroll down, here I am required to click “next” each time which breaks the continuity.*
7. *For a teacher with a non-ICT background and not much exposure, this course was like hands-on introduction to ICT, with all the resources I needed and more. Feel more equipped and at par with my own students in this aspect.*
8. *Cannot download and am not used to studying directly from the computer.*

The tutors in this course found the experience to be enriching and enabling, and expressed greater ease of mobilising the resources for classroom discussion, “for demonstration and illustration, videos could be directly accessed and played in the class. Some scanned figures are difficult to show and need to be redrawn. An E-book format would serve the purpose better.”

Impact on Learner Performance and Learning Outcomes

The indicators used to assess impact on learner performance were learner retention rates, learner performance on continuous assessment, and term-end examination as well as the overall course score¹⁴. In addition, achievement of course learning outcomes based on learning outcome metrics used at WOU are also showcased to show the learner performance prior to and after OER intervention.

The *Microeconomics* and *Programming Fundamentals with Java* courses present an interesting pre-post comparison as both were initially (from 2007-8 to 2012) offered as non-OER, self-instructional ODL material wrapped around prescribed textbooks. These were revised in 2012 to be presented as OER-based courses. In both cases, course learning outcomes show improvement over the past scores. In terms of learner performance, course scores in both cases showed a progressive improvement.

As *ICT in Education* has only been offered as an OER course, it does not have comparative non-OER learner assessment figures to compare against. Data on assessment and learning outcomes compare favourably with the non-OER courses in the M. Ed programme. However, since valid comparison cannot be made between different courses and their assessment-score even within the same programme, no inferences can be drawn on the impact of OER use on learner assessment or learning outcomes for this course, except on the basis of qualitative comments on the learner survey conducted at the end of each cycle where the OER-based course materials were consistently rated high in their ability to meet the outcomes.

¹⁴ Assessment of learner performance at the university is conducted through assignments and term-end examinations at the end of each semester. The overall cumulative assignments score (OCAS) and the overall examinations score (OES) are combined in a weighted sum of 50:50 for undergraduate programmes and 40:60 for postgraduate programmes to arrive at the course score (CS)

Table 7 presents learner performance on assessment for the three courses. **Table 8** presents the performance on achievement of Course Learning Outcomes (CLOs).

| Course performance on assessment | | | | | | |
|---|-----------|----------|---|-------------|----------|--------------|
| Pre-OER Performance | | | Post-OER Performance (last 2 semesters) | | | |
| Course presentation | Mean OCAS | Mean OES | Course Score | Mean OCAS | Mean OES | Course Score |
| <i>Programming Fundamentals with Java</i> | 75.48 | 50.98 | 63.04 | 75 77 | 80 50 | 67 63 |
| <i>Microeconomics</i> | 76.03 | 49 | 62 | 74.69 78 | 58 51 | 66 64 |
| <i>ICT in Education</i> | | | | 69 69 | 55 52 | 61 59 |

Table 7 Course scores for OER-based courses

| Class achievements for course learning outcomes (CLO) Pre-OER | | | | | | | Class achievements for course learning outcomes (CLO) Post-OER | | | | | |
|--|------|------|------|------|------|------|---|------|------|------|------|------|
| OUTCOMES | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 |
| <i>Microeconomics</i> | 71% | 65% | 58% | 67% | 61% | 59% | 70% | 67% | 68% | 70% | 71% | 69% |
| <i>Programming Fundamentals with Java</i> | 55.5 | 56.4 | 62.3 | 55.1 | 56.5 | 50.0 | 56.9 | 68.5 | 53.2 | 50.8 | 56.0 | 53.6 |
| <i>ICT in Education</i> | | | | | | | 86.1 | 92.8 | 85.7 | 87.2 | 83.3 | 85.7 |

Table 8 Learner performance on achievement of learning outcomes

Impact on Learner Retention

To understand the possible effect of OER use on learner retention, data on retention rates of learners for *Microeconomics* and *Programming Fundamentals with Java*, the two courses which have been revised and offered as OER versions was collected. **Table 9** presents learner retention for the two courses over the last 10 offerings.

| Student retention (comparison between courses before and after OER intervention) | | | | | | |
|--|--|-------------------------|----------------|--|-------------------------|----------------|
| Course | OER (Mean of semesters on post-OER intervention) | | | Benchmark (Mean of five semesters prior to OER intervention) | | |
| | At registration | At point of examination | Retention rate | At registration | At point of examination | Retention rate |
| <i>Microeconomics</i> | 205 | 186 | 90.97% | 203.25 | 181.12 | 89.11% |
| <i>Programming Fundamentals with Java*</i> | 93 | 80 | 86.02 | 135.6 | 122.4 | 90.26% |

Table 9 Learner retention on pre- and post-OER intervention

*For the last 2 semesters, the course *Programming Fundamentals with Java* has been converted from a core major course to an elective course for B. Tech Electronics Programme resulting in much lower enrolment.

The comparison of the retention rates between the OER-based course offering and the non OER-based course offering does not indicate negative effect of OER use on learner retention.

Impact on Faculty Motivation Varied Across Courses

ICT in Education: The main driver for this pioneer OER was the urge to demonstrate that OER present an alternative, much more effective route to develop and present high quality, well-designed, current course materials using a rich diversity of world experts and to lead by example. This course, in a sense, became the catalyst for other faculty members to seriously experiment with OER-based development. This particular course team was a group of OER converts to begin with, highly committed to the idea of bringing home the potential of OER use at WOU which has faced resource constraints in terms of both subject matter expertise in the country and finances. The course development put into motion several dynamic changes, the development of OER policy infrastructure, sustained advocacy of OER use at all levels in the university and a systematic capacity building of the faculty. The successful completion and offering of the course has added to the motivation of all the team members as well as the School of Education faculty to pursue OER use actively.

Programming Fundamentals with Java: The Course Coordinator reported that the OER development experience led him to access new sources of material, the possibility of shorter development cycles, and enabled writing research papers on this new approach. Exposure to other concepts and material, led to ideas about areas to develop in the future like offering mobile-based learning and experimenting with collaborative OER-based development.

Microeconomics: This course writer found the vast potential of OER very empowering and the possibility of doing away with textbooks very liberating. Having revised this course almost single-handedly, he was enthused about replicating the experience for his other courses. The wide exposure showed him alternative possibilities of presenting concepts and ideas. He ended up writing much more than finally got used, because there was simply too much good material out there to resist inclusion. He admitted experiencing something of a kid in the supermarket syndrome.

| Faculty motivation for using OER | | | |
|--|-------------------------|-----------------------|---|
| Motivating Factors | <i>ICT in Education</i> | <i>Microeconomics</i> | <i>Programming Fundamentals with Java</i> |
| Curiosity | +++++ | ++ | +++ |
| Interest in innovation | +++++ | ++ | ++ |
| Interest in educational excellence | ++++ | +++ | ++ |
| Improving quality | ++++ | +++ | +++ |
| Enhancing time efficiencies in content development | ++ | ++ | +++++ |
| Freedom from dependence on prescribed texts | +++ | +++++ | +++ |

Table 10 Faculty motivation for using OER

Quality Assurance in OER-Based Courses

Quality assurance in course and programme development at WOU is premised on:

1. Benchmarking its academic processes and content development against international best practices in ODL.
2. Extensive review and intervention by external peers.
3. Clearly documented standard operating procedures for all core activities in the content development process accompanied by regular monitoring.
4. Extensive consultation and feedback from all the stakeholders that are documented, evaluated and acted upon.
5. Subjecting processes and systems to regular internal and external audit and review.

To oversee the implementation of these premises, WOU has put on place a full time directorate of Quality Assurance which manages the Quality Assurance and Teaching Learning Committee, and responsible for developing and implementing its quality assurance system. The quality assurance unit is headed by a full time Director.

External peer review and intervention form a very important part in the QA system for programme and course development. At the institutional level, the university has an international advisory board to advise on international norms and practices and an Advisory Peer group for each school. Once a programme is identified for development under the advice of an APG, the concerned school prepares an Outline Programme Proposal (OPP) which is passaged through the School

Board, Senate and the University Council. After review and suggestions at each stage, the proposal is sent back to the School to be finalised as a Detailed Programme Proposal (DPP). The approved DPP is submitted to the MQA, who may raise issues in the initial evaluation report sent to the university. Upon agreement on all issues as provided by the concerned school, the MQA approves the programme for launch.

As part of its quality assurance process, external experts are engaged at several levels:

1. An external Advisory Peer Group (APG) comprising senior members from the academia and industry advises on the development and review of programme curricula.
2. External course writers, drawn from the country or abroad are engaged to develop the content.
3. External course assessors at the level of professors or associate professors provide expert assessment on contents of each course.
4. Once the programme has been developed, an external programme assessor is engaged to provide critical review of the programme structure and relevance.

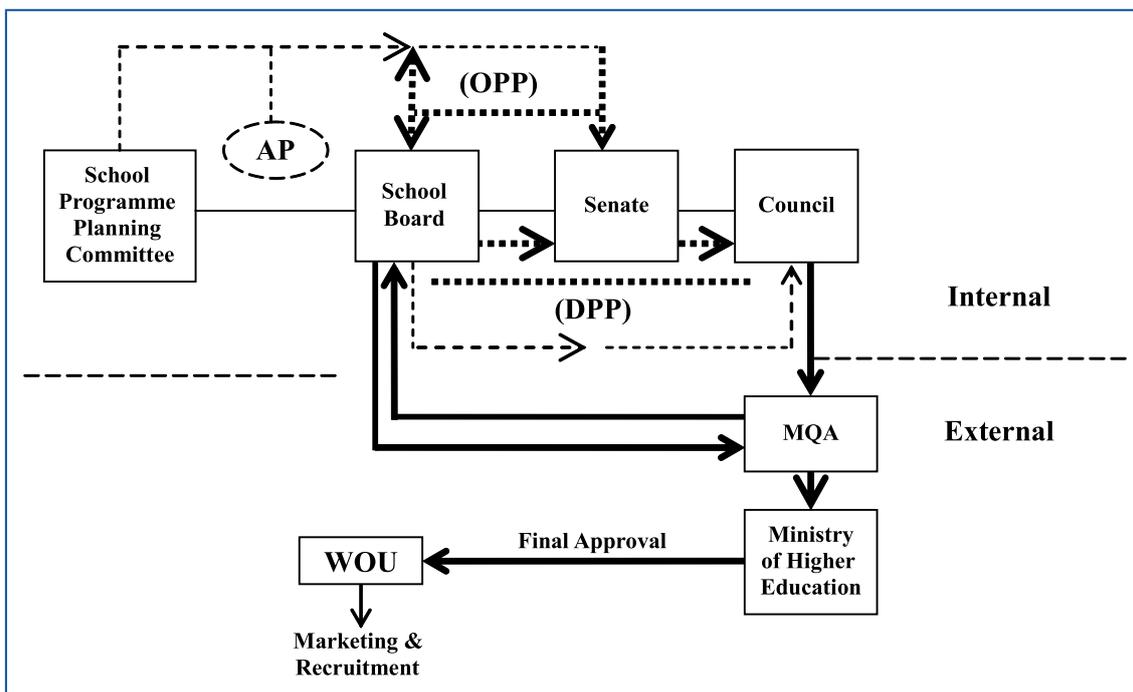


Figure 3 QA processes for programme planning and development

Quality assurance at the course development level is ensured by the active involvement of an external course assessor right from the stage of the course blueprint development to the final manuscript as shown on **Figure 3**.

