Editorial – Volume 14, Issue Number 1

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You will see below that once again IRRODL authors, reviewers, and editors have produced a fine multinational set of research papers relating to important topics in open and distance learning. I also note that we have just exceeded 5,600 subscribers to IRRODL and am gratified of this support.

The ClustrMap below illustrates the geographic diversity and the quantity of readers currently accessing IRRODL.

In the 5 days from Feb 18-22, 2013, 7,458 unique visitors (or 1,492 per day) learned from the IRRODL archive of articles and reviews.

Our first article of this first issue of 2013, « Green Curriculum: Sustainable Learning in Higher Education, » focuses on ways to reduce the environmental impact of open and distance learning (ODL) institutions. This South African researcher reviews the need for ODL institutions to be active proponents and participants in green initiatives, including the most natural calling to teach students how to live within the constraints (and opportunities) of our bounded globe.

In the second paper, « A Predictive Study of Student Satisfaction in Online Education Programs, » the American authors examine the relationship between student satisfaction and a host of demographic and instructional design variables using regression analysis. As expected, the answers are complex, but I was not surprised to see the relationship between satisfaction and student-teacher and student-content interaction. Interesting, as well, in this year of the MOOC, that only the latter (student-content interaction) is scaleable.

I have long contended that too great a proportion of open and distance learning research takes place in formal education courses and especially with the tiny subset of graduate students studying education. However in the next article, « On-the-Job E-Learning: Workers' Attitudes and Perceptions, » Spanish researchers focus on the perceptions and expectations of workers and employers. As expected employers love the potential cost savings of e-learning while workers also acknowledge the advantages, but retain a fondness of face-to-face training opportunities as well.

Last month I was fortunate to be able to visit the Commonwealth of Learning and their new president Dr. Asha Kanwar. I was pleasantly surprised to see the number and variety of open educational resources as well as a host of training and research products, championing the value of OER for cost-effective educational development. This next article from India presents « An OER Architecture Framework: Need and Design. » The framework is designed to provide a conceptual organization to OER development, distribution, use, and reuse.

In this issue's next article from South Africa, « Development of ODL in a Newly Industrialized Country according to Face-to-Face Contact, ICT, and E-Readiness, » researchers investigate the attitudes of student teachers towards use of ODL in their programs. Not surprisingly, their acceptance is associated with their personal e-readiness, which to me underlines the necessity for both students and teachers actively developing their net presence and net efficacy.

Distance students have traditionally been older students who are more concerned with jobs and families than traditional campus students. Thus, this study from Portugal, «Employability in Online Higher Education: A Case Study, » very usefully researches both students and teachers ideas about the need for employability skills and attitudes to infuse online university programming. As expected both groups have many similar views, but a few interesting differences are also revealed.

Since we know that education and learning are culturally bound activities, it is rare to find an OER that perfectly matches the unique needs of any particular student group. Fortunately, good OER can be remixed so as to customize the learning activities and outcomes. In this article « Identifying Barriers to the Remix of Translated Open Educational Resources, » a Brazilian researcher seeks to understand the barriers that inhibit or prohibit effective mixing of OER.

Researchers sometimes wonder if anyone ever reads the work they publish in journals (well, excepting articles in IRRODL, which of course are hot topics in online and campus coffee rooms around the world!). In « Uses of Published Research: An Exploratory Case Study, » a Canadian researcher examines the impact of 10 articles that he has published over the past decade. He concludes with advice for authors to insure their work is not ignored.

Many of the 'pioneer' open learning institutions founded in the last half of the 20th century emerged within a technology and an industrial culture of print production of learning content. As both technology and the industrial culture have changed, many of these institutions are struggling to reinvent themselves for an online era. In « A Framework for Developing Competencies in Open and Distance E-Learning, » a researcher from the Philippines investigates how the distance education workplace has changed and the challenges and opportunities associated with these changes.

I had the pleasure of visiting Sweden last year and observing the peer–review system described in « Peer Portal: Quality Enhancement in Thesis Writing Using Self-Managed Peer Review on a Mass Scale » in action. I must say I was impressed. The supervision of thesis students has always been a challenge to distance educators in large part because we have not yet been able to scale the support and delivery of thesis supervision, thus increasing cost and/or constraining opportunities. In a classic substitution, student-student interaction is, to some degree, substituted for student-teacher interaction and the whole process made persistent and transparent through a unique data base system.

I am pleased to see that our next article focuses on the diverse forms of open and distance learning that are emerging beyond the group, namely in networks and collectives. In « Learning in Multiple Communities from the Perspective of Knowledge Capital, » Turkish authors overview the opportunities provided by emergent social structures that have potential to move beyond course- and group-based learning and to bridge to lifelong learning of teachers and students.

Progressing even further beyond the classroom door (online or physical) we see how « A Multimedia Approach to ODL for Agricultural Training in Cambodia » affects the real lives of rural farmers. As expected comparison between face-to-face and online instruction showed little difference in outcomes, but savings in time and cost and increased flexibility, as always, provided advantages for students and teachers using ODL methods.

The allure of artificial intelligence and its promise of being able to automatically assess and personalize learning has long fascinated many of us. In this more technical article titled « Automatic Evaluation for E-Learning Using Latent Semantic Analysis: A Use Case, » Spanish authors overview latent semantic technology developments and an application used for assessing students at a distance.

Finally, in the Field Notes section, American authors document one of the most far-reaching innovations in Western secondary education, that of an open school that uses 100% open content. In « "Opening" a New Kind of School: The Story of the Open High School of Utah, » the authors recount the successes and the challenges of bringing quite radical reforms even to the current (and very youthful) first generation of online high schools.

As always, we end this editorial with a sincere thanks to all who make IRRODL happen : First to our sponsor Athabasca University, second to our authors and reviewers, and finally to our 5,600 (and counting!) subscribers.

We have updated our list of reviewers' names on the IRRODL Web site from 2012. You too may see your name in print by volunteering to review IRRODL articles. The volume of submissions continues to increase at IRRODL, and I try to assign only one review a year, so we need more reviewers. You may volunteer by logging into the IRRODL system and checking the reviewer checkbox in your profile. But please also add a few areas of interest and expertise to the "Reviewing Interests" box, so that I can match your interests with the work of potential IRRODL authors.

Best of the year 2013, the year of the Snake, Islamic year 1434, Ugadi, and the many other celebrations of this time of year to all IRRODL readers!

