

# The Open Educational Resources (OER) movement: Free Learning for all Students

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## I. INTRODUCTION

In recent years, the term Open Educational Resources (OER) has emerged, aiming to promote open access to digital educational resources that are available online for everyone at a global level [1]. The term was first adopted by UNESCO [2], which has defined Open Educational Resources (OERs) as the “*technology-enabled, open provision of educational resources for consultation, use and adaptation by a community of users for non-commercial purposes*”. With regard to this broad definition, a number of narrower definitions of OERs have been proposed by different OER initiatives, which consider OERs similar to [3]: “*full courses, open courseware and content, educational modules, textbooks, streaming videos, tests and assessments, open source software tools, and any other tools and materials used to support teaching or learning*”.

Six significant trends are emerging in the OER arena:

- *Unsatisfied global demand for education.* Global demand for education exceeds the capacity of existing systems and it isn't economically viable to build new universities.
- *Growing inventory of OER on the Internet.* Thousands of OER can be assembled or integrated into courses for academic credit.
- *Free-tuition institutions are growing.* These non-profit institutions are using OER. However, credible solutions for providing assessment and credentialisation services are needed.
- *Cost-structures for asynchronous learning are changing.* The marginal cost of replicating OER is near zero. Course assembly rather than development requires no “new” money but rather a reallocation of resources.
- *Protocols exist for assessment and accreditation of OER learning.* RPL and challenge examination combined with credit transfer and course articulation can support formal credentialisation of informal learning.
- *Restrictive licensing and Digital Rights Management* render proprietary content too restrictive for use in open online learning

environments making OER essential for modern learning.

This panel includes reports on OER initiatives and opinions in Europe, North America and Asia. (McGreal)

## II. SCIENCE EDUCATION OER INITIATIVES IN EUROPE

Science Education is recognized as top priority for Europe[4]. In the past few years, large numbers of digital science education resources, in the form of Learning Objects (LOs) [5], have become available for open access through science museum collections, digital repositories and libraries facilitating their sharing and re-use among science education communities. These resources are enabling teachers to improve their day-to-day science teaching [6].

Additionally, it has been recognized that science teachers can improve the quality of their teaching through their participation in communities that promote the best science teaching practices [7]. In response to this increased interest in digital educational resources and learning designs for science education, several prominent European Initiatives have been launched.

The OpenScienceResources Repository has more than 1,100 registered users and it includes more than 1,300 LOs and over 110 Learning Design (LD) modules (<<http://www.osrportal.eu/>>). It was developed as an EU-funded project providing access to science education content offered by European Science Centers and Museums. See <<http://www.openscienceresources.eu/>>.

The EU-funded COSMOS Repository provides access to science education LOs and LDs for schools and higher education institutions. It has more than 1,650 registered users and includes more than 100,000 LOs and over 350 LDs. See <<http://www.cosmosportal.eu/>>.

PATHWAY is another EU-funded project that coordinates and supports actions focusing on the effective widespread use of inquiry and problem-based science teaching techniques in primary and secondary schools in Europe and beyond by demonstrating and disseminating best teaching practices. The project facilitates the development of communities of practice that will enable science teachers to learn from each other. Within this

context, sharing, using and re-purposing science education LOs and best teaching practices in the form of LDs through web-based repositories are key features. This Project makes use of both the OpenScienceResources Repository and the COSMOS Repository for engaging European science teachers in the process of sharing, using and re-using science education LOs and LDs. Figure 1 presents the overall approach of the PATHWAY Coordination and Support Action. Also see <<http://www.pathway-project.eu>>.

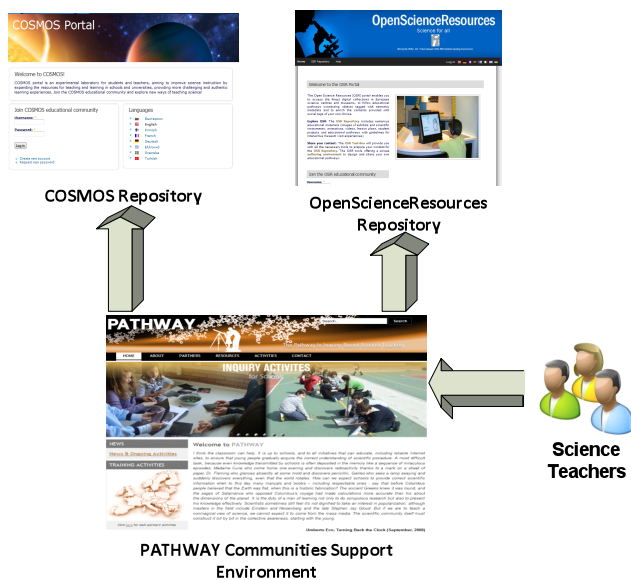


Figure 1. The Approach of the PATHWAY Coordination and Support Action.