This institutional quality assurance processes, used for all courses, were also utilised for the three OER-based courses. These included consultative preparation and approval of the course blueprint, consideration and approval by the university bodies, use of the external course assessor and the course feedback after each semester. The example of *ICT in Education* course is shared here to illustrate QA process used, in addition to the standard QA processes described above.

1. The expertise, vast experience and familiarity with OER-related issues of the main resource persons in the course writing team, was a major influence in the final quality of the content developed.
2. A very high level of interaction between the course team members, right from the very outset characterised this course development exercise, partly because it was a new initiative requiring frequent experimentation/consultation for the new formats being implemented.
3. The search was guided by reliance on well-reputed acknowledged world experts to ensure input quality. Only highly reputed original sources of OER, resources by world experts and reputed repositories were used.
4. The external course assessor was extensively involved at all stages of development. The ECA comments, are indicative of the high quality reflected in the course content. To quote:

“themes are well represented and coherent. Good instructional design strategies are used, and examples and assessment are well designed.”... “The content is quite readable for learners. Cases and examples often refer to the Malaysian situation and will suit the Malaysian learners well... Learners are treated as equals throughout the text.”... There are no glossaries as the new terms are well explained. There are adequate resource materials for the learning tasks”.

The first presentation feedback was used to incorporate some changes in the second presentation. Learner feedback and formal presentation of course reports guided subsequent development. In all three cases, learner and tutor feedback was systematically tracked, analysed and presented to the university Senate after each presentation.

Barriers and Difficulties

Several difficulties were encountered by the course teams in the initial stages of course development. Some emanated from the novelty of the exercise and others from the absence of a formal policy and established procedures at that stage of development. **Table 11** summarises the barriers and difficulties experienced by various stakeholders in OER use for the three courses.

| Barriers/ Difficulties | Course Development Team | Instructional Design Team | Tutors | Learners |
|---|---|--|--|--|
| <i>ICT in Education</i> | <ul style="list-style-type: none"> • Search and identification of data is very time consuming. • Dedicated chunks of time as data is difficult to find. • Search for appropriate software programme to facilitate multimedia integration. • Policy yet at the development stage so issues of OER with appropriate CC licence delayed the search. • Permission is required for non-OER content. | <ul style="list-style-type: none"> • Initialising the EXE application is problematic and time consuming as this was the first for the team. • Material from the Course development team is received in instalments, making it difficult to maintain continuity in the ID process. • Copyright clearances were not done by the CDT in all cases. • References are difficult to locate at times. | <ul style="list-style-type: none"> • Some of the scanned figures are not very clear. • Learners are not very active in following the excellent links shared for further reading. | <ul style="list-style-type: none"> • The ePub version makes printing difficult. On printing, material turns out to be too voluminous to handle. • The navigation of the content in this format is not as user friendly as the pdf version. As learners are used to the pdf version, the requirement of needing to click “next” after each page here is cumbersome. • The content is too rich and much more than required for completing the course. |
| <i>Programming Fundamentals with Java</i> | <ul style="list-style-type: none"> • Search for OER at the required level was an issue. • Legal implications of using OER with different CC licences were not clear at the time. • Customisation of level and content were required to suit the local context. • Content for all inputs required by the blueprint is not available. • External writer needed orientation for OER customisation and integration of his content. | <ul style="list-style-type: none"> • Material from different sources had to be brought under similar presentation style and language. | | <ul style="list-style-type: none"> • Difficult to follow up with all the references. • Textbook was an additional resource for other courses. |

| | | | | |
|------------------------------|--|--|--|--|
| <p><i>Microeconomics</i></p> | <ul style="list-style-type: none"> • Language and writing style of the identified OER are very different. • Adequate library support was not available at that time to facilitate search. • CC Licence choice by WOU was found to restrict choice as OER with compatible licence only were considered. • For this basic course, a large variety of very rich OER were available. Narrowing down became time consuming and difficult. | <ul style="list-style-type: none"> • The course writer identified much more content which needed to be edited out. • Some redrawing of graphics is needed. | | |
|------------------------------|--|--|--|--|

Table 11 Barriers and difficulties faced by various stakeholders in OER use

Learners, during the focus group interview for the *ICT in Education* course, showed no awareness that the course in question was developed as an OER and treated it like any other course in their programme curriculum. It follows that no specific efforts were in place in all OER-based courses to clearly convey to the learners the transition that was being made with the OER use in their courses and to share with them the benefit that they now had for accessing resources of assured quality from a large pool of world expertise, as well as the opportunity to access the original source of the resources to get an extensive exposure.

Impact of OER Use at WOU: A Summation

The impact of use of OER in this case can be assessed through:

1. **A comparative cost analysis between resulting costs for these courses as compared to the conventionally developed course material:** The analysis presented in the section on financial resources (**Tables 4 and 5**) clearly underlines the financial rationale for using OER at open universities. In all the three course development situations, the university was able to achieve significant cost efficiencies. A projection of cost of offering OER-based courses over the next five years, based on current cost and enrolment estimates shows an even more emphatic case of high cost efficiencies to be attained if OER-based content use is adopted as university practice.

2. **Analysis of time efficiencies:** The comparison of time taken in course development, in person-days was found to translate into very significant time efficiencies, though quantum varied between courses (**Table 6**).
3. **Analysis of learner performance:** Learner performance was found to have positive impact on OER use as shown by both quantitative and qualitative analysis. The quantitative assessment was obtained from a comparison of OCAS, OES and CS scores of learners for non-OER and OER versions (**Table 7**). Improvement in learner performance on achievement of course learning outcomes as measured by the outcome matrix was found to be significant (**Table 8**). The qualitative assessment based on learner feedback data, learners' surveys and focus group data indicated greater comprehension and ease of access of materials, more user-friendly language, greater identification with the concepts discussed on account of contextualised examples, exposure to world class resources and the consequent urge to explore cited resources (at Masters level).
4. The learner retention trend was seen to be unaffected by OER being used as a course material.

The deductive inference that can be drawn on the basis of all these indices is that the use of freely available public resources as course content in place of expensive textbooks which supported and commissioned course contents does not in any way negatively impact learners' experience and performance. The latter in fact, showed a successive improvement.

1. **Assessment of faculty capacity building:** All three cases showed that the involved faculty members were excited and very encouraged in what was termed as a liberating, empowering experience of creating course packages through their own efforts, without requiring the crutch of a single prescribed text. Some admitted that while the initial exposure was built through workshops, most of their learning on OER-based development came from the actual hands-on experience of developing the content themselves. The search and identification was a huge learning experience and exposed them to the possibilities of alternative ways of presentation of concepts, and interesting use of graphics and media. The younger faculty were also able to develop research papers and benefit from the rewards and recognition programme at the university.
2. **Access for disadvantaged learners:** Based on focus group interactions with learners as well as on learner feedback, some impact was seen on creating access to resources for disadvantaged learners. In the *ICT for Education* course, "as all resources are integrated in a single package, those disadvantaged on account of lack of access to Internet can now seamlessly access all the embedded content without needing to surf for referenced resources". The learners of the *Programming Fundamentals with Java* course reported that the provision of all the links of additional resources, within the material itself created a more equitable provision for all, as now even those without access to a good library could have access to reference material and explore further.

3. **Teaching learning processes:** The learners in the Masters programme expressed excitement about the course being something of an eye opener as it took them to an exploration of things they may not have otherwise looked at. To a certain extent, OER use enabled shift towards independent and self-directed learning for learners as the linkages provided motivated a tendency of further inquiry and exploration of the original resources. Some learners in the same course complained of an information overload. Learners for both undergraduate courses expressed better comprehension and greater control of their learning activity on account of not having to alternate between the textbook and the university material.

4. **Faculty motivation:** The most important impact of OER use and adoption at the University, however, was the dynamic that got created towards individual uptake and use of the OER alternative by the younger faculty at the university. Initiatives on using open books i.e., using OER to replace existing content in successive revision cycles; a practice of first assessing the available OER for a given course blueprint and then commissioning the balance for external or internal writing, and working towards the goal of eliminating the dependence on prescribed textbooks are indicators of the directions of a change process that has been set into motion. This dynamic has long-term implications for the way the university in future manages its course and programme development, which account for a major segment of its direct costs.

The use of OER to replace the textbook-supported model of courseware development could be seen as a game-changer in the life cycle of open universities, enabling them to produce and disseminate high quality content using free, open source materials from world experts without, in any way, negatively impacting learner retention or teaching learning processes and with potential to improve learning outcomes.

Replicability of the Models Used

The models for OER-based content development used for these three courses are highly replicable for other courses within the university and by other open universities. The resources needed to successfully replicate implementation include:

1. Supportive OER policy environment at the institutional level and support of top leadership.
2. Faculty expertise in the subject and exposure to OER development, including licensing issues.
3. Infrastructural support in the form of adequate bandwidth and Internet access to enable OER search and identification, including library services support.
4. Expertise in instructional design, graphics and multimedia design support, as well as publishing expertise to facilitate access to users.

Lessons Learned

The OER use at the university is at the initial stages of adoption cycle. Most OER-based courses have been run for a maximum of three presentations. The journey of development, reusing, revising, remixing and redistribution has been enriching and rewarding with important payoffs in terms of cost and time efficiencies, and some challenges which made for important lessons which could guide future developers.