Athabasca University

Green Curriculum : Sustainable Learning at a Higher Education Institution

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Abstract

The United Nations (UN) constituted 2005–2014 as the decade for educational sustainable development when bridges have to be built between academic institutions and their communities. In this article I will therefore do a literature search from 2005–2011 on what it means to be a sustainable university with a sustainable curriculum by looking at case studies from other higher education institutions in order to begin to give guidelines for such an endeavour in an open and distance learning (ODL) institution. Thereafter I will focus on recommendations on how to transform present study material into a green curriculum by using a qualification in Human Settlements as a case study.

Keywords: Human settlements; sustainability; transformation; green curriculum; resilience; ecological footprint

Introduction

The current global energy and environmental crisis, the possible impact it might make on future generations, the fact that energy demand is increasing, and oil prices that have risen steadily have brought the demand for more efficient buildings, homes, cars, and consumer products to the fore. Coburn, a partner at Price Waterhouse Coopers, states: "the growing demand for environmental products and services could translate into one of the biggest new markets in recent memory" (Coburn, 2008, p. 1).

The United Nations (UN) has also constituted 2005−2014 as the decade for educational sustainable development. This decade speaks to the bridges that must be built between academia and the needs of the community as well as the need to enact sustainability in higher education in order to positively affect the larger society and biosphere (UNESCO, 2006).

UNESCO (2006) has identified four main goals in order to achieve this, of which the second speaks directly to education:

> Rethinking and revising education from nursery school to university to include a clear focus of current and future societies on the development of knowledge, skills, perspectives and values related to sustainability. This means reviews of exiting curricula in terms of its objectives and content to develop transdiciplinary understandings of social, economic and environmental sustainability and recommended and mandated approaches to teaching, learning and assessment. (p. 56)

Higher education has a critical role to play in producing sustainable students by helping them to understand "the complex connections and interdependencies between the environment, energy sources, and the economy" (Elder, 2009). Elder further states:

> The education required to accomplish this is a new way of thinking and learning about integrated, systemic solutions not just to the economic and environmental challenges but also the interdependent health, social and political challenges. Above all, this new way of thinking uses the green economy as the focal point for understanding the deep connections between economics, energy, the environment and social well-being, often referred to as *sustainability*. (p. 108)

Universities, according to Togo (2009, p. 22), are considered to have three missions, namely teaching, research, and community services. He is of the opinion that they still serve this role in modern society but where traditionally universities were predominantly for the elite they can now be valuable if they are also involved in

community service. Universities are therefore tasked to critically engage with values in order to produce students who can play a role in seeking solutions to societal problems.

Togo (2009, pp. 61-63) has studied universities worldwide on the issue of sustainability in education and the lessons he learnt are (summarised) as the following:

- The impact of the environment should be the primary concern in all university decision making processes and students should be part of this;

- An environmental management system provides important opportunities for lecturers and students to engage with issues on sustainability;

- A university that follows an environmentally friendly path enhances its public image, attracts and retains committed staff, and reduces consumption and therefore saves money; and

- Including environmental issues in existing qualifications as well as having distinct qualifications in which the content is uniquely environmental and sustainable is a better approach as lecturers will not feel as if they are working beyond the parameters of their disciplines.

I agree with Togo (2009, p. 32) when he says it is important for higher education to redefine sustainability locally "...because sustainable development problems crucial to developing countries are different from those of developed nations." In this article I will use the terminology *green curriculum* and *sustainability* interchangeably as the word 'green' is used as 'go green' and the word 'sustainability' to capture the connections and integration of an interdisciplinary curriculum. Furthermore I will do a literature search from 2005–2011 on what it means to be a sustainable university with a sustainable curriculum by looking at case studies from other higher education institutions in order to begin to give guidelines for such an endeavour in an ODL institution. Thereafter I will focus on recommendations on how to transform present study material into a green curriculum by using a programme in Human Settlements as a case study.

Sustainable Learning at a Higher Education Institution

The present United States president, Barack Obam, said at the United Nations summit (Kanter, 2010) that it is imperative that we act now to create a sustainable future: "Our generation's response to [the challenge of climate change] will be judged by history, for if we fail to meet it – boldly, swiftly, and together – we risk consigning future generations to an irreversible catastrophe."

Higher education in America, according to Elder (2009, p. 108), is beginning to do its part; to date, 650 colleges and universities have signed a Climate Commitment and they are working towards development plans to make their campuses climate-neutral. For

example, largely as a demand from students, the higher education sector is now the largest purchaser of wind energy in the United States. Many other education institutions in America have made sustainability one of their guiding principles and top priorities, yet similar changes to the curriculum (according to Elder, 2009) are lagging behind.

The emerging local academic field that is focussing on sustainability should address complex problems which will lead to important future implications. Brundiers, Wiek, and Redman (2010, p. 309) state: "These kinds of problems, which most often manifest as a conglomerate of problems, call for sophisticated solutions and extensive problem-solving processes...by using systems-thinking, anticipatory, normative and strategy-building methods..." They go further by giving the following guidelines to identify real-world learning opportunities (2009, p. 312):

> Address the actual sustainability challenges in your own community; provide students with the opportunity to apply the methods and concepts they learned in their studies; give academic supervision with the collaboration of the local community and business to develop a robust solution to the problem; and strive to produce workable contributions to solutions in order for the students to understand the impact this will have on the world.

Wals (2010, p. 380) agrees with this as he says: "Universities in particular have a responsibility in creating space for alternative thinking and emergence of new ideas, as well as in critically exploring old ones." He is of the opinion that it is the task of higher education to appreciate and utilize differences amongst students because social interaction allows them to relate their ideas to others which may lead them to rethink their ideas with alternative and contesting viewpoints. Wals (2010, p. 387) says: "At the same time (learning) experiences which are shared with others, are likely to gain importance....giving the learner a sense of competence and belonging to the community of learners."

Wals (2010, p. 387) further argues that another component of sustainability is to cope with uncertainty: "...educational spaces should build a culture of learning awash with uncertainty and in which uncertainty provokes transformative yet precautionary commitment rather than paralysis." Togo (2009, p. 34) agrees with this as he is of the opinion that the concept of resilience is increasingly being used in sustainable development. I agree with both the previous researchers. As discovered from personal experience in an ODL environment, a resilient problem-solving student can become an employable graduate who is also an asset to his or her community.

