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**THE INTEGRATION OF MASSIVE
OPEN ONLINE COURSES (MOOCS)
INTO A MEDICAL CURRICULUM,
AN IMPLEMENTATION MODEL****ABDELMONIEM S. ELMARDI**

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ABSTRACT

PURPOSE: This paper reports the experience of the author in integrating MOOCs as part of the online component of the implemented medical school's curriculum.

DESIGN/METHODOLOGY/APPROACH: The research is an action research applying an intervention and reporting its effect. The author used a model that he developed through his life experience in integrating e-learning in a medical school's curriculum. The paper describes the approach used to search for, identify and select the MOOCs that are appropriate for integration into the curriculum. The paper also describes the preparations and measures applied to ensure stakeholders' engagement in the process in a way that guarantees buy-in and commitment to use the virtual learning environment. The effect of the planned and structured gradual integration of MOOCs into the curriculum is also reported.

FINDINGS: The effect of the orientation and training parts of the model in dealing with the change angst of the faculty was positive, despite the presence of some expected resistance. Some reluctance on the part of faculty was also observed. Overall, using the model was found to be effective, and the integration of MOOCS was found to be beneficial.

ORIGINALITY/VALUE: Although the application of change management models, and the use of online resources, were both reported in the literature, the application of the reporter model and the utilization of MOOCS in medical education are both original and valuable.

KEYWORDS: e-learning, virtual learning environment, MOOCs, medical education, educational technology

INTRODUCTION

In recent years, the education community has been experimenting with content (Open Educational Resources), accessibility (Open Access), and form (Open Courses). These experiments passed through phases of development and integration of these concepts and approaches. The integration and effective utilization was, and is, not always successful due to difficulties caused by a multitude of factors. The Massive Open Online Course (MOOC) is an emerging method of education: due to its relative novelty, some of its theoretical assumptions are still evolving (Mackness, 2010). Its applicability across a broad range of fields is untested, and its applicability to medical education may be highly contentious.

This paper reports a model that was developed and used to try to overcome these difficulties and enhance its utilization. As the successful implementation of MOOCs requires conceptual changes in understanding by instructors and students, the author adopted an approach of implementation that assists teaching staff in understanding the conceptual changes required by instructors to implement a MOOC successfully.

LITERATURE REVIEW

The term MOOC was first coined as a result of a large online course run by George Siemens and Stephen Downes in 2008 (Cormier and Siemens, 2010). Its evolution was excellently described in a paper by Masters (2009). He explained that “massive” in MOOCs refers primarily to the number of students, but may also refer to the scope of the course’s activities. MOOCs are a stage in the long journey in the evolutionary history of e-learning and online education. At first lecturers placed notes and presentations into an online repository or file server with a shared drive that was only accessible by students registered for the course. Then structured Learning Management Systems (LMS) or Virtual Learning Environment (VLE) were developed that could include activities (chat rooms, discussion fora and wikis, etc.) and resources (Hill and Hannafin, 2001).

At this stage of the evolution, lecturers started using learning objects known as reusable learning objects (RLOs), which included multimedia objects and interactive tutorials. At that time, some institutions allowed teachers and students from other education institutions to access these RLOs (Ellaway et al., 2005): This concept is known as open access (Seely Brown and Adler, 2008). Accessibility to RLOs exploded exponentially during the current social networks revolution. The multimedia learning objects available in www.tec.com & www.youtube.com

are literally uncountable (Gilroy, 2009). Education in medicine and other health professions was not an exception. Tools and resources were similarly developed for this field and similar integration ventures were undertaken. Some educators have even developed complete online medical curricula. These included The Integrated Medical Curriculum (<http://imc.meded.com/>) developed by the DXR Development Group Inc., and the International Virtual Medical School (<http://ivimeds.org/uwa/>) developed by a consortium of medical schools.

However, this evolutionary trip was not an easy ride. Problems of integration, engagement and utilization were many, the most important being teaching faculty's resistance to change (Finley and Hartman, 2004). Many attempts were made to overcome these difficulties. One of the proposed solutions for this issue was the application of integration models that considers this problem at the early stages of planning and preparation before the actual integration of e-learning into the curriculum (Khalil, 2013; Smith, 2012). The author implemented a framework that is a modification of the models proposed by experts in the field based on his own experience in the Arab countries (Oman, Sudan and Saudi Arabia).