1. The prevailing modes of course developments, either textbook-supported or commissioned course writer supported, present solutions that are not sustainable in the long run. OER use, on the basis of the evidence generated at the university, offers a path that may lead to a far more viable alternative in terms of cost and time efficiencies, without compromise on relevance or quality of the content. The organisational commitment to such options needs to be clearly articulated and demonstrated.
2. Senior management support is vital to creating a conducive environment for the highly collaborative and interactive activities like OER-based course development and publishing that span across various departments and support divisions. Wherever such support is deficient, gaps in the execution result in avoidable delays.
3. Policy plays a critical role. Policy in the initial years of OER activity, however, is a work in progress and may require successive iterations.
4. Faculty capacity building: The capacity building for OER has to be broader based and widespread if OER use is to be mainstreamed. Individual, periodic attempts in different schools would not generate a critical mass to mobilise large scale gains.
5. Faculty motivation tends to vary among people and is positively correlated to the exposure and first hand application of OER. Formal recognition of early adopter efforts needs to be made by including these practices in the institutional performance evaluation process.
6. Demonstration effect works well especially if those with established credentials are seen to champion new developments and are willing to lead by example. Internal sharing of both successes and barriers is vital to bring about a common understanding of pitfalls to avoid and outcomes to aspire for.
7. Greatest gains are visible in terms of high enrolment in compulsory, basic courses, for which incidentally, a large pool of OER is increasingly becoming available. In the initial years of OER adoption, some prioritisation of subjects selected for adoption may help demonstrate visible gains.
8. Clear understanding and interpretation of the CC licensing environment, especially for derivative works, is important and a lack of widespread understanding could hamper efficient development.

9. Library support in the form of staff dedicated to help search for OER is highly desirable. Dedicated human resource provision at the library may be required to provide the much required support in OER search and identification for the course development team and OER users.
10. Learner surveys and focus group discussions with learner groups showed that they were not really aware that their courses were developed as OER and perceived them as differently presented (*ICT in Education*) or easier to access (*Microeconomics*) but had no real appreciation of why. This information needs to be widely shared, especially for mature students in a Master's programme.

Summing Up

The higher education scenario has changed, perhaps irreversibly, in Asia as in the rest of the world. The conventional methods of content development and delivery; and the duplication of the same development effort by multiple institutions for the share of the same pie are slowly but surely becoming unviable. The affordance created by the willingness of institutions and individuals to share intellectual property as open education resources, and the enabling licencing frameworks are developments that institutions, specially open universities just cannot afford to ignore. While smaller, more nimble institutions would probably take the lead and risk of early adoption and use of OER, evidence is already building that both seekers and providers of education stand to gain significantly with systematic and sustained use of OER in content development.

Appendix 1

Open Educational Resources Policy Wawasan Open University

1.0 Purpose

1.1 Policy Declaration

WOU is committed to promoting and facilitating the creation, integration and gradual institutionalisation of Open Educational Resources (OER) to provide high quality and academically-rich learning content to students meeting the needs of a Knowledge Society.

1.2 Specific Policy Statements

- a. WOU top management is committed to promote, foster and reward all efforts towards the integration, sharing and remix of Open Educational Resources in course design, development and delivery in an e-learning environment for achieving increased quality and cost-efficiency.

- b. WOU academic and academic support staff are committed to the philosophy of Open Educational Resources (OER) in building capacity and positive attitudes for effective OER creation and OER integration for the development and delivery of courses as well as other professional engagements.
- c. All members of WOU academic and academic support staff are committed to planning and implementing suitable academic activities involving the use of Open Educational Resources by learners and thereby helping them acquire competencies required for a knowledge society.

1.3 Policy Objectives

The objectives of the policy are as follows:

- a. To formulate the necessary strategic outputs, tasks and performance indicators to achieve OER creation and integration in the development and delivery of WOU courses.
- b. To develop awareness about the concept and practices related to OER among all WOU staff.
- c. To build capacity among the academic and academic support staff for the creation, identification, storing and integration of OER in their professional engagements.
- d. To prepare all required guidelines and manuals for OER creation and integration including open licensing procedures.
- e. To establish an OER repository in the public domain containing WOU's open licensed materials and an in-house repository of relevant OER resources for use of WOU staff.
- f. To procure/develop and install the required hardware and software infrastructure for OER creation and integration.
- g. To continuously monitor so as to ensure that the policies are implemented effectively.
- h. To develop and incorporate an effective feedback mechanism that will enable WOU to take informed decisions for any mid-term corrections in the implementation of OER integration; and
- i. To consider and incorporate changes in the process according to international developments in the field and the requirements of WOU.

2.0 Scope

2.1 This Policy applies to all academic and academic support departments of WOU including Schools, ETP, LLS, Registry as well as the academic functions in the Regional Centres.

3.0 Definitions

3.1 WOU — Refers to Wawasan Open University.

3.2 Open Educational Resources (OER): WOU interprets OER to comprise all types of open and free digital content for teaching and learning, software-based tools and services, and licenses that allow for open development and reuse of content, tools and services.

3.3 OER Creation: This refers to the development/production of digital open content and its publication online with an open license.

3.4 OER Integration: This is viewed as a logical and systematic process of using, re-mixing, re-purposing and sharing of Open Educational Resources and engaging in practices for course development and delivery based on the nature of licensing of each material.

3.5 Knowledge Society: This is viewed as a community or formal association of people who acknowledges the strength of knowledge creation and is committed to make effective use of networking of people with similar interests and in this process, contribute to this knowledge.

4.0 Responsibility and Authority

4.1 The Vice-Chancellor as the head of the University as well as the Assistant Vice-Chancellor (AS) shall ensure compliance to this policy with the guidance of the OER-Steering Committee chaired by DVC (A) as indicated in 5.2 below.

5.0 Policies and Procedures

5.1 OER Concept and Philosophy

OER creation and integration in WOU is viewed as a shared responsibility executed in a centralised and decentralised manner. While the Vice-Chancellor and the senior management staff play a major role in driving and promoting the University's OER integration initiative, all members of the University community are expected to recognise and support OER practices. Heads of Departments who provide academic support and Deans of Schools are responsible for ensuring that policy requirements are fulfilled among their own staff. Members of staff especially all Course Coordinators and academic support personnel of Educational Technology and Publishing (ETP) and Learning and Library Services (LLS) will receive intensive training followed by regular ongoing expert support to become competent in OER creation and integration in WOU courses.

5.2 OER Steering Committee (OER-SC)

An OER Steering Committee (OER-SC) is constituted to plan and implement the OER integration initiative.

OER-SC shall consist of:

- a. Deputy Vice-Chancellor (Academic) who shall be the Chairman
- b. Assistant Vice-Chancellor (Academic Support) who shall be the Convener
- c. Director, ETP
- d. Director, LLS
- e. Professor, ETP
- f. Quality Assurance Manager
- g. Representatives from each School

OER-SC will meet at least once every month during the first year (2012) and at least bimonthly in the subsequent years.

5.3 Monitoring and Management

The day-to-day operations under OER creation and integration initiative will be monitored and managed by the Office of the Assistant Vice-Chancellor (Academic Support).

5.4 Review Procedure

- a. The OER Steering Committee (OER-SC) reviews the effectiveness of the WOU OER Policy every year in its first meeting and an OER Review Report is prepared.
- b. OER-SC review report will go to the Senate for consideration, endorsement and approval.
- c. If revisions are endorsed and approved, the OER-SC shall disseminate the revised policy to all stakeholders.

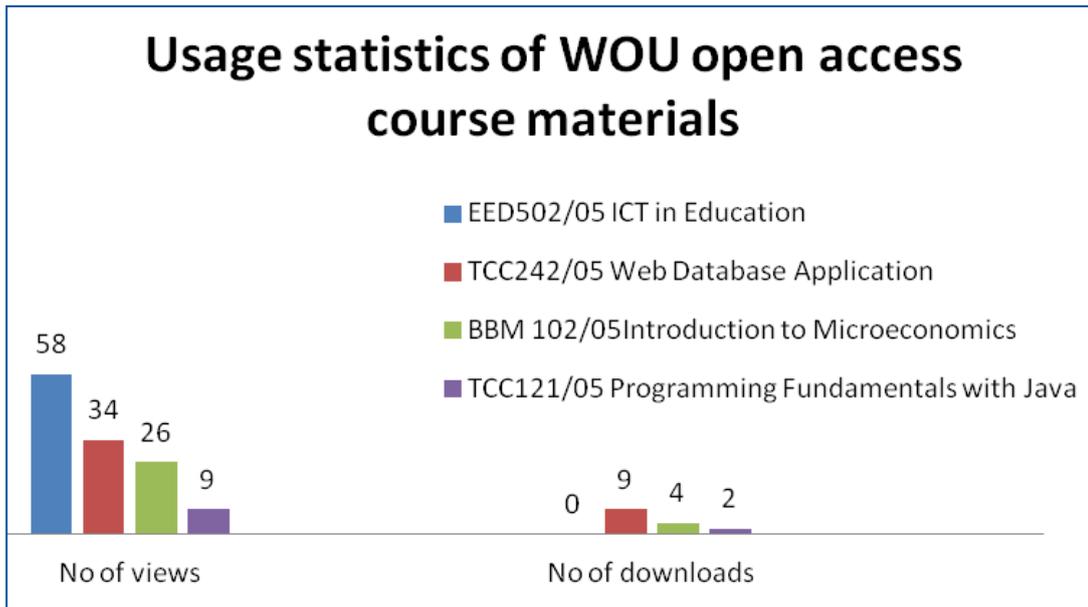
Appendix 2

Usage Analysis of WOU's Open Access Course Materials Tun Dr Lim Chong Eu Library

1. Using WOU's OER Repository web system (<http://weko.wou.edu.my>), the data collection on the usage of WOU's open access course materials was generated from the month range of June 2014 to October 2014. The web report usage statistics recorded the number of views and number of downloads with breakdowns of different domains such as country of access, dot.com and from unknown sources.
2. To date, the total number of open access course materials published in the repository together with its full-text content from Unit 1 to Unit 5 is four (4).
3. The full-text content format for the above course materials is available in PDF files for all units except for *EED 502/05 ICT in Education*. This course material is made accessible via a multimedia hyperlink to its interactive web content.
4. **Table 12** records the number of views and downloads for each title. As the materials are deposited to the repository on different month period, thus the usage statistics collected ranged from one to four months' usage (Note: Data are generated from the repository system as at 31 October 2014).