Aina (2009, p. 23) summarises the above opinions when he says, "Higher education contributes to the formation and development of human capital, the cultural and social construction of values and meaning, and the capacity for individual and collective emancipation from ignorance to domination." However we might wonder how far are

we locally with this endeavour? The demand for sustainability here in South Africa has created the development of new careers in the green industry, such as solar panel installers and wind turbine technicians, and the "greening" of all other employment from construction to business management, but how far are we locally in designing our curricula to create the sustainable future of which President Obama speaks?

Coburn (2008, p. 2) states that Siemens has accepted the challenge when they declare: "Our mission is to help our customers manage their buildings' energy costs, improve reliability, and enhance performance while having a positive impact on the environment."

Locally, Rhodes University has a drawn up a Community Engagement Policy with the following objectives:

> promotion of community service in relation to working with the community towards a better future; generating graduates who have a sense of civic responsibility; and promoting learning which benefits the community as well as provides students with the opportunity to apply theory to local, regional and national development issues. (Rhodes University, 2005)

This university therefore has a range of environmental and sustainability programmes which are offered by the science and education departments.

An ODL institution does not have a residential campus as the students reside at a distance. They therefore belong to various communities and it might be necessary to set special guidelines for sustainable learning in such an institution.

Preliminary Guidelines for Sustainable Learning in an ODL Institution

The University of South Africa (Unisa), one of the largest open and distance learning institutions, makes the following pledge in their charter on transformation: "Institutional change entails the reconfiguration of systems, processes, structures, procedures and capabilities to be expressive of transformational intent." They go further by saying that they must find innovative ways of enriching the student experience by incorporating alternative knowledge canons (Unisa, 2011).

Wals (2010, p. 380), states that "in a post-modern world the search for sustainability is marinated in uncertainty and poorly defined situations with diverging norms, values, interests and reality construction."

Cummings (2010, pp. 38-40) tries to set institutional criteria for high-performance in sustainability by suggesting the following four steps: infusion of green concepts in the curriculum; focus on workforce development and 'green jobs'; research and development related to renewable energies; and promotion of environmental principles in the operations and facility management of the institutions.

Cummings goes further by placing integrity at the centre of institutional initiatives in sustainability (2010, p. 60), which might be the exact same thing Unisa wishes to accomplish by having all staff and students sign their charter on transformation. Cummings (2010, p. 133) found in his study of sustainability at different intuitions that the following might contribute to achieving the above outcomes:

> strong commitment by top leaders; leveraging administrative and human resource powers; celebrating milestones and acknowledging success; building and supporting faculty and student interests; building philanthropic support; and integrating sustainability into the curriculum.

Hope and Cook (2009) agree with Cummings and add that that a collegial culture is important and the traditional divisions between academic disciplines should be broken down. Brundiers, Wiek, and Redman (2010, p. 310) summarised the literature by giving three key sustainability competencies:

> the **strategic** knowledge cluster, clusters past developments, creates future scenarios and sustainable visions which deals with the competency of diverse opinions; the **practical** knowledge cluster deals with the competency of linking knowledge with action; and the **collaborative** cluster which involves the competency to work in teams.

Hopkinson and James (2009, p. 368) asked a group of 30 United Kingdom experts about the challenges they had in implementing their framework on sustainability. The results are summarised as follows:

> Social aspects were seen as the main challenge; the most important responsibility was raising awareness; the most prominent task was modelling and evaluating performance; the highly regarded skill was in dealing with complexity; the best educational approach was case studies and role play; and the best measure of effectiveness was evidence of a wider perspective.

Unisa's position on sustainability is that the targets of sustainable development should be met (United Global Compact, 2011, p. 7).

> It is therefore essential that Unisa responds to these issues through its core functions. Unisa has consciously elected to infuse sustainability into its business model. This includes teaching and learning, research, postgraduate education and community engagement. While teaching and scholarship must begin to reflect on sustainability related issues, students must be taught to learn to think in a more integrated manner.

Although all of the above opinions are not specifically for an ODL institution, it can shine some light on how one should go about in creating sustainable learning at such an institution. This needs to be researched further before a green curriculum can be designed.

Sustainability at an African ODL Institution

The scale of the student numbers in an ODL institution (e.g., Unisa) means that ODL students are a crucial target for 'greening' sustainable initiatives, not only in their homes but also in their communities. Hopkinson and James (2010, p. 366) state:

> This aims to increase student awareness about linkages between their subject and sustainable development; the potential impact and contribution their activities can make to this achievement; and the development of competencies that they can carry forward in their careers where they have the potential to make significant differences to people and the planet.

The question remains, how do we direct African universities away from European society with its unique sustainability challenges and root them in local social structures, which have their own unique challenges? Unisa's enrolment figures for 2010 show that the 293,437 registered students are dispersed across 28 countries. African students are dispersed across the African continent, mainly within the Southern African Development Community (SADC) region.

The United Nations (UNEP, 2008) is of the opinion that the African ecosystem and socioeconomic system are highly vulnerable to the impacts of climate change. The livelihoods of people are therefore threatened by typical challenges known to the African environment. This, according to Togo (2009, p. 37), includes climate change, deforestation, over-exploitation of resources, deterioration of marine and coastal ecosystems, and water quality issues as well as problems with poverty, food insecurity,

war, HIV/AIDS, environmentally related diseases, drought, water supply, and sanitation problems. Togo further states (2009, p. 37-39) that these sustainable challenges are compounded by a low capacity for responding to environmental challenges due to a lack of economic development, poverty, disease, and high population density. Countries in Africa do not meet the human development threshold of 0.8 and most have ecological footprints lower than 1.8. Notable is the fact that the 19 countries with the lowest human development index are in sub-Saharan Africa.

The Department of Environmental Affairs and Tourism (Togo, 2009, p. 39) released a discussion document for sustainable development in South Africa, which tried to address sustainability challenges in general, but according to Togo it was more orientated towards socioeconomic inequities and it 'glossed over' environmental issues. The second draft of the document, according to Togo, however outlined the sustainable challenges we have in South Africa; they are

> a high and increasing ecological footprint; increasing pollution; unsustainable exploitations of natural resources; declining water quality; land degradation; unmet basic needs; unemployment; inequality; and increasing levels of poverty which reinforce direct dependency on natural resources and make the poor more vulnerable to water and air pollution.