The three aforementioned initiatives, and several others, will be integrated under a new European project referred to as “*Open Discovery Space: A socially-powered and multilingual open learning infrastructure to boost the adoption of eLearning Resources*”. This project aims to include more than 150,000 LOs and LDs by aggregating LOs and LDs from a federated network of seventy five (75) existing LORs and LDs in Europe. See <<http://www.opendiscoveryspace.eu>>. (Sampson)

### III. DEVELOPMENTS OF OER IN TAIWAN

The Taiwan Open CourseWare Consortium (TOCWC), established in 2008 now has 27 university members. Over 700 courses are available online; most with video lectures [8]. The site has attracted millions of visitors. The goal is to have over 1,500 open online courses with at least 1000 courses with high-quality video lectures by 2015. In addition, the consortium is also aiming to convert at least 100 courses for mobile learning.

Issues that have arisen in the Taiwan experience include the following:

(1) *How to produce a video-based lecture, which is pedagogically sound?*

It is not pedagogically sound or effective for learners to watch a 2-3 hours non-stop video lecture, which is produced by directly videoing a traditional classroom. Firstly, the original classroom environment and context are lost in the recorded video lectures. Learners watching a recorded video lecture can easily become bored. The granularity of a topic/knowledge unit to be recorded in one video lecture and the appropriate length of a recorded video lecture to be used in different settings are the critical issues to be considered.

(2) *How OERs can be effectively used in formal educational settings?*

OERs should be created in a format that teachers can easily adapt and use in designing meaningful learning activities for physical classrooms. In this vein, some schools have been practicing the flipped classroom [10] concept by asking students to listen at home to the video recorded lessons available from the Khan Academy [9], and then coming to classrooms to do homework assignments with teachers nearby to do just-in-time facilitations and active interactions among peers. (Chen)

### IV THE OER MOVEMENT: FREE LEARNING FOR ALL STUDENTS (A CANADIAN PERSPECTIVE)

Advances in technology in recent years have enabled mobile devices to make use of various modalities including the use of multimedia objects as OER. Recently, mobile devices equipped with input and sensor options support user-generated content, which can be employed to create examples of real life learning situations, for authentic learning. However, existing research and implementations demonstrate a gap between the creation of authentic learning examples and their subsequent reuse as OER.

Creation of OER scenarios, which not only provide reusable learning objects but also the learning activities in such a way that they could be customized to suit different contexts is an emerging area for research. As an initial step, an application has been implemented for a mobile device to author authentic learning examples in a standardized format to technically enable OER reuse. MAAIMS, the Mobile Authentic Authoring in IMS [11] captures authentic learning examples using mobile device sensors (such as still cameras, video cameras, and microphones), which can be supplemented with location-aware GPS coordinates and other descriptive metadata following IMS Metadata specifications. MAAIMS encapsulates these authentic learning examples and employs them in standardized learning objects (IMS Content Packages), and optionally, standardized learning activities (IMS Learning Designs). The standardized output of MAAIMS is shared via a repository, and can then be imported into other learning platforms, learning management systems, a runtime environment, or editing and authoring tools; thereby sharing and reusing authentically created learning examples and

learning activities in different contexts. MAAIMS successfully demonstrates, firstly, that mobile device sensor data can be used to author authentic learning examples; secondly, that IMS standard learning content and learning designs can be authored in a mobile context; and lastly, that learning designs support authentically authored learning activities be shared across contextual boundaries. (Kinshuk)

## V. NATIONAL PROGRAMME ON TECHNOLOGY ENHANCED LEARNING: A VISION FOR INDIA

NPTL is a national programme for content creation in higher education that was launched by seven Indian Institutes of Technology and the Indian Institute of Science in 2003 with financial support from the Ministry of Human Resource Development [12]. NPTL has released so far about 300 one-semester courses in several engineering disciplines covering the undergraduate curriculum of Indian technical institutions in five disciplines prepared by well known experts in their respective subjects, who are also accomplished researchers in their own area.