| Title | Date published to repository | No. of views | No. of downloads |
|--|------------------------------|--------------|------------------|
| <i>EED 502/05 ICT in Education</i> | 12 May 2014 | 58 | 0 |
| <i>TCC 242/05 Web Database Application</i> | 10 July 2014 | 34 | 9 |
| <i>BBM 102/05 Microeconomics</i> | 8 August 2014 | 26 | 4 |
| <i>TCC 121/05 Programming Fundamentals with Java</i> | 17 October 2014 | 9 | 2 |

Table 12 Usage statistics by views and downloads



(Data generated from the repository system as at 31 October 2014)

5. **Table 13** records the number of views and downloads for each title with breakdowns by the domains of access e.g., Country, dot.com, unknown sources.

| Title | Date published to repository | No. of views | | | | No. of downloads | | | |
|--|------------------------------|--------------|---------|----------|---------|------------------|---------|----------|---------|
| | | Unknown | Dot.com | Malaysia | Denmark | Unknown | Dot.com | Malaysia | Denmark |
| <i>EED 502/05 ICT in Education</i> | 12 May 2014 | 23 | 2 | 32 | 1 | 0 | 0 | 0 | 0 |
| <i>TCC 242/05 Web Database Application</i> | 10 July 2014 | 7 | 1 | 13 | 4 | 2 | 0 | 3 | 4 |
| <i>BBM 102/05 Introduction to Microeconomics</i> | 8 August 2014 | 4 | 7 | 11 | 4 | 2 | 0 | 3 | 3 |
| <i>TCC 121/05 Programming Fundamentals with Java</i> | 17 October 2014 | 1 | 0 | 7 | 1 | 0 | 0 | 0 | 2 |

Table 13 Usage statistics by domains
 (Data generated from the repository system as at 31 October 2014)

Chapter 7 Open Courseware: Enhancing Access

~ Naveed A. Malik

Introduction

The higher education sector in Pakistan is faced with two stark challenges: a lack of capacity and an acute shortage of qualified manpower. When the Virtual University of Pakistan (VU) was established in 2002, according to the Economic Survey of Pakistan 2004-5¹, the total number of students in Pakistan's higher education system was approximately 475,000 which translated into an enrolment ratio of 2.6 percent for the age group of 17 – 23 years compared to 10 percent in India and 68 percent in South Korea. There were 96 universities and degree awarding institutions (DAIs) in the country in both the public and private sectors combined with a grand total of 3130 PhD faculty members for a dismal average of about 33 PhD faculty members per university². The lack of physical capacity could have been overcome by allocating adequate financial resources to build new university campuses. The acute faculty shortage, however, was a different matter altogether and no shortcuts were available to overcome this.

The Virtual University was established by the Government as a public-sector, not-for-profit university that would leverage information communication technology (ICT) as a force-multiplier to deliver affordable, high quality education to aspiring students across the entire country. VU was designed as a formal distance learning university that would supplement the capacity of existing universities as well as help to overcome the acute shortage of qualified faculty in those institutions.

One of the aims behind establishing the Virtual University of Pakistan was to improve the quality of higher education in the country, especially in light of the acute faculty shortage referred to earlier. The University started by purchasing airtime on Pakistan Television, the public broadcaster, to deliver its video lectures. Later on, the University established its own broadcast facility and now owns and operates four free-to-air satellite television channels. Broadcast television is open by its very nature and by keeping the doors of its “virtual” classrooms wide open, the University planned to achieve its design goal of improving quality of higher education by providing open access to learning resources that were authored by nationally known and respected professors and professionals. Openness of course materials was thus built in by design and led to VU becoming the prime developer of OER in Pakistan.

¹ <http://www.accountancy.com.pk/?wpmact=process&did=MjMuaG90bGluaw==>

² [http://www.hec.gov.pk/Stats/Documents/1973_statistical_booklet_on_hec\(2001-02to2003-04\).pdf](http://www.hec.gov.pk/Stats/Documents/1973_statistical_booklet_on_hec(2001-02to2003-04).pdf)

Broadband access to the Internet spread across the country at about the same time that the Virtual University was expanding its outreach. During the period 2008-13, television viewership remained relatively static at around 86%–89% of the population while radio listeners declined from 49% to 21%. In contrast, access to the Internet rose steadily from 3% of the population to 6% over the same period³. However according to the ITU, over 10% of the population had access to the Internet in 2010⁴. It was thus natural that the Virtual University would enhance its delivery mechanism from broadcast television alone to a combination of broadcast television and the Internet. Internet-based content had the additional advantage of freeing students from rigid broadcast schedules while allowing them to pause or repeat a lecture at their convenience.

The advent of broadband enabled the provision of lecture videos through the university’s Learning Management System (LMS). In line with its open outlook, the University placed all of its video content on Youtube⁵ in 2008. The University’s OpenCourseWare (OCW) website⁶ was established in 2011 and was recognised as the best new OCW site of the year in 2012 by the OCW Consortium (now the Open Education Consortium).

The Virtual University of Pakistan is chartered by the Federal Government of Pakistan and offers formal academic credentials validated by the Higher Education Commission (HEC) and recognised and accepted nationally and internationally. Although all of its courses are published as OER, the University charges tuition from its registered students. Large student numbers make the University sustainable even though the fees are very affordable. For example, the total cost of a full four-year BS degree program comes to about US \$900 only.

The Virtual University offers programs in several disciplines with IT and Management Sciences being the oldest. Currently a variety of Bachelors and Masters Programs are being offered with PhD programs in Bioinformatics, Business Administration and Computer Science planned for 2015 along with several new Associate Degree programs. The current course offerings are summarised⁷ in the table below:

| Program category | Number of disciplines offered |
|---|-------------------------------|
| Associate Degree | Three |
| Bachelor’s programs (2-year BA, BSc) | Seven |
| Bachelor’s programs (4-year BS degrees) | Fifteen |
| Masters programs | Twelve |
| MS/MPhil programs | Three |

³ BBC Media Action, Policy Briefing #9 SEPTEMBER 2013, Pg 8

⁴ <http://www.internetworldstats.com/asia/pk.htm>

⁵ <http://www.youtube.com/vu>

⁶ <http://ocw.vu.edu.pk>

⁷ Full listing available at <http://www.vu.edu.pk> — Academic Programs

In addition to the above, a series of diploma and specialisation certificates are also offered. All VU courses can also be taken as standalone certificate courses which students may later use to obtain exemptions when they enrol for a degree program. Student enrolment stands at over 100,000 students⁸ and is set to increase as the portfolio of disciplines and programs offered by the University expands.

The Virtual University of Pakistan is a sustaining member of the Open Education Consortium⁹ and a founding member of the MIT (USA) based Learning International Networks Consortium (LINC)¹⁰. One of MIT-LINC's initiatives is MIT BLOSSOMS¹¹ which provides open Math and Science video lessons for high school classes. The Virtual University has produced and contributed several BLOSSOMS lessons that have been authored by eminent academics from various universities of Pakistan.

VU follows the practice of publishing its original content (video lectures, reading materials, assignments and their solutions) for free and open access on its OpenCourseWare website (<http://ocw.vu.edu.pk>). However, there is no written policy that governs the use of its material. The material is published under a Creative Commons¹² license requiring attribution, not permitting any commercial use and requiring an identical licensing of all derivative works (CC-BY-NC-SA). The licensing is an institutional choice since the Creative Commons licensing regime has not been formally adopted by Pakistan as a legal framework. It is important to note that the Virtual University produces this material for its internal consumption and as such, it is the principal user of these materials since all programs and courses offered by the University are exclusively based on these OER. There is no evidence to date that indicates that VU content has been re-mixed or re-purposed by any other individual or institution, but the University is considering putting some limitations on the amount of revision allowed for the content, were this to happen.

From the above background information, it would be clear that the VU case may not directly address several questions laid out in the terms of reference. For example, VU does not acquire any external OER; all its programs are completely based on its own in-house content which is then published as OER; there is no re-purposing or re-mixing of OER since all the courses are custom-designed from scratch, etc. However, the case study does offer some evidence that the University's OER content has been accessed by external users and available data on such adoptions is presented in this study.

⁸ VU Management System — internal data

⁹ <http://www.oeconsortium.org/members/>

¹⁰ <http://linc.mit.edu/about/partners.html>

¹¹ <http://blossoms.mit.edu/>

¹² <https://creativecommons.org/>

Curriculum and Program Design

The Higher Education Commission¹³ designs and approves curricula for various university programs and universities and DAIs are expected to follow these very closely. These curricula are developed by National Curriculum Committees established for various subjects and as such, represent the collective wisdom of higher education institutions across the country. While the Virtual University is an autonomous body with its own Boards of Study and Academic Council, almost all of its programs follow the national curricula.

All Virtual University courses are based on its own original content and all content is published as OER through its OCW site. This is one aspect of this case study that is reversed in scope. Being a formal university, all courses carry formal credits which have to be assessed in a manner acceptable to the HEC. The pedagogical approach employed by VU is a combination of video lectures and associated reading materials which are made available through a comprehensive Learning Management System (LMS). Students access course materials, videos as well as text (other than commercial textbooks which are also prescribed for some courses) through the LMS. Lecture /topic videos are also directly available over the Internet through Youtube and the OCW site of the University without having to go through the LMS.

Learning is assessed using standard practices such as assignments, quizzes and examinations. While assignments and quizzes are conducted through the LMS over the Internet, examinations are held in a formal proctored environment at designated examination centres throughout the country. Students have to physically appear at these centres, provide proof of identity, mark their attendance and then sit for the exams. The examinations are conducted electronically through special software developed for the purpose¹⁴. This innovative system allows each student to choose his/her examination city and centre and then create an individualised datesheet (examination schedule). This requires that students receive distinct question papers and the IT-based examination system ensures this through the use of a question bank for question paper generation.

OER Resource Procurement and Development

Virtual University courses comprise video lectures and associated learning materials. These courses are developed by well-known professors, primarily from other universities across the country. Developing these courses requires financial and technical resources to deliver the requisite level of quality. VU courses are authored and developed on invitation by top-tier academics from other national institutions. The deliverables in any course include:

1. Video lectures (1 credit hour equals 15 hours of video)
2. Original reading material authored by the resource person
3. One complete set of semester assignments along with grading rubrics
4. Four sets of midterm and final term examinations with solutions.