The above document should therefore be the resource for an ODL curriculum by engaging students from Africa in ways that inspire them to not only become leaders in general, but also to exhibit excellence in learning pathways when dealing with the challenges that confront their own survival on this continent. Sustainability initiatives from the institution's side should therefore provide students with the knowledge, attitudes, and skills to become better citizens in their own communities.

Preliminary Guidelines for a Sustainable Curriculum

The Ubuntu Declaration (UNEP, 2006), an initiative from education and scientific organisations all over the world, raised the following areas where universities have a role to play:

> review programmes and curricula in order to address the challenges of sustainable development; strengthen the role of teachers and attract young people to the profession; develop mechanisms to keep teachers informed; and promote knowledge transfers in innovative ways in order to bridge the gaps and inequalities of present knowledge. (p. 67)

In Europe (Togo, 2009, p. 64) and in the United States (as previously mentioned) various courses of action have been taken towards curricular greening, and the following topics were proposed for sustainable development: atmosphere and climate; transport systems and fuel sustainability; agriculture, conventional and organic farming; ecological economics; tourism and sustainability; and urban physical environments.

In South Africa we also have to take notice of two international trends before embarking on the curriculation of local qualifications, namely

- the triple bottom line trend, that is people, planet and profit , must be taken into consideration (Goethe institute, 2008); and

- the societal shift from focussing on learning rather than teaching (Wals 2010).

A local institution's position on a sustainable curriculum should be to model sustainable practises: "It is therefore important that academics and institutions keep experimenting with, and sharing their efforts to embody sustainability, especially in making it a focus of their disciplines and professions in the process of curriculum design, development and research" (United Global Compact, 2011, p. 7).

Human Settlements as a Case Study

Human Settlements as a new qualification came about because according to research from Professor Kobus van Wyk from the Nelson Mandela Metropolitan University the affordable housing project of the government did not make the necessary impact and therefore a 'green-collar' position of manager in human settlements arose (Van Wyk, 2009, p. 1). The University of South Africa (Unisa), because it is an ODL institution which can reach many students and communities in Africa, was approached by government to consider this new qualification in order to bridge this gap.

The problem space was first defined as a tremendous shortage of individuals with the right skills; specifically, they have to know how an affordable house can be built and how to interact with the powers that be in making such a project sustainable in terms of the planet, people, and profit. The students will not only have to learn how to manage a process, but should also have sufficient knowledge in order to negotiate with building contractors, municipalities, lawyers, and workers. This curriculum therefore will be transdiciplinary in nature, including collaborative group work, community services, experiential education, ecological footprinting, reflective practise, and participatory decision-making.

It was necessary to once again consult the literature on what is done globally with this problem space. Hopkins and James (2010, pp. 74-82) had a similar case study and had the following recommendations:

1. Use head, hands and heart as a holistically organising principle by integrating learning processes rooted in the students' heads, hands and hearts. Heads: knowledge. Hands: physical labour such as building and painting. Hearts: values, behaviour, learning communities with individual and group responsibilities.

2. Relate pedagogies: Study different epistemologies and implement them in order to enable transdiciplinary and experiential placed-based learning.

3. Map the pedagogical landscape in order to ensure transformational learning happens.

4. Analyse the sustainability of the qualification to see if it meets the learning outcomes.

Bacon et al. (2010, p. 194) agree with this and are of the opinion that a holistic framework will encourage students to look for solutions in the social, cultural, ecological, and political spheres of life; however, they are of the opinion that it requires careful examination of social and environmental needs in contrast to narrowly defined solutions. Some problems might require innovation in engineering while others suggest social innovation and/or changes in daily routines. They are adamant that interdisciplinary learning is very challenging, and problem-based learning with an all-inclusive project overview might be the answer to these problems.

Brundiers, Wiek, and Redman (2010, pp. 319-320) state that real-world learning opportunities can align well with key competencies in sustainability, but they warn such opportunities need to incorporate three principles to be effective: collaborative design; coordination, where the opportunities build on one another; and integration of general introductory modules because students are usually unfamiliar with real-world learning, so they need to be introduced to those models, methods, and tools.

In a project like Human Settlements, lecturers tend to fall back on the knowledge and the content they already have to design a new curriculum for a new qualification, but because of the interdisciplinary nature of this qualification this could not happen and the literature and the problem space once again had to be considered first.

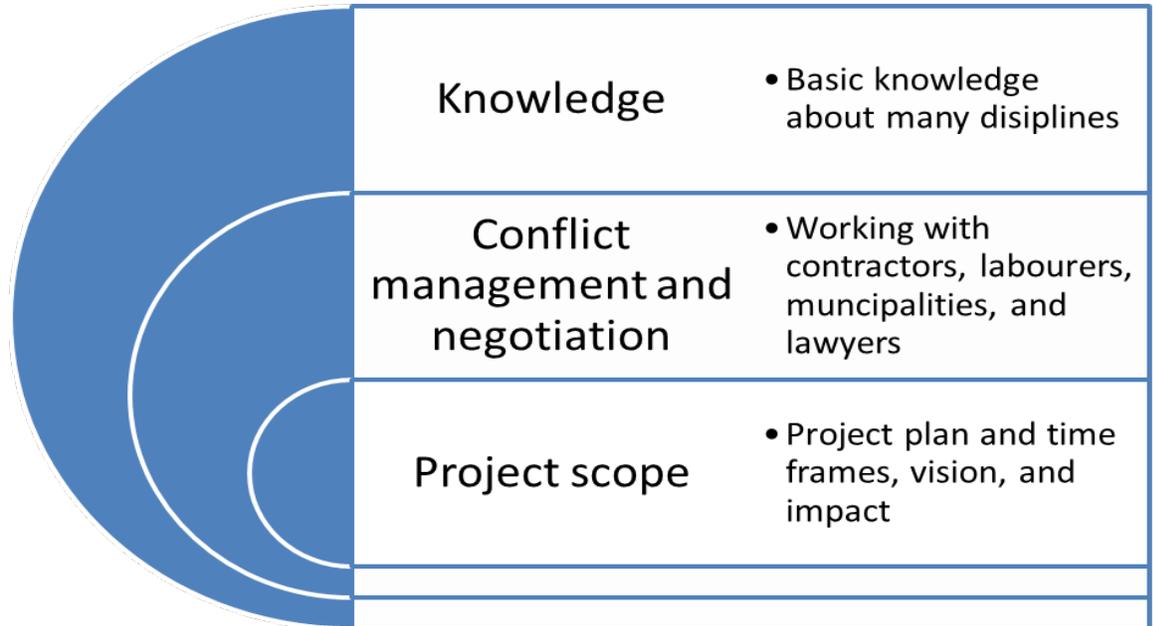# Implementation of a Sustainable Human Settlements Qualification

Figure 1. Suggested curriculum for a human settlements qualification.