RESEARCH METHODOLOGY

The study design is a case report using an action research approach. As part of the efforts of the e-learning and educational technology unit to prepare an effective virtual learning environment (VLE) at the College of Medicine, Al-Imam University, an intensive survey was launched to identify digital learning materials available in the market as well as open online resources. The survey was conducted by interested faculty, information technologists, librarians and students. The resources were classified into the following groups:

1. Commercial multimedia resources and interactive learning materials (online and computer-based);
2. Downloadable open source multimedia resources;
3. Online open source multimedia resources (in YouTube and elsewhere);
4. Online integrated interactive tutorials;
5. MOOCs.

The resources identified through the survey, including MOOCs, were classified and registered in an annotated index. This was then entered into a database to make it easily searchable. A new implementation approach was then developed to integrate these tools and resources in the taught curriculum. The model adopted had three sequential steps and one longitudinal phase running parallel to the other steps.

STEP 1: AVAILABILITY:

The college sought to acquire as much of the commercial and open source

downloadable material as possible, and made a register of the links to the open source online material including the MOOCs.

STEP 2: ACCESSIBILITY:

The commercial and open source downloadable materials were stored in a resource server, and retrieval software was developed that had an interface to make a digital resources library accessible through the Intranet of the college. The interface also included the links to the online material.

STEP 3: STRUCTURING:

The resources were integrated into the syllabus structure of a number of educational units using the learning management system MOODLE. The students are involved in weekly activities in which they access these resources using the Directed Self-learning and Guided discovery approaches. The MOOCs used were of two types:

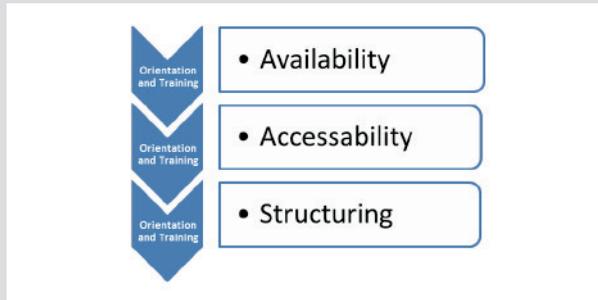
- Synchronous, for which the students are asked to register for a particular delivery date that suits the timetable of their respective course;
- Asynchronous, for which some flexibility is allowed.

The important aspect of ensuring engagement and use was addressed in different ways. For some courses, the teachers signed up for the courses to follow the progress of their learners and actually interacted with them in the course, although this was difficult because of the massive numbers of learners. In other courses, learners were asked to provide evidence of enrolment and interaction. In others, special activities were included for the purpose of reporting, including the submission of written reports, the delivery of a presentation through conferencing, a forum or a quiz.

STEP 4: PUBLICIZATION AND TRAINING

This phase is a longitudinal one and starts at the beginning of the project at the stage of planning. In this way, all the stakeholders, teachers, students, technicians, librarians, coordinators, and administrators are involved and engaged in the process. A series of orientation and training activities were conducted and the stakeholders were involved at all levels and all phases to guarantee buying in, especially by decision makers, teachers and students (see Figure 1).

Figure 1: The VLE implementation framework



Source: Devised by author

The MOOCs identified were evaluated by technology, content and instructional process experts using website evaluation tools and criteria recommended by a number of researchers and scholars (e.g., Tsai and Chai, 2005; Chiou et al., 2010; Elling et al., 2007). Monitoring of engagement and utilization was done by the VLE administrator and ICT personnel by regularly checking the log of the LMS. The attitude of educators and learners was measured through a simple survey.

RESULTS AND DISCUSSION

IDENTIFYING MASSIVE OPEN ONLINE COURSES:

The results of the study indicated that a huge wealth of learning tools and materials, including Massive Open Online Courses, is now available and is being developed by the day. It also indicated that most of the available courses are of high quality and are offered by reputable educational institutions. Through the search conducted by a group of information technologists, librarians, teachers and students, a large number of MOOCs were identified, classified and entered in an annotated index with a brief description of the MOOC. These are indicated below.