¹³ <http://www.hec.gov.pk/INSIDEHEC/DIVISIONS/AECA/CURRICULUMREVISION/Pages/RevisedCurricula.aspx>

¹⁴ <http://linc.mit.edu/linc2010/proceedings/plenary-Malik.pdf>

At the conclusion of each semester, assignments and their solutions are also published for free and open access through the OCW site, since fresh assignments are developed by the University staff every time a course is offered.

The technical expertise required to develop video courses depends on the production value that is targeted. High production value (elaborate sets, multi-camera, extensive post-processing) recordings entail a higher level of professional expertise in developing courses. Low production value (simple sets or chroma key, single camera with only Powerpoint presentations) recordings may even be produced by the professor authoring the course. VU has opted for high production value in its approach and although the format is evolving continuously, the aim is to maintain the perceived video quality at a professional level. This approach requires studio expertise (lighting, video and audio) and producers capable of handling multi-camera productions. In addition, graphics artists and designers are required to develop the required illustrations and animations, if any, that are to be inserted into the video lectures. In many cases, recordings showing a practical working environment may be required. In such cases, recordings are made on location and then incorporated into the lectures. This requires ENG (Electronic News Gathering) camera work and production. Manpower possessing the required expertise is employed by the Virtual University on a full-time basis and this professional broadcast quality capability has become a hallmark of VU.

In the early years, the entire production process was outsourced on a turnkey basis. The outside agency charged with the production had to provide a fully equipped air conditioned studio along with lighting, cameras, recording equipment and crew. All post-production, including graphics work, was included in the lump-sum contract which amounted to \$350 per finished hour of video. The learning curve on the part of professors was also very steep and it required a lot of effort and time to record and complete a single lecture. Professors' remunerations ranged from \$350 – \$450 per finished lecture hour, based on their seniority and thus, the total production cost was close to US\$800 per lecture hour.

As the University expanded, it established its own production studios and broadcast station and outsourcing costs were eliminated. In addition, a better control of the production process led to improvement in quality as well as a lowering of costs. Experience has also led to better in-house support for the professors invited to develop courses and the quantum of effort required at their end has reduced substantially.

The remuneration given to the professors is based on their qualifications, experience and standing in the profession only. The academic level of the course being developed (undergraduate, graduate, etc.) is not considered to be a factor since the quantum of effort involved is essentially the same for all levels. There are two slabs for the professors' remuneration — non-PhD staff and PhD qualified faculty. These slabs are:

Non-PhD resource persons: \$140 – \$180 per finished lecture hour

PhD qualified resource persons: \$200 – \$250 per finished lecture hour

The production/post-production/overhead costs come to about \$50 per finished lecture hour. Based on these figures, the cost for 3-credit-hour course (45 hours of video content) ranges from a minimum of \$8,550 to a maximum of \$13,500 which is substantially lower than the cost for the early (pre-2004) years.

While the cost of delivering the courses involves many other factors such as the cost of infrastructure and online mentoring, the overall cost of delivery is much lower than that for conventional universities having a comparable student body. For example, the University of the Punjab which has a smaller on-campus student body had a budget of \$60 million for years 2013-14¹⁵ while the Virtual University’s budget for the same period was about \$10 million. However, it must be noted that cost is not the only factor to be considered: the faculty shortage in higher education still exists and this approach enables broader access to higher education which would otherwise have not been possible.

In an era of rising costs, the video lecture approach has allowed VU to achieve its stated mission of providing “affordable” education. The University has become nearly self-sustaining and the annual recurring grant of \$1 million provided by the HEC amounts to less than 10 percent of the University budget; the remaining amount is made up from tuition fees.

Figure 1 below shows the monthly family income of 7,136 students who obtained admission to the Virtual University programs in 2012. The figure shows that an absolute majority of students belong to families having a monthly income equal to or less than \$300. As is clear, the Virtual University model has gone a long way towards enabling access to higher education for the disadvantaged segments of society.

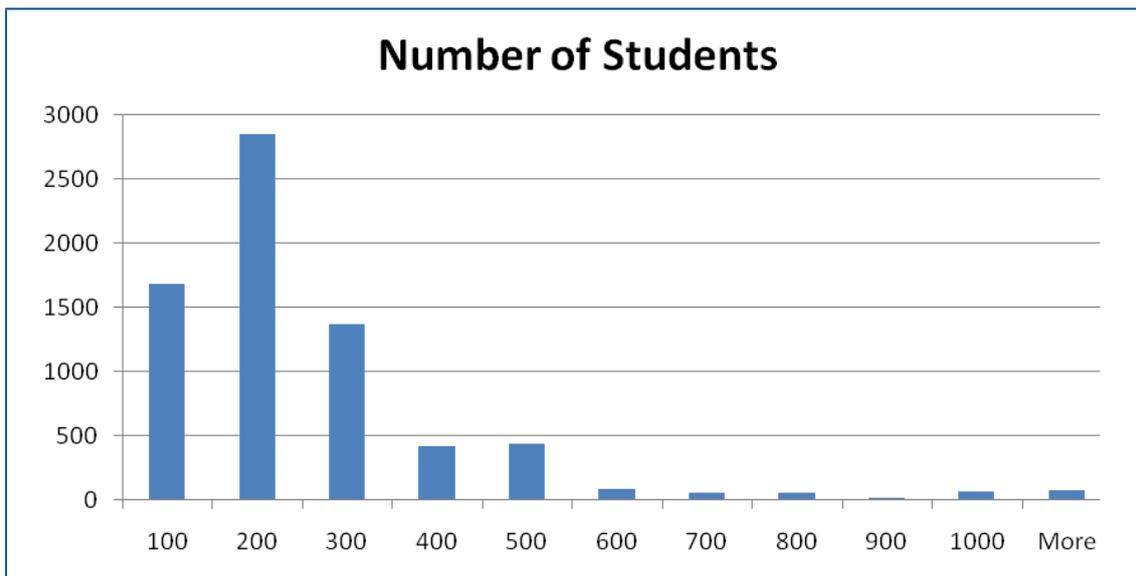


Figure 1 Student Strength vs. Monthly Family Income in US Dollars (Fall 2012 Admissions)
 Source: VU Database

¹⁵ <http://pu.edu.pk/page/puglance/Budget.html>

The Development Process

The starting points for any course development exercise is the course syllabus contained in the curricula prescribed by the HEC.

Since VU is the producer and consumer of its content, quality aspects have to do more with the development process rather than with the selection of external, third-party OER. An invitation to develop courses for VU is permanently placed on the VU website¹⁶. However, the selection of eminent faculty from other universities is more often the result of references and standing in the profession rather than being in response to the invitation.

Once a professor has been selected to develop a course, the first step is to fill out a course outline template¹⁷ and submit it to the University. One permanent VU faculty member is assigned the role of Development Coordinator and it is the coordinator's responsibility to have the outline reviewed from an external reviewer who is at the same or higher level of academic standing in comparison to the selected professor. The review is a blind review and it takes very little iteration to develop an approved course outline. The professor is also required to undergo an audition at the University studios in order to determine the suitability of screen presence and voice quality. Once this step is over, the actual content development starts.

After approval of the outline and successful auditions, the professor is required to develop individual topics based on the course outline and submit a detailed plan as per prescribed template¹⁸, which is reviewed and approved internally by the University's course development team. The professor is guided to prepare a detailed script for each topic, rehearse topic delivery timings and prepare or define slides, figures, graphics and animations that may be required for the topic. Once the topics have been approved, the actual recording process starts.

For each topic/lecture, the professor is required to review the recorded material and ensure that any mistakes in content or delivery are identified. Necessary steps are then taken in a subsequent recording session to remove such errors. In addition, all materials delivered by the professor are subject to external review. Only when the course is completely developed and signed off by the reviewer, it is made available to students by being uploaded into the LMS.

Complete courses are immediately published on the VU OCW site as per policy. The initial publication as OER consists of lecture/topic videos and associated original reading material. After the course has been offered once, assignments along with solutions from the concluded semester are published on the OCW site. New assignments are created and used every semester, and efforts are made to keep the OCW site updated with the latest set of pf assignments and their solutions. The entire process is depicted in the flowchart shown in **Figure 2**.

¹⁶ <http://www.vu.edu.pk> - Home > Opportunities > Course Development

¹⁷ http://www.vu.edu.pk/downloads/VU_Content_Outline_Template.doc

¹⁸ http://www.vu.edu.pk/downloads/Detailed_Session_Plan_Topic_1.docx

Teaching and Learning Practices

The development process for VU courses has been described in the previous section. The instructional design of course material is left to the professor concerned and no professional designers are involved. This is primarily due to the lack of available expertise and is also one of the prime drivers for selecting very senior academics to develop these courses. Professors are encouraged to use examples from local contexts wherever possible so that students can identify easily with them. Efforts are also made to ensure that the selected professor has taught the same or similar course several times in a conventional environment so that they are comfortable with the pedagogy to be employed.

The LMS employed by the University has been developed in-house and contains special features that have been dictated by practice. While standard video and reading material delivery is facilitated by the system, specially designed Moderated Discussion Boards (MDB), Graded Discussion Boards (GDB) and Team Discussion Boards (TDB) have been incorporated into the system to facilitate student-tutor interaction. In addition, university level features include a gradebook, an accounts book and a Student Services section that allow common tasks to be requested/performed by students directly without having to send emails or make telephone calls.