A human settlements manager must be a "Jack of all trades," who has enough knowledge, the appropriate skills, the vision, and the quality assurance for the project to be successful; therefore, the following curriculum was suggested for this qualification in order to ensure that sustainable learning would take place.

Knowledge: basic knowledge of many disciplines such as basic building construction; water conservation and recycling; energy conservation; solid waste; biodiversity; demographic issues such as land acquisition and management; finance, cost and purchasing of cost-effective materials; designing business plans; environmental education; history of settlements; geographical issues; social issues such as crime, poverty, HIV/AIDS, joblessness; contracts with municipalities and legal matters that need to be considered with such contracts.

Conflict management and negotiation: people skills, a vision for the project, and above all conflict management and problem-solving skills.

Project scope: project plans, scope, and time frames as well as quality assurance, evaluating afterwards if the job was well done.

All of the above was considered as important for this curriculum, but according to the literature (discussed earlier) one should always keep the planet, people, and profit in mind. The focus should be on the learning aspect and according to the literature this can only be sustainable if each of the three fields of study is taught through real-world problems and through problem-based learning experiences.

An example of a real-world problem, as a problem-based learning experience, would be for the students to go to their own communities or nearby low-income settlements and consult with the people living there about the challenges they endure every day. A list of these problems should then become the project scope and plan. Research should be done with business partners and institutions such as the Council for Scientific and Industrial research (CSIR). Possible solutions should then be sought in consultation with these stakeholders. The budget and the consultations should be documented at all times, from the start through the project to the final assessment of achievement.

The curriculum designer of this qualification took all of the above guidelines into consideration and settled on the following purpose statement:

> The purpose of this qualification is an academic orientated formative and transdiciplinary qualification which equips graduates with the knowledge base, theory and methodologies of Public Administration, Human Settlements Management and various functional areas. The degree will enable students to demonstrate initiative and responsibility in an academic and professional context and will equip them with critical thinking and problem solving competencies in the public and in private sectors as well as non-governmental organisations, in the field of human settlements management. With these skills and competencies, graduates will be able to understand, manage and administer human settlements projects and activities to successful completion. (Unisa Academic Management System)

Only time will tell if a comprehensive university such as Unisa will succeed in reaching the above goals and will be able to name this as a sustainable qualification where sustainable learning has taken place.

Conclusion

The above case study shows that universities should rethink their way of designing curricula, not look at content first, and not view existing study material as sufficient to cut and paste into a curriculum of the 21st century. Wals (2010, pp. 387-388) states:

"Our search for a more sustainable world requires cutting edge new thinking that can break the cycle of unsustainable knowledge creation and transfer unsustainable technological development and unsustainable consumption patterns tied to unsustainable economic principles." Wals further advises universities to break this pattern by questioning and reforming deeply entrenched routines, structures, and practises by taking advantage of the privileged position they have in society to transform social learning in order to cultivate a learning environment that mirrors real-world problems and becomes 'learning for being' or learning for future living.

Togo (2009, p. 131) agrees with Wals on real-world problems as case studies, but warns that the following challenges should be taken into consideration before embarking on such a path: not improving practice; not making available the data of success stories; not including information in the theoretical approach; and being grounded in a single institution.

He advises (drawing from Yin, 2003) that the following is important: a theoretical basis where research questions are described; triangulation is ensured by using multiple sources of evidence; a chain of evidence with traceable reasons and arguments are fully documented; and a comprehensive report is compiled in the end.

The theme of this new qualification in Humans Settlements is one of public outreach where the students' own communities become the problem space. An ODL institution should consequently go beyond a curriculum that fits all by allowing individuals to solve their own problems in their own communities through radical problem-solving initiatives and transformative ideas that are imaginative and holistic in nature, to not only be profitable, but also to save the people and the planet.

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A Predictive Study of Student Satisfaction in Online Education Programs

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Abstract

This paper is intended to investigate the degree to which interaction and other predictors contribute to student satisfaction in online learning settings. This was a preliminary study towards a dissertation work which involved the establishment of interaction and satisfaction scales through a content validity survey. Regression analysis was performed to determine the contribution of predictor variables to student satisfaction. The effects of student background variables on predictors were explored. The results showed that learner-instructor interaction, learner-content interaction, and Internet self-efficacy were good predictors of student satisfaction while interactions among students and self-regulated learning did not contribute to student satisfaction. Learner-content interaction explained the largest unique variance in student satisfaction. Additionally, gender, class level, and time spent online per week seemed to have influence on learner-learner interaction, Internet self-efficacy, and self-regulation.

Keywords: Interaction; satisfaction; self-regulation; Internet-self efficacy; online learning; regression

Introduction

Academic leaders in the United States indicated that online learning is critical to the long-term growth of their institutions, reporting that the increase in demand for online courses or programs is greater than that for face-to-face courses. Nearly one third of higher education students enrolled in at least one online course (Allen & Seaman, 2008; Allen & Seaman, 2010). According to previous studies, online learning does not differ considerably from traditional face-to-face classroom learning in terms of learning outcomes (Allen & Seaman, 2010; Allen, Bourhis, Burrell & Mabry, 2002; Biner, Bink, Huffman & Dean, 1997; Brown & Liedholm, 2002; Johnson, 2000). Student satisfaction in online learning remains undiminished when compared to face-to-face instruction (Allen & Seaman, 2010).

Student satisfaction is an important indicator of the quality of learning experiences (Moore & Kearsley, 1996; Yukselturk & Yildirim, 2008). It is worthwhile to investigate student satisfaction in online settings because new technologies have altered the way that students interact with instructors and classmates (Kaminski, Switzer, & Gloeckner, 2009). The quality of interaction in online settings may depend to a large extent on the technology tools utilized during learning (Parsad & Lewis, 2008). Lack of confidence in using information and communication technology (ICT) may decrease students' satisfaction during online instruction and in turn lower their performance. As opposed to face-to-face instruction, the nature of online learning demands greater responsibility on the part of learners (Moore & Kearsley, 1996). Online learners who are unable to regulate learning efficiently are unlikely to be satisfied (Artino, 2007; Puzziferro, 2008) This study investigated factors (i.e., Interaction, Internet self-efficacy, self-regulation) associated with student satisfaction in fully online learning settings.