Top 10 Sites for Information about MOOCs:

1. Udemy Free Courses – Udemy is an example of a site that allows anyone to build or take online courses. Udemy’s site exclaims, “Our goal is to disrupt and democratize education by enabling anyone to learn from the world’s experts”. The New York Times reported that Udemy, “recently announced a new Faculty Project, in which award-winning professors from universities like Dartmouth, the University of Virginia and Northwestern offer free online courses. Its co-founder, Gagen Biyani, said the site has more than 100,000 students enrolled in its courses, including several, outside the Faculty Project, that charge fees”.

2. iTunesU Free Courses – Apple’s free app “gives students access to all the materials for courses in a single place. Right in the app, they can play video or audio lectures. Read books and view presentations”.
3. Stanford Free Courses – From Quantum Mechanics to The Future of the Internet, Stanford offers a variety of free courses. Stanford’s – Introduction to Artificial Intelligence was highly successful. According to Pontydysgu.org, “160000 students from 190 countries signed up to Stanford’s Introduction to AI course, with 23000 reportedly completing”. For further information look at Stanford’s Engineering Everywhere link.
4. UC Berkeley Free Courses – From General Biology to Human Emotion, Berkeley offers a variety of courses. For further information look at Berkeley Webcasts and Berkeley RSS Feeds.
5. MIT Free Courses – For further information look at MIT’s RSS MOOC feed, and MIT’s Open Courseware.
6. Duke Free Courses – Duke offers a variety of courses on iTunesU.
7. Harvard Free Courses – From Computer Science to Shakespeare, students may now get a free Harvard education. “Take a class for professional development, enrichment, and degree credit. Courses run in the fall, spring, or intensive January session. No application is required.”
8. UCLA Free Courses – For further information look at free courses such as their writing program that offers over 220 online writing courses each year.
9. Yale Free Courses – At Open Yale, the school offers “free and open access to a selection of introductory courses taught by distinguished teachers and scholars at Yale University. The aim of the project is to expand access to educational materials for all who wish to learn”.
10. Carnegie Mellon Free Courses – Carnegie Mellon boasts “No instructors, no credits, no charge”.

A number of directory websites provide lists with information and links to MOOCs provided by specialized providers and educational institutions. The most comprehensive of these are:

1. <http://www.mooc-list.com/>
2. http://www.openculture.com/free_certificate_courses
3. <http://distancelearn.about.com/od/isitforyou/tp/Top-Massively-Open-Online-Courses-Moocs.htm>
4. <http://www.moocs.co/>

Some directories provide information about the main MOOC providers. The most useful of these is <http://www.technoduet.com/a-comprehensive-list-of-mooc->

massive-open-online-courses-providers/. Some directories provide information for medical MOOCs. Of these, the following are the most useful:

1. <https://www.class-central.com/subject/health>
2. <https://www.edx.org/course-list/allschools/medicine/allcourses>
3. <https://www.coursera.org/courses?orderby=upcoming&cats=medicine>
4. <http://www.healthinformaticsforum.com/MOOC>

Although some of the courses require prior registration, and some of them are offered in real-time on specific dates, there was diversity and satisfactory flexibility allowing easy integration into a structured virtual learning environment. The following provider platforms offered the most useful courses:

Table 1	
EdX	A Not-for-profit enterprise with MIT and Harvard universities as founding partners.
Coursera	A social entrepreneurship company founded by computer science professors Andrew Ng and Daphne Koller from Stanford University.
NovoEd	Rebranded version of Stanford's Venture Lab, with a special focus on students' collaboration and real-world course projects.
Udacity	Udacity was an outgrowth of a Stanford University experiment in which Sebastian Thrun and Peter Norvig offered their 'Introduction to Artificial Intelligence' course online for free, in which over 160,000 students in more than 190 countries enrolled.
Futurelearn	The first UK-led multi-institutional platform, partnering with 17 UK universities, offering MOOC to students around the world. It is a private company owned by the Open University.
OpenUpEd	First Pan-European MOOC initiative, with the support of the European Commission. It includes partners from 11 countries.
iversity	A company with a diverse interdisciplinary team from Berlin, presently offering MOOC production fellowships and a collaboration network for academia.
Open2Study	An initiative of Open Universities Australia, which itself is a leading provider of online education through the collaboration of several Australian universities.
Canvas	An open, online course network that connects students, teachers and institutions.
10gen Education	An online learning platform run by 10gen (the MongoDB company).