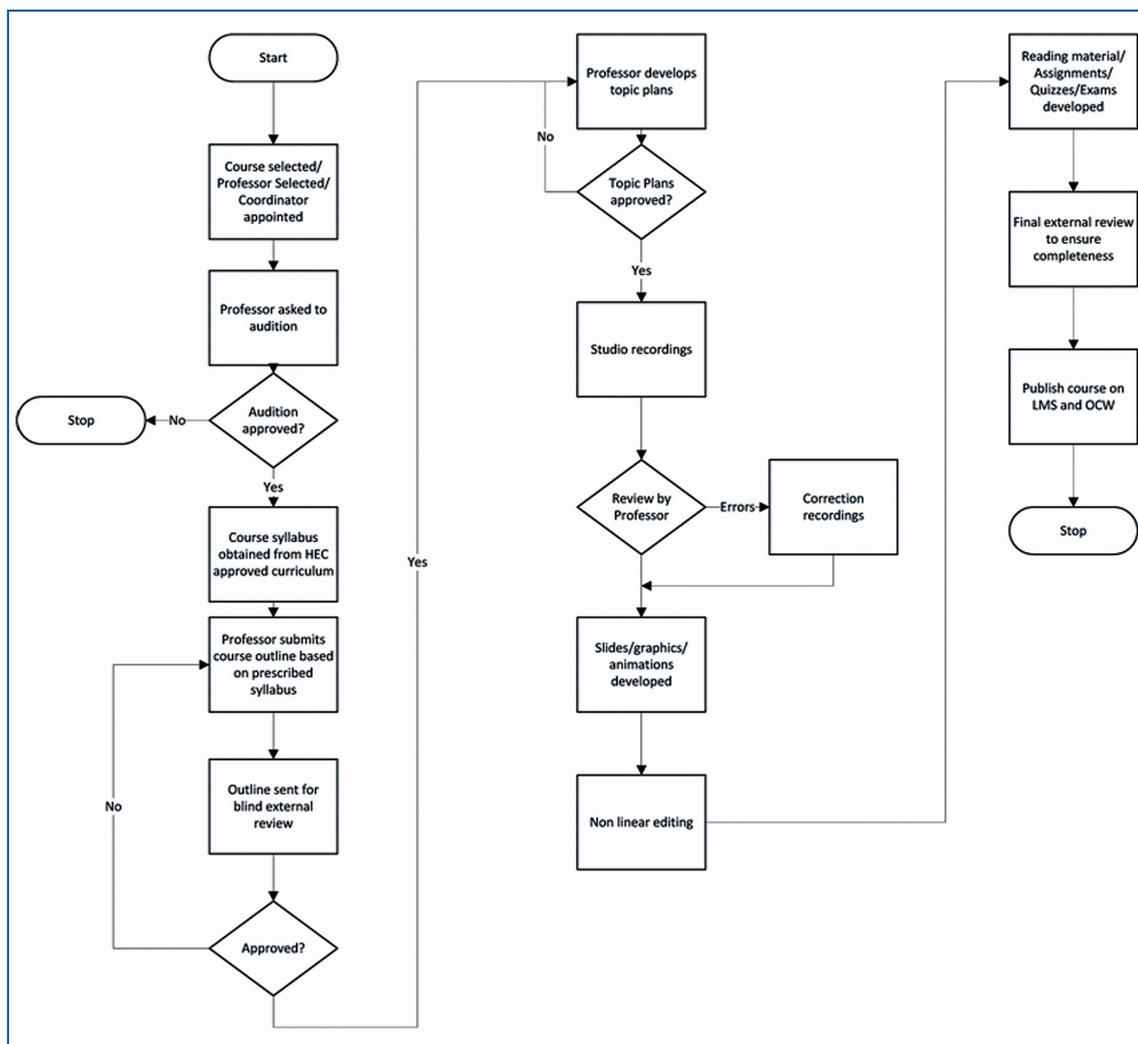


Figure 2 Course development process

In order to provide much needed social interaction, especially for younger students who join the Virtual University directly after high school, the University has established a network of “Virtual Campuses” across the country. These campuses are basically computer laboratories with Internet access that allow students to access their courses and interact with their teachers, while also being able to socially mingle with their university fellows from their respective geographical area. Currently, there are over 200 Virtual Campuses distributed in more than 100 cities of Pakistan. It is important to note that in the VU model, there is no face-to-face contact between the teachers and students and all interaction, even from these campuses, takes place asynchronously over the Internet. The primary instruction is delivered through the video lectures while mentoring and support is provided by full-time VU tutors through the LMS using the MDBs, GDBs and TDBs.

With the expansion of the University’s programs, four television channels have become insufficient to deliver content for all courses being offered in a semester. In the early years, a digital dish receiver was installed in every virtual campus and four classrooms were established, one for each channel, so that students could attend the courses in the form of conventional classes. With the wide availability of broadband, access to study materials has slowly shifted to the Internet. Campuses still maintain the television reception facilities but the demand for Internet bandwidth has continuously increased over time. Access to the University, both in terms of content as well as for student-teacher interaction has now become firmly Internet-based and the University is seriously considering the use of mobile devices for the next evolution of its delivery services. While many VU students do not have their own personal computers or access to the Internet (which is why they use the virtual campuses), almost all of them have personal cell phones. The recent advent of 3G services in the country has made smart phones a viable alternative to Internet-connected computers. The Virtual University is very sensitive to this transformation and initiatives to leverage the new platforms are already underway. While the VU video format conforms to the small screen from an aspect ratio perspective, some pedagogical adjustments will need to be made. The one-hour lecture format is being replaced with a shorter duration “topic-based” format and the use of text material in the videos is being reduced.

An analysis of the student data taken from Admission Forms for the Fall 2012 semester has revealed that almost all students possess a personal cell phone and have registered their phone numbers with the University. Even though all of these students may not own a smartphone, the cost involved in upgrading from an ordinary phone to a smartphone is rapidly decreasing. At current market prices, the cheapest 3G enabled smartphone costs about \$100 while a simple cell phone costs about \$20 in Pakistan. While this difference seems small, it may not seem negligible when viewed in perspective of the family income distribution shown in **Figure 1** above. This may have consequences for the marginalisation of certain segments of the population, but efforts will be made to ensure that all content developed is backward compatible.

The experience of working with OER can be classified into three categories: the institutional experience, the faculty experience and the learners’ experience. Of course, since VU is the producer, consumer and publisher of its open educational resources, the experience is different when compared to institutions that use external OER for incorporation into their courses.

At the institutional level, the elements of the experience are:

1. Selection process of Professors

2. Development process of courses
3. Perception of VU course quality

The faculty experience consists of:

1. Capacity building
2. Content development

Finally, the learners' experience may be classified as:

1. Perception about video lectures
2. Development of independent study habits

Institutional Experience

The selection process of professors chosen to develop VU courses has been quite complicated. In the early days, only a few hand-picked individuals had to be invited for course development. Later, when the course portfolio grew in size, a permanent advertisement/invitation was placed on the VU website and professors from other universities were invited to participate. However, the selection process is quite subjective and factors such as reputation, experience, standing in academia or the relevant profession have to be considered before the person concerned is engaged by the Virtual University. A financial quote is never required and the University pays according to its own set of standard rates. While this may not be the most economical approach, this is done to avoid having to settle for “least cost” offers which may otherwise prove unsuitable.

The development process has been described in detail earlier. The experience of dealing with “prima donnas” has been very educative for the video production staff. However, professors have been very accommodating and have, in general, taken studio direction very positively. On the other hand, academic matters have proven to be different. Suggesting modifications in course outlines or examples being used have invited academic debates where rank has often been used to overrule suggestions from junior colleagues!

From an external perspective, the involvement of well-known professors and public personalities for course development has led to a very positive reception of VU courses. The use of broadcast television has allowed viewers from outside the University to sample VU content and when these viewers happened to be people of influence or decision makers (e.g., public representatives or senior bureaucrats), it has led to a very positive perception about VU course quality in the general public. VU courses are widely respected and many are viewed as the gold standard in their specific domains. Several vice-chancellors of other universities, being eminent professors in their own right, have contributed to this important cause. **Table 1** below shows the grouping by profile of some of the individuals who have been involved in the VU course development.

| | |
|--------------------------------|----|
| Professors/Deans | 69 |
| Associate Professors | 46 |
| Industry CEO | 6 |
| Practicing Psychologist | 6 |
| Rector/Vice Chancellor | 3 |
| President of professional body | 3 |
| Pro-Rector | 1 |
| Chairman, HEC | 1 |
| Prominent journalist | 1 |
| Prominent lawyer | 1 |
| Senior bureaucrat | 1 |

Table 1 Grouping of individuals involved in VU course development

Keeping the courses open has led to a new appreciation of the distance learning mode of education and while there are many academics who are of the opinion that quality education can only be delivered in a face-to-face environment, VU has led a quiet revolution in promoting the acceptability of modern distance education in Pakistan. Several conventional universities have now established their distance learning directorates and some have even copied the VU model almost completely, including the terminology¹⁹.

Faculty Experience

The faculty experience mainly has to do with capacity building. Virtual University faculty consists of staff members at all academic levels ranging from Tutors to Professors who are primarily concerned with mentoring students over the Internet. They are also responsible for creating and grading assignments, quizzes and examinations. The fully-developed video courses have led to considerable capacity building of junior staff members from an exposition perspective. At the moment, VU staff act as course development coordinators for external resource persons and as quality assurance personnel by the University. The immersive experience with these courses has encouraged quite a few to volunteer for future development efforts. Although only one VU course has been completely authored by the VU faculty²⁰, it is expected that many future courses will be developed by VU's own staff.

A new research group for e-learning innovation and development has recently been established in the Department of Education. Many junior faculty members, having been inspired by existing courses, have signed up for this group.

¹⁹ <http://ciit.edu.pk/AboutCIIT/Campuses.aspx>

²⁰ <http://ocw.vu.edu.pk/CourseDetails.aspx?cat=Computer+Science%2fInformation+Technology+&course=CS201>

Learners' Experience

The percentage of VU students who complete their studies successfully within the minimum time prescribed for their programs, ranges around the 30% level²¹ which is quite comparable to the results from other public-sector universities. However, there are some serendipitous outcomes that have proved interesting.

One of the design parameters decided at the very beginning was that VU lecture videos would directly address the viewing audience; the professor on screen would not use a studio audience and a camera-in-the-classroom approach would be avoided. The psychological impact of this approach, although much more felt in the early days, still exists today: many of the younger students treat the video lectures as “live” lectures and ask questions through the LMS/email that use statements like “in today’s lecture, you said...”. A side benefit of providing content to learners in the form of OER has been the development of their abilities to identify and obtain useful information from the Internet. This is very apparent when viewing discussions on their social networking sites and also when grading their assignments. Although many such attempts result in plagiarism, students’ ability to locate useful information from VU and other digital sources seems to have become fairly refined.

An outcome that was not part of the design but is quite obvious in hindsight is the fact that all VU graduates are completely proficient in the use of office automation tools such as word processors, spreadsheets, presentations etc.