Literature Review

Student Satisfaction

Evaluation is important in distance education and it consists of different dimensions in alignment with the goals of a course or program (Olmstead, 2007). Course grades are often used as an indicator of student achievement in online instruction (Barnard, Paton, & Lan, 2008; Reinhart & Schneider, 2001; Noel-Levitz, 2011). But affective factors can be as important as cognitive factors in explaining and predicting student learning in online settings (Biner et al., 1997). Among the attitudinal constructs, student satisfaction, referring to student perceptions of learning experiences and perceived value of a course, may be particularly worthy of investigation. Student satisfaction is related to several outcome variables such as persistence (Allen & Seaman, 2008), retention (Debourgh, 1999; Koseke, & Koseke, 1991), course quality (Moore & Kearsley, 1996), and student success (Keller, 1983; Pike, 1993; Noel-Levitz, 2011). High

satisfaction leads to lower attrition rates, higher persistence in learning, and higher motivation in pursuing additional online courses (Allen & Seaman, 2008; Biner, Welsh, Barone, Summers, & Dean, 1997; Keller, 1987; Koseke, & Koseke, 1991). Higher education institutions consider student satisfaction as one of the major elements in determining the quality of online programs in today's markets (Yukselturk & Yildirim, 2008). Online learner perspectives provide valuable information on the areas that matter to students and help institutions gain a better understanding of their strengths and challenges in provision of online programs (Noel-Levitz, 2011). With data on student satisfaction, course designers, educators, and administrators can identify areas where improvement is needed (Reinhart & Schneider, 2001).

Predictors of Student Satisfaction

Previous studies have determined factors that influence student satisfaction in distance learning environments (Artino, 2007; Bolliger & Martindale, 2004; Reinhart & Schneider, 2001; Sahin, 2007). The framework of this study was proposed based on the interaction model developed by Moore (1989) with the addition of potential variables including Internet self-efficacy and self-regulated learning.

Interaction.

Interaction has been deemed one of the most important components in distance education due to the isolation of instructors and learners (Moore & Kearsley, 1996). Moore (1989) proposed an interaction framework including learner-learner interaction, learner-instructor interaction, and learner-content interaction.

Learner-learner interaction refers to two-way reciprocal communication between or among learners who exchange information, knowledge, thoughts, or ideas regarding course content, with or without the presence of an instructor (Moore & Kearsley, 1996). Learner-instructor interaction consists of two-way communication between the instructor of a course and learners. Learner-content interaction is a process of individual learners elaborating and reflecting on the subject matter or the course content. In contrast with learner-instructor and learner-learner interaction, only one person – the learner – is directly involved in learner-content interaction (Moore & Kearsley, 1996).

Other authors have used Moore's interaction model as a basis for new interaction models. Hillman, Willis, and Gunawardena (1994) proposed learner-interface interaction to recognize the importance of technology interfaces in interaction with content, instructors, or learners. Anderson and Garrison (1995) expanded Moore's interaction model by adding three new types of interaction: instructor-instructor, instructor-content, and content-content interaction.

Previous research has indicated the positive influence of interaction on student satisfaction in distance education (Bray et al., 2008; Burnett, 2001; Moore & Kearsley,

1996; Northrup, Lee & Burgess, 2002; Thurmond & Wambach, 2004). Of the three types of interaction, learner-learner interaction and learner-instructor interaction were investigated more often than learner-content interaction. Learner-learner interaction and learner-instructor interaction seem to be more related to and predictive of student satisfaction than learner-content interaction in most studies of online learning (Bolliger & Martindale, 2004; Jung, Choi, Lim & Leem, 2002; Rodriguez Robles, 2006; Thurmond, 2003). Battalio (2007) concluded that learner-instructor interaction was the most required interaction in his summary from several online studies. However, the findings are inconclusive. Some studies indicated that the amount of interaction that learners have with the content is most important to student satisfaction in web-based learning, in comparison with learner-learner interaction and learner-instructor interaction (Chejlyk, 2006; Keeler, 2006).

Internet self-efficacy.

Expanded from the self-efficacy theory in psychology (Bandura, 1977), researchers in education have indicated that efficacy beliefs positively influence achievement and persistence related to specific instructional tasks (Hodges, 2008; Pintrich & De Groot, 1990). Internet self-efficacy refers to the belief in one's capability to organize and execute Internet-related actions required to accomplish assigned tasks (Eastin & LaRose, 2000). There are two reasons to include Internet self-efficacy as a predictor of online student satisfaction. First, online learning relies on Internet delivery through which various types of activities take place such as group discussions, collaborative projects, communication with instructor or classmates, and so on (Roach & Lemasters, 2006). Technical problems while using the Internet may cause student frustration and dissatisfaction (Choy, McNickle, & Clayton, 2002). It seems important for online learners to possess high Internet self-efficacy to complete required tasks for an online course delivered through the Internet.

Secondly, Internet self-efficacy, as one of the three self-efficacy constructs in web-based instruction, is less addressed than academic self-efficacy or computer self-efficacy. The impact of Internet self-efficacy on student satisfaction is scarce and inconclusive. For example, Eastin and LaRose (2000) indicated that Internet self-efficacy is positively correlated with expected outcomes including entertainment, social, and informational outcomes. Chu and Chu (2010) found a positive correlation between Internet self-efficacy and satisfaction in their study where adults aged 45 to 87 enrolled in courses on computers. Rodriguez Robles (2006) found Internet self-efficacy is not a significant predictor of student satisfaction in a study involving undergraduates and graduates who attended a web-based distance education course from a university in the United States.

Self-regulated learning.