Table 1 (continued)

OpenLearning	Public and private online courses from educators and individuals worldwide.
Class2Go – UWA	Offered by the University of Western Australia.
Class2Go – Stanford	Now in maintenance mode. Will be merged with edX platform.
MRUniversity	Focusing on economics courses, founded by two GMU professors.
Academic Earth	Academic Earth believes everyone deserves access to a world-class education, which is why we continue to offer a comprehensive collection of free online college courses from the world's top universities
P2PU	Peer to Peer University is a non-profit online community based learning platform, founded with funding from the Hewlett Foundation and the Shuttleworth Foundation.
Udemy	An online learning platform that allows anyone to host their video courses.
OpenHPI	The educational Internet platform of the German Hasso Plattner Institute, Potsdam, focusing on courses in Information and Communications Technology (ICT).
UoPeople	University of the People (UoPeople) is a tuition-free, non-profit, online academic institution offering undergraduate programmes in Business Administration and Computer Science.
Saylor	A non-profit organization that provides over 280 free, self-paced courses.
World Education University WEU	Provides free education through innovative technology, which enables students worldwide to improve their socio-economic condition and inspires socially responsible humanitarians.
CourseSites MOOCs	A free, hosted online course creation and facilitation service that empowers individual K-12 teachers, college and university instructors and community educators to add a web-based component to their courses, or even host an entire course on the Internet.
Open Learning Initiative – CMU	A grant-funded group at Carnegie Mellon University, offering innovative online courses to anyone who wants to learn or teach. Our aim is to create high-quality courses and contribute original research to improve learning and transform higher education.
iDESWEB	Started in February 2012, Eliademy is backed by CBTEC Ltd, a company founded by ex-Nokia veterans, who possess core expertise in Open Source Technology. Eliademy was built using Open Source Technology in cooperation with Finnish educators and learners and it is free of charge.

The following courses were found to be most relevant to medical education:

Provider	No of Courses
Edx	15 courses e.g. introduction to biomedical imaging
Coursera	65 course from global partners e.g. Instructional methods in health professions education, Introduction to clinical neurology

Source: Devised by author

THE RESULTS OF INTEGRATION:

Almost all learners using the MOOCs, which were structured within the syllabi of courses, had their engagement with the courses monitored. The diversity in their engagement was similar to their commitment in traditional courses with no e-learning components, which indicates that structuring and making the involvement mandatory improves utilization. It also improved their learning as measured by their course results as compared to their results in previous courses, and in courses running at the same time with no e-learning components. The engagement of teachers was also variable. They all had to evaluate students' assignments and therefore had to be involved. There was diversity related to joining chat rooms and fora. Some teachers were more involved than others, and more effort needs to be exerted by course designers to encourage more involvement.

DIFFICULTIES ENCOUNTERED:

1. The process of establishment of the courses was time consuming and labour-intensive, especially for course designers;
2. Some technology failures affected the flow of the courses at the beginning;
3. Some learners did not enrol in some of the MOOCs, and some of those who registered had poor commitment; this affected the flow of the remaining components that depended on enrolment;
4. Reluctance and resistance of some teachers affected the outcome of integration.

RECOMMENDATIONS AND IMPLICATIONS FOR FUTURE RESEARCH

The report is concluded with the following recommendations:

1. There are some useful MOOCs in the field of medical education;
2. MOOCs can be effectively integrated in a medical school's curriculum;

3. Using an implementation model that ensures stakeholders' engagement improves the chances of utilization and success;
4. Some difficulties are bound to be encountered due to infrastructural, logistic and sociocultural factors that need time to be overcome.

The implications of this report on future research are:

1. Further research is needed to check the extent of utility of MOOCs in medical education;
2. Some research can be directed towards checking the effectiveness of the proposed model;
3. Some research can study ways of overcoming the difficulties encountered in this study.

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BIOGRAPHY

Professor Elwardi is a Professor of Anatomy and Director of the pre-clinical phase at the Faculty of Medicine, Alimam Mohammed Bin Saud Islamic University, Saudi Arabia. He is also the Head of E-learning and Educational Technology Unit, as well as a Member of the Curriculum Development Committee and Member of the Faculty Development Unit Committee.