External Users

VU students obtain access to video lectures and course material through their LMS accounts. In addition, they may order video lectures on DVDs (US\$0.60 per course) from the VU Bookshop²² for viewing at their convenience. This facility is also used by many non-VU learners as well. With the publication of VU courses on Youtube and subsequently the launch of the VU OpenCourseWare site, many non-VU learners have started accessing VU OER. Google Analytics has been used to analyse website traffic to VU websites and the results give a clear insight into the access patterns of VU OER.

The VU OCW website (<http://ocw.vu.edu.pk>) is structured to allow all content developed by VU to be published under a Creative Commons license. Courses have been grouped by broad subject areas although a visitor to the site can also view a comprehensive list of published courses. For each course, the information provided includes the level of the course, number of credits, prerequisites, if any, and the course outline. The course overview provides a course synopsis, its learning outcomes and also provides a full sample academic calendar for the course, and well as the grading scheme used by the University. Published content includes video lectures, reading material and presentations and assignments from the previous semester along with their solutions. Some sample screenshots from the OCW site are shown below.

²¹ VU internal data

²² <http://bookshop.vu.edu.pk>



Figure 3 VU OCW site home page

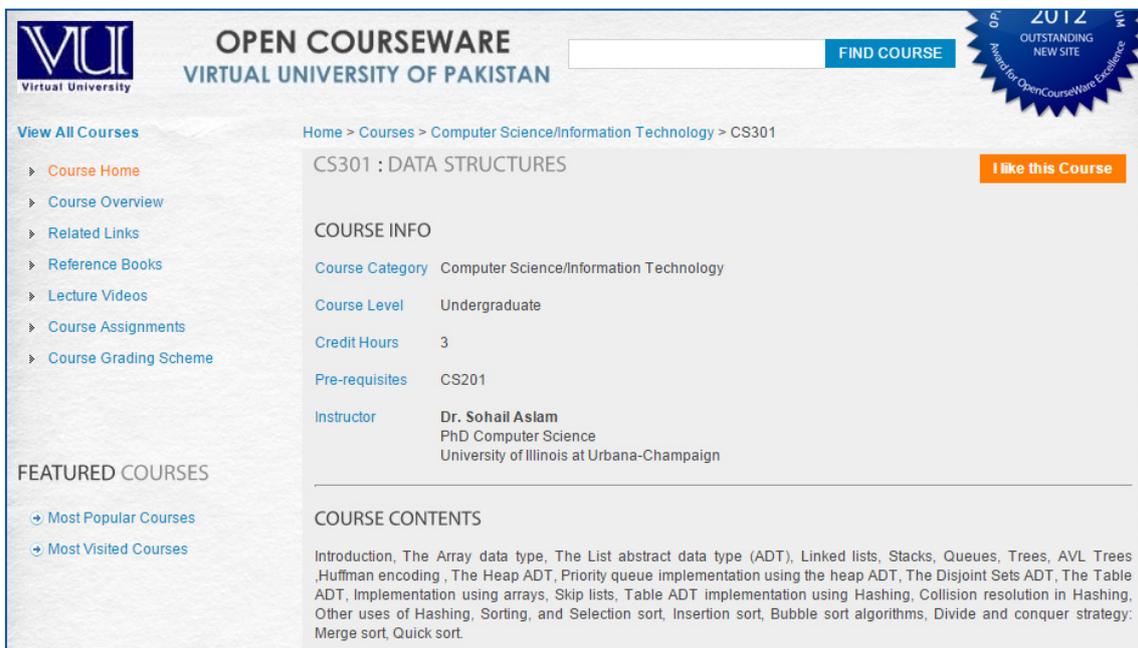


Figure 4 A course home page on the VU OCW site

Table 2 below shows the country-wise number of hits²³ for the VU LMS site by VU students (VU has students within and outside Pakistan) for the period November 1, 2013 to October 31, 2014. Out of a total of 52 countries accessing the LMS site, the sites with at least 100 or more hits are shown. Since the LMS is accessible only by registered students, this data does not include any casual or external visitors.

| Country | Number of hits |
|----------------------|----------------|
| Pakistan | 130,057 |
| United States | 3,885 |
| Saudi Arabia | 3,008 |
| United Arab Emirates | 2,634 |
| Kuwait | 654 |
| United Kingdom | 632 |
| Oman | 294 |
| Qatar | 253 |
| Germany | 229 |
| Italy | 219 |
| Libya | 158 |

Table 2 Hits on the VU LMS site for the period Nov 1, 2013 to Oct 31, 2014

Data for the same period for the VU OpenCourseware site is shown in **Table 3** below. The total number of countries/territories accessing the OCW site was 189 and the data for countries having at least 10,000 hits is shown in this table. Although there is no bar to VU students accessing material directly from the OCW site however, since they also have their semester activities to worry about, it is assumed that the majority access their courses from within their LMS accounts. **Table 3** is therefore more reflective of external visitors to the OCW site.

²³ A hit is a page view. It is not possible to distinguish between casual and serious visitors.

| Country | Number of hits |
|----------------------|----------------|
| Pakistan | 1,873,859 |
| India | 162,874 |
| United States | 126,421 |
| Saudi Arabia | 39,704 |
| United Arab Emirates | 27,104 |
| United Kingdom | 21,331 |
| Afghanistan | 12,389 |
| Germany | 10,547 |

Table 3 Hits on the VU OCW site for the period Nov 1, 2013 to Oct 31, 2014

The interesting point to note from the OCW table is that India ranks second in the list. VU courses use a mix of English and Urdu (the local language) in most of the video lectures. Urdu is very close to Hindi (the language of northern India) and is well understood in the region. The available data seems to reinforce this point.

The VU OCW site requires users to register if they wish to download materials. This allows us to differentiate between serious visitors, who would actually put the material to use, from casual visitors to the site. Download statistics for the period of June 2013 to November 2014 are shown below, grouped by subject area.

| Subject area | Lectures downloaded |
|------------------|---------------------|
| Computer Science | 435,478 |
| Management | 239,789 |
| Economics | 73,150 |
| Mathematics | 68,100 |
| English | 47,810 |
| Finance | 34,844 |
| Physics | 31,698 |
| Psychology | 29,480 |
| Accounting | 19,329 |
| Statistics | 18,986 |
| Sociology | 17,850 |

| | |
|---------------------------|--------|
| Mass Communication | 15,073 |
| Marketing | 12,267 |
| Pakistan Studies | 11,033 |
| Political Science | 11,031 |
| Human Resource Management | 8,131 |
| Information Technology | 6,790 |
| General Science | 6,016 |
| Islamic Studies | 5,703 |
| Education | 4,884 |
| Banking | 4,004 |
| Urdu | 1,426 |

Table 4 Downloads from VU OCW site for the period June 2013 to November 2014
(Number of registered visitors: 24,699. Each download represents a single lecture, not a course)

Although VU offers a fairly large number of degree programs, the oldest and most popular by far, are programs in Computer Science/Information Technology and Management Sciences. Interestingly, the download pattern from the OCW site correlates very well with the actual number of registered students in various disciplines. This seems to imply that while students access video lectures through the LMS, a substantial number download their lectures from the OCW site as well.

VU OER have also been cited by researchers from other national universities²⁴ and although we do not have direct evidence of usage by these institutions, it is obvious that the material is well known and accessed by non-VU users on a regular basis. In fact, one large public sector institution requires its junior faculty to audit a VU course if they are planning to deliver a similar one in the following semester²⁵. Based on the interest shown by sister institutions, the Virtual University offered to install a local copy of its OCW site at all public and private sector universities of the country provided that the university concerned made the necessary hardware and environment available. Out of a total of 150 universities that were corresponded with, 34 showed an interest in installing a VU OCW server and to date, fifteen installations have been completed. The list of universities and DAIs where the VU OCW site has been physically installed is given in **Table 5** below:

²⁴ E.g. <http://www.slideshare.net/CEMCA/oer-pak-ppt-nabi-bux>

²⁵ Statement of Rector CIIT at a VU Board of Governors' meeting

| Sr # | Name of Institution | City |
|------|--|------------|
| 1 | IBA Karachi | Karachi |
| 2 | Institute of Management Science | Peshawar |
| 3 | University of Balochistan Quetta | Quetta |
| 4 | Kinnaird College for Women | Lahore |
| 5 | University of Central Punjab | Lahore |
| 6 | Institute of Business Administration (IBA) Sukkur | Sukkur |
| 7 | Pakistan Institute of Engineering & Applied Sciences | Islamabad |
| 8 | The University of Faisalabad | Faisalabad |
| 9 | FAST National University of Computer & Emerging Sciences | Lahore |
| 10 | Arid Agriculture, Rawalpindi | Rawalpindi |
| 11 | International Center for Chemical and Biological Sciences, Karachi | Karachi |
| 12 | Shaheed Benazir Bhutto University, NawabShah | Nawabshah |
| 13 | Bahria University Islamabad | Islamabad |
| 14 | University of Science and Technology Bannu | Bannu |
| 15 | GIFT University Gujranwala | Gujranwala |

Table 5 List of universities/DAIs where the VU OCW server has been installed

It is instructive to look at the profile of some of these institutions. IBA Karachi (Institute of Business Administration — <http://www.iba.edu.pk>) is the oldest and one of the best business schools in the country²⁶. Its history states: “IBA is the oldest business school outside North America. It was established in 1955 with initial technical support provided by the world famous Wharton School of Finance, University of Pennsylvania; later, the University of Southern California set up various facilities at the Institute and several prominent American professors were assigned to the IBA. The course contents, the curriculum, the pedagogical tools and the assessment and testing methods were developed under the guidance of reputed scholars from these two institutions. IBA has zealously guarded the high standards and academic traditions it had inherited from Wharton and USC while adapting and adjusting them with the passage of time.”²⁷

²⁶ <http://www.hec.gov.pk/InsideHEC/Divisions/QALI/Others/RankingofUniversities/Pages/CategoryWise.aspx>

²⁷ <http://iba.edu.pk/historyofiba.php>

The University of Balochistan is the largest university in the province of Balochistan. Kinnaird College Lahore (<http://www.kinnaird.edu.pk/>) is one of the finest women's colleges in the country which has recently been granted degree awarding status. The University of Central Punjab (<http://ucp.edu.pk/>) is one of the largest private sector universities in the country. The Pakistan Institute of Engineering & Applied Sciences (<http://www.pieas.edu.pk/>) is among the top scientific research schools in the country. FAST National University of Computer & Emerging Sciences (<http://www.nu.edu.pk/>) is considered to be the best school for computer science and information technology in the country while the International Center for Chemical and Biological Sciences (<http://www.iccs.edu/>), Karachi is a top tier research institution having an international standing.