Self-regulation, originally from psychology, was first defined by Bandura (1988). The central ideas underlying self-regulation are motivation and learning strategies that students utilize to achieve their learning goals. The scope of self-regulation has been expanded to studies in education areas (Pintrich, Smith, Garcia, & McKeachie, 1993). Self-regulated learning refers to the degree to which students metacognitively, motivationally, and behaviorally participate in their own learning (Zimmerman, 1989). Metacognitive processes involve learners' ability to plan, schedule, and evaluate their learning progress. Motivational processes indicate that learners are self-motivated and willing to take responsibility for their successes or failures. Behavior refers to the characteristics of the strategies that students utilize to optimize learning (Zimmerman & Martinez-Pons, 1986, 1988).

The importance of self-regulation in student performance is evident in traditional face-to-face learning settings (Pintrich & De Groot, 1990; Zimmerman & Schunk, 1989). Unlike traditional classroom instruction, online learning is student-centered and much self-directed effort is required for success (Artino, 2007). Although most of the studies have indicated that the ability to self-monitor and self-evaluate at different learning stages is positively related to student performance or achievement, there is very limited research pertaining to the association between self-regulation and student satisfaction. For example, Artino (2007) found motivational components of self-regulation are positively related to student satisfaction from a sample of participants attending military online training in the U.S. Navy. Puzziferro (2008) studied students who took online courses from a liberal arts community college and indicated that meta-cognitive self-regulation is positively correlated with student satisfaction at a significant level.

This study focuses on metacognitive self-regulation because metacognitive processes are considered to be the most critical in self-regulation (Brockett & Hiemstra, 1991; Corno, 1986; Corno & Mandinach, 1983; Lee, Kim, & Grabowski, 2010).

Purpose and Research Questions

Based upon the literature review, interaction is critical in distance education; however, the literature is inconclusive regarding which type of interaction is most important in predicting student satisfaction in online settings (Bray, Aoki, & Dlugosh, 2008; Chejlyk, 2006; Keeler, 2006; Rodriguez Robles, 2006). In light of the characteristics of online learning, we assumed that Internet self-efficacy and self-regulation are important in online learning and included them as predictors. Moreover, the scarcity of research leads to ambiguity pertaining to the effect of self-efficacy and self-regulation on student satisfaction (Artino, 2007; Chu & Chu, 2010; Puzziferro, 2008; Rodriguez Robles, 2006). Hence, the purpose of this study was to investigate the extent to which the potential variables – interaction, Internet self-efficacy, and self-regulation – predict

student satisfaction in online learning. The influence of student background variables on predictor variables was explored. In addition, this study examined the unique contribution of key predictor variables in explaining the variation of student satisfaction scores.

1. Are the three types of interaction, Internet self-efficacy, and self-regulated learning correlated with student satisfaction?

2. Are the three types of interaction, Internet self-efficacy, and self-regulated learning significant predictors of satisfaction?

3. What are the effects of student background variables (age, gender, marital status, class level, and time spent online per week) on the three types of interaction, Internet self-efficacy, and self-regulated learning?

Method

Sample

The sample of this study consisted of undergraduate and graduate students enrolled in summer-session online courses from the College of Education at a western university. The summer-session courses were 12 weeks long. With the permission of and assistance from the instructors who agreed to have their students participate in the study, an online survey link was distributed to 11 online courses (e.g., Adolescence, Cognitive Psychology, Stress Management, Internet Development) from the disciplines of psychology, special education, instructional technology, and physical education. Of the 291 enrolled students from 11 online courses, 111 completed the online survey, a return rate of 38%. The number of respondents in this study fulfilled the requirements of a multiple regression model with 5 independent variables in which at least 75 participants are needed to make confident assumptions about any observed relationships (Stevens, 2002).

There were more female respondents (77%) than males (23%). Most respondents were married (64.9 %). Table 1 shows that most respondents were between the ages of 26 and 35 years old. There were only a few students over 46 years old. More than half of the respondents took undergraduate-level courses. Most respondents spent less than 15 hours per week on the online course.

Table 1

Student Background Information

	Frequency	Percent
Gender		
Male	25	23%
Female	83	77%
Marital status		
Married	69	64%
Single	39	36%
Age		
18-25	37	34%
26-35	54	50%
36-45	13	12%
46-55	4	4%
Above 56	0	0%
Course level		
Undergraduate level	66	61%
Undergraduate/graduate level	18	17%
Graduate level	24	22%
Hours spent online per week		
Less than 5 hours	29	27%
6-10 hours	41	38%
11-15 hours	22	21%
16-20 hours	8	7%
Above 20 hours	8	7%

Instrumentation

The survey included questions on demographics, five predictor variables, and student satisfaction. Demographic questions covered gender, age, marital status, course level, and the hours spent online per week. This study adopted Internet self-efficacy and self-regulation instruments created by prior researchers (see below). Instrument development was involved for interaction and student satisfaction scales.

The Internet self-efficacy scale was developed by Eastin and LaRose (2000) to measure one's confidence in the ability to be successful in performing certain tasks using Internet-based technology. This measurement is a 7-point Likert scale with 8 items that ranged from 1 (*very unlikely*) to 7 (*very likely*). This scale was found to be reliable and internally consistent with a Cronbach's coefficient alpha value at .93, based on a population of 171 undergraduate students at a university.

The self-regulated learning scale was adopted from the metacognitive self-regulation subscale in the Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich et al. (1993). The scale is a 7-point Likert scale with 12 items ranging from 1 (*not at all true of me*) to 7 (*very true of me*). It assesses the extent to which learners used planning, monitoring, and regulating strategies during the learning process. It is reliable and valid with a coefficient alpha at .79.

The measure of interaction and satisfaction was modified from an existing instrument developed by the authors (2009) in a blended learning environment. It is a 5-point Likert scale ranging from 1 (*strongly disagree)* to 5 (*strongly agree*). Three stages were involved in the instrument development process.

- Stage 1: Slight modifications such as wording changes were made to assure the suitability of items given the context of this study was within a fully online learning setting.

- Stage 2: To ensure the content validity of the instrument, a content validity survey was conducted. Six experts, including university professors and professionals with either research expertise or teaching experiences in online learning, were invited to review the questions. Reviewers were asked to rate each item and determine whether the item was adequate for these specific domains on a basis of three choices: essential, useful but not essential, and neither essential nor useful. Content validity ratio (CVR) was calculated based on the ratings from these six experts. The threshold of CVR value to maintain an item for a case of six reviewers is 0.99 (Cohen & Swerdlik, 2004). Considering the small number of reviewers, we decided to combine "essential" and "useful but not essential" into one option for CVR calculation. Items measuring similar concepts or with a CVR value lower than 0.99 were either removed or combined with other items. Wording changes were made based on the suggestions of reviewers.

- Stage 3: The slightly revised items and combined items were sent back to the reviewers for a second-round rating to ensure they were adequate and necessary.

After item elimination and revision, there were eight items in the learner-learner interaction subscale, six items in the learner-instructor interaction subscale, and four items in the learner-content interaction subscale (Table 2). The Cronbach's coefficient alpha values, calculated based on the sample of this study, indicated the developed instruments are reliable (Table 2).

Table 2

Reliability Information for Subscales

Scales	Number of items	α
Learner-learner interaction	8	0.99
Learner-instructor interaction	6	0.88
Learner-content interaction	3	0.92
Satisfaction	5	0.93

Procedure and Data Analysis

The researcher contacted instructors about their willingness to include their online students in this survey. Different deliveries were utilized by interested instructors to distribute the survey link, including email, Blackboard announcements, Blackboard discussion threads, or some alternative means. The survey was hosted in SurveyMonkey. To increase the response rate, follow-up emails were sent to instructors as a reminder message.

Data analyses were conducted using SPSS 16.0. Descriptive analyses were conducted to present the student basic information and the average score of predictor variables and student satisfaction. Correlation analysis was performed to understand the relationship between the three types of interactions and student satisfaction. Multiple regression analyses were performed to investigate whether five predictor variables significantly predict student satisfaction. ANOVA was performed to investigate the effect of student background variables on the five predictors.

Findings

Descriptive Analyses of Variables

Table 3 depicts the average scores on the subscales. It seems that the amount of interaction among students is lower than that of interaction between learners and instructor or content. Most of the students had a slightly high level of Internet self-efficacy given that the average score was larger than the mid-point score of 4. The average score of self-regulation was neutral, implying that students may be able to apply some of the self-regulation skills properly in their learning, but not in a very refined way. Overall, students were moderately satisfied with their learning experiences in an online course.

Table 3

Average Scores on Each Scale

Scales	Range	Midpoint	Mean	*SD*
Learner-learner	1-5	3	2.86	1.14
Learner-instructor	1-5	3	3.85	0.93
Learner-content	1-5	3	3.93	1.01
Internet self-efficacy	1-7	4	5.33	1.31
Self-regulated learning	1-7	4	4.04	0.81
Satisfaction	1-5	3	4.02	0.98

Correlation Analyses

The Pearson correlation coefficients among the scales are presented in Table 4. The three types of interactions were all positively related to satisfaction. Students' responses on learner-content interaction ($r = .664$, $p < .01$) and learner-instructor interaction ($r = .542$, $p < .01$) are relatively highly correlated with student satisfaction in comparison with learner-learner interaction ($r = .246$, $p < .05$). It seems that when the interactions of students with their fellow students, instructors, or content increased, the level of

satisfaction was enhanced. Internet self-efficacy was also positively related to satisfaction ($r = .437$, $p < .01$). Students who had higher self-efficacy in performing Internet actions tended to be more satisfied with the course. There was no significant relationship between self-regulated learning and satisfaction ($r = -.004$, $p > .05$).

Table 4

Correlations between Factors

	Learner-learner	Learner-instructor	Learner-content	Internet self-efficacy	Self-regulated learning	Satisfaction
Learner-learner	—	.430**	.288**	.057	.004	0.246*
Learner-instructor		—	.499**	.220*	.115	0.542**
Learner-content			—	.263**	.050	0.664**
Internet self-efficacy				—	.063	0.437**
Self-regulated learning					—	-0.004
Satisfaction						—

Regression Analyses

Multiple regression analysis was performed to see how much the independent variables can predict student satisfaction. The result revealed that the combination of the independent variables significantly predicts student satisfaction ($F(5, 102) = 26.751$, $p < .001$). Approximately 57 % of the variance in student satisfaction was accounted for by the five predictors, including the three types of interaction, Internet self-efficacy, and self-regulated learning.

Table 5

Multiple Regression of Five Predictors of Student Satisfaction

Variables	B	$SE\ B$	β	t	p	Tolerance	VIF	Semi-partial	Square of semi-partial
(Constant)	0.52	0.46		1.12	0.26				
Learner-learner	-0.02	0.06	-0.20	-0.26	0.80	0.80	1.25	-0.017	0.000
Learner-instructor	0.28	0.09	0.27	3.28	0.00**	0.64	1.55	0.213	0.045
Learner-content	0.46	0.07	0.47	6.15	0.00***	0.72	1.39	0.401	0.161
Internet self-efficacy	0.19	0.05	0.26	3.82	0.00***	0.92	1.09	0.249	0.062
Self-regulated learning	-0.09	0.08	-0.07	-1.12	0.26	0.98	1.02	-0.073	0.005

As shown in Table 5, there was no multicollinearity for the predictors with tolerances larger than .10 and VIFs smaller than 10. Learner-instructor interaction ($t(102) = 3.28$, $p < .05$), learner-content interaction ($t(102) = 6.15$, $p < .001$), and Internet self-efficacy ($t(102) = 3.82$, $p < .001$) were significant predictors in explaining student satisfaction. Learner-learner interaction ($t(102) = -0.26$, $p > .05$) and self-regulated learning ($t(102) = -1.12$, $p > .05$) did not significantly contribute to the prediction of student satisfaction.

The squared semipartial correlation (Table 5) informs the uniqueness of a predictor, which is the amount of variance that cannot be explained by other variables entered in the equation. Learner-content interaction explained the largest amount of unique variance (16.1 %) in satisfaction compared to other the four predictors. Internet self-efficacy and learner-instructor interaction followed with 6.2 % and 4.5 % of the unique variance in student satisfaction respectively.

ANOVA Analyses

One-way ANOVA analyses were performed to explore the effects of student background variables on the three types of interaction, Internet self-efficacy, and self-regulated learning. Levene's Test of Equality was performed in advance to ensure the assumption of equal variance was met. Age and marital status were found to have no significant influence on any of the predictor variables. Post hoc tests were used to compare all groups of participants with each other.

As indicated in Tables 6 and 7, gender and class level had a significant effect on learner-learner interaction. Female students ($M = 2.99$, $SD = 1.07$) had significantly more learner-learner interaction than male students ($M = 2.44$, $SD = 1.28$), $F(1, 106) = 