The curricula provided through this project and the detailed course content released so far match quite well with the engineering and technical education curricula of major universities throughout the world. The programme aims for completion in 2012 with course materials for an additional 900 courses for students entering engineering, technology or management programmes from high school and graduating with a Bachelor/Masters of Technology, or an MBA degree in their respective disciplines.

While serving as open educational repositories for anyone interested to learn, this course content is also used extensively to train young and inexperienced teachers on the one hand, and by senior faculty to provide supplementary and bridge-content on the other hand. This is particularly important in the Indian context since the disparity in quality of higher education between institutions is considerable. As one of the principal coordinators in this large, collaborative and developmental project for a national curriculum, this author hopes to give a glimpse of challenges faced by the team so far, and which lie ahead, in the design of pedagogy, cooperative development and ICT based education. This is significant because India supports the world's second largest engineering student population, next only to China. The content is available online to everyone in the world; it also hosts several thousands of hours of video-based lectures for personal downloads.

The author is also a participant in the National Development Programme in India, which was launched recently. This has a much larger framework for ICT based content development in all subjects in higher education, virtual laboratories, spoken tutorials, and educational resource planning. The courseware is pedagogically designed in line with the Washington accord. (Krishnan)

## VI. NATIONAL PILOT CURRICULUM PROJECT IN CHINA

In 2003, the National Pilot Curriculum (NPC) project was formally launched by Chinese Ministry of Education (MoE, 2003), which aims to create and select the national top level courses from colleges and universities. To raise the quality of teaching. It consists of model courses with "first-class faculty, first-class content, first-class infrastructure, first-class pedagogy, and first-class effectiveness". Funding of 100,000 RMB will be provided for the development of a course, with the proviso that the course resources could be used freely for five years [13].

By 2010, 3,790 NPCs had been developed, including 2,525 NPCs for undergraduate students, 1037 NPCs for vocational college students and 228 NPCs for online education school students. Many National Pilot Curriculums (NPCs) were produced each year from 2003 to 2010, during which about 20,000 professors and associate professors took part in the construction of NPCs for undergraduate students [14].

A study indicated that in the process of the construction of NPCs, technology has played an important role in transforming teaching methods from "teacher-centered" to more "student-centered", which facilitates students' independent learning, inquiry learning, and collaborative learning. Experiential and practical teaching methods grew significantly from 2004 to 2008, which indicated that students' experience and practice were more active and on-task, as more independent learning was emphasized in university teaching [15].

Like the MIT OpenCourseWare project, the NPC provides a unique website for each course, listing different resources, including course outlines, often with slides for each lecture and reading lists. Many courses will have supplementary material, audio and video recordings of some or all lectures, previous examination questions, students' work, etc. An investigation suggested that the construction of NPCs have greatly promoted the sharing of quality teaching resources, which will benefit students' learning and teachers' collaboration among universities [16].

Overall, the NPC has played an active role in the promotion of quality of higher education in China. It has motivated professors to return to the podium to give lectures to undergraduate students. It has led to positive changes in the overall teaching structure, teaching content, teaching materials, teaching methods and teaching management by promoting the sharing of high quality teaching resources in urban and rural areas, which support the idea of Learning For All while supporting educational equity. (Huang)

## VII. SUMMARY

Common themes run through the experiences of the different projects on three different continents. Firstly it becomes clear that OER can be used for enabling teachers to

improve their teaching; OER are being successfully used for teacher training. Secondly OER can be used as organizational focal points for creating communities of practice among educators. Thirdly these communities, because of available OER can share, re-use and re-purpose the content to suit their specific contexts and local conditions. Fourthly, the implementation of OER improves our understanding of the different settings and the granularity in which they might be appropriate pedagogically. Fifthly in OER implementations, the critical issues to be considered become apparent and so can be addressed with lessons learned. Sixth, the role of advanced technology and how it can be applied to create real-life learning situations can be better researched using OER because of their flexibility, being able to be customized to suit the different contexts, applications and devices, particularly the emerging tablets, and 4g mobile phones. Lastly, because OER are pedagogically-designed, they can demonstrate their quality as being equal, if not better than, that used in traditional universities.

So, the experience of these OER projects, the growing number of OER in these and other projects being conducted in many different countries demonstrates that OER have a place in meeting the unsatisfied global demand for education. OER will play a role in supporting free-tuition institutions, overcoming restrictive licenses, and reducing costs. OER will also be catalyst for stimulating the development of protocols for assessment and accreditation.

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