National and Institutional Education Sector Policy Issues

The national ICT Policy was first drafted in 2002. It has subsequently been re-drafted in 2012²⁸ and in this draft, the first implementation theme is concerned with education. Initiatives in the area of education are aimed at improving the quality and reach of primary and secondary education and basic computer science exposure at a national level using technology. The policy indicates that the government will “facilitate the sharing of existing and future audio and video-based content to encourage promotion of local content and localisation of relevant content”²⁹ but makes no mention of OER. No national OER policy exists at this time.

In the absence of an enabling policy environment, the development or use of OER outside of the Virtual University's efforts has remained relatively unknown. A recent effort by the Punjab Government is aimed at providing e-textbooks for high school students³⁰. *eLearn Punjab* is the official repository of free online digitised textbooks augmented with animations, simulations, videos and assessments. The portal represents a mix of original and reused content and lists a host of resources such as the Khan Academy and the University of Colorado's PhET simulations as partners.

With the advent of Massive Open Online Courses (MOOCs) in the global OER landscape, Virtual University of Pakistan has started investigating this phenomenon with a view to including it in its offerings and thereby reaching a wider audience. The MIT based edX³¹ platform has been published as an open source platform and VU has adopted it for its own use. Three VU courses have been transformed into MOOCs by re-purposing and modifying existing courses, on an experimental basis. This re-purposing of the OER provides another opportunity for review and quality assurance and the University staff are responsible for the transformation review of the previously-developed material with an even finer tooth comb.

²⁸ <http://www.pseb.org.pk/images/docs/draft%20national%20it%20policy%20-%20revised%202012.pdf>

²⁹ National ICT Policy Draft 2012 Section 8.1(d)

³⁰ <http://elearn.punjab.gov.pk>

³¹ <https://www.edx.org/>

The Quality Enhancement Cell (QEC) of the Virtual University (<http://qec.vu.edu.pk/Default.aspx>) regularly conducts self-assessment exercises within every department of the University with a view to assure and enhance quality in every aspect of university operations. The self-assessment reports (SARs) are submitted to the HEC and the QEC consistently obtains the highest ranking. The processes for curriculum construction, course design and development, and assessment have already been elaborated above. As far as staff selection is concerned, standard academic practices are followed. Positions are advertised, applicants shortlisted and interviewed by the University Selection Board that comprises representatives of the Ministry of Information Technology (the federal ministry responsible for the Virtual University), one member of the Board of Governors and experts from other universities. The rigorous process ensures that only the best and brightest are offered faculty positions at the university.

Conclusion

Faculty members at VU are required to mentor the courses developed by external resource persons and every course is taught as per the published academic calendar³². As a result, a culture of efficiency and discipline pervades the working environment. Though this may be useful at the undergraduate level where course completion and the desired level of rigour are all important, it has two significant negatives: creativity and free thinking are suppressed and some junior faculty members fall into a mechanical work-mode and do not bring any additional value into their mentoring of students. The University has become aware of this though internal feedback (SARs) and new measures are being introduced to overcome these issues. During the Spring 2014 semester, the concept of live audio tutorials was introduced using Teamviewer³³ and Skype³⁴ software. This is the first time that any synchronous activity has been used at VU and the results have been very encouraging. Staff members now feel more involved in the teaching process and have started innovating and introducing new elements over and beyond the available OER. Plans are underway during the Fall 2014 semester to introduce face-to-face sessions on lines similar to those practised by the Wawasan Open University³⁵. VU faculty members are geographically located in six cities of Pakistan. Face-to-face sessions have been initiated at these locations while a formal training program for mentorship is being developed. Once this program is offered, the network of VU instructors will be significantly enhanced and many more cities will be covered.

Over the period of twelve years since its operation, the Virtual University has been able to overcome the negativity generally associated with distance learning. The modern version of technology-assisted distance learning is increasingly being viewed as an acceptable alternative to conventional methods of education in Pakistan, as evidenced by the number of existing universities that have started offering programs at a distance³⁶. The HEC has even published quality guidelines for initiating such programs at conventional universities³⁷. The Virtual University can claim some of the credit for this new perspective on distance education, since its high quality OER changed the public perception about this mode of education.

³² <http://www.vu.edu.pk>

³³ <http://www.teamviewer.com/>

³⁴ <http://www.skype.com/>

³⁵ http://www.wou.edu.my/study_with_us.html

³⁶ <http://www.pakistaniuniversities.info/2014/06/pakistani-universities-offering-distance-learning.html>

³⁷ <http://www.hec.gov.pk/InsideHEC/Divisions/QALI/QADivision/Documents/Guidelines%20for%20DDEs.pdf>

In terms of internal lessons learnt, there have been pedagogical lessons that are now driving the development of new programs at VU. Initially, VU courses were based on lecture videos mimicking the classroom. A three-credit hour course comprised of 45 pre-recorded one-hour lectures and student support was provided asynchronously through the LMS deployed for the purpose. The original approach tried to bring students into a classroom to watch these lecture videos on a large screen and then work individually, or in small groups to do their assignments etc. However, this approach left out the large number of working professionals who viewed the lectures from home and did not have the time to go to a campus. The University has continuously evolved its approach and instead of classrooms, lecture-viewing stations have been developed and deployed having a small number (eight) of seats, headphones instead of speakers, and locally controlled video playback.

Recent research has indicated that the attention span of students viewing video lectures is very short, with an average engagement time of only 6 minutes regardless of the length of the lecture³⁸. Combining this knowledge with global trends and the advent of MOOCs, the current development methodology of VU courses has become topic-based rather than being lecture-oriented. This approach holds the promise of greater engagement with the students and in combination with synchronous activities, in the shape of audio tutorials over the Internet or face-to-face classroom interaction, it is anticipated that learning outcomes will be further improved.

The topic-based approach lends itself naturally to re-purposing as MOOCs and also allows the delivery of content over the newly introduced 3G and 4G cellular networks. Smartphones are rapidly becoming ubiquitous and their penetration has far outpaced the access to laptops and personal computers in the target audience as according to a research conducted by a software company³⁹. As such, it is an important platform to focus on for VU and due thought is being given to developing OER in these modern formats. Work is already underway to develop custom applications (apps) for smartphones and VU will make its OER available in the new formats and on these platforms.

The learning model used by VU is fairly replicable but does require the use of video production facilities. As mentioned earlier, the level of investment varies considerably based on the video format adopted and further study is required to ascertain whether high production value content is worth the cost. The LMS deployed by VU has been developed in-house and incorporates many features that are required to run university operations smoothly. However, the system requires that most aspects of university operations should be based on information technology (IT) and automated systems. This is possible in green-field projects like the Virtual University but transitioning an existing conventional university into an IT-based operational model requires serious change management and effective leadership possessing a keen insight into the potential of Information Technology.

Since VU is a public sector university, it was fairly easy for it to adopt the OER approach and be large-hearted with its content. One critical lesson that has been learnt is that opening up a university's content as OER never harms the institution; if anything it promotes public goodwill for the institution and fosters a better appreciation of the content that would otherwise have stayed behind closed doors.

³⁸ <https://www.edx.org/blog/optimal-video-length-student-engagement#.VKeSFSuUezo>

³⁹ <https://www.techinasia.com/smartphones-in-pakistan-infographic-2014/>

Epilogue

In the emerging and middle income economies of Asia, there is a case for the state to be actively engaged in promoting the sharing of educational resources extensively among its citizens, especially so, since in many of these countries, the state is a principle provider of finance to generate those resources. Equally, as a principle provider of resources, the state also has the added responsibility to facilitate and support actively innovations in the educational space, some of which may be disruptive as in the case of OER. Ministries of education and the agencies that work for and with them could do so in any number of ways including some, learnt from the studies reported in this book, such as:

1. **Encouraging the digitisation of open content for greater portability.** This may include training programmes to develop technical skills on the digitisation of content. Establish and maintain web platforms to host digital content, to deploy standardised global taxonomies for describing resources in different disciplines, and training programmes on web design and management skills. Promoting in as far as possible, open technologies and open source software. One such platform, at the development stage, is the one in India called NROER — National Repository of Open Educational Resource (<http://nroer.gov.in/home/repository>).
2. **Developing national repositories of open educational content** by conducting training programmes in knowledge management and developing national and institutional capacities to put in place sustainable open repositories to host curriculum materials such as the one currently presented by the Wawasan Open University (<http://oerasia-repository.wou.edu.my/>).
3. **Strengthening data collection and storage on OER-associated activities** by urging Ministries of Education and institutions of higher learning to undertake collection, curation and dissemination of information on OER. Support institutional capacity-building programming, database, data modelling, warehousing and visualising skills.
4. **Encouraging greater investments in improving the present IT environment** for education. Almost all governments have near-perfect policies for this purpose but modest resources are expended in making these policies a reality.
5. **Promoting “Open Educational Practice” as an important pillar of national educational strategies** by urging and supporting their institutions to embed openness in education for all citizens; embracing Open Educational Practice thereby giving citizens greater access to higher education through policy instrument and funding institutions to encourage partnerships amongst HEIs to collaborate and share educational resources.
6. **Provide funding to support Public-Private partnerships** between HEIs and the publishing industry to develop open textbooks which is envisaged as part of the open textbook initiative of the Open University of Hong Kong.

While the state's role as a catalyst is critically important, equally necessary is the commitment of institutional leadership and the academic community therein. In all the six cases, institutional champions of innovation took the lead in exploring the ways in which their individual institutions can benefit from OER as in the case of the Wawasan Open University and its desire to save costs on materials development (Chapter 6) or in the case of the Open University of Hong Kong which is attempting to shift the dependency of teachers in that territory from commercial publishers to free web resources (Chapter 3). The study by Sharma (Chapter 2) in Karnataka illustrates the coming together of a community of STEM teachers to support each other in the enrichment of their curriculum through utilising OER through freedoms provided by creating Commons license.

It is our expectation that the documentation of the OER-related practices draws attention to the value of disruptive technologies can bring about even in the absence of poor infrastructure, lower level skills and limited financial resources. An important lesson these six case studies illustrate is the importance of sustainability without any dependence on external or donor funding. An innovation like the introduction of OER and others requires indigenous "buy in" and resources for sustenance. Without such, innovation dies.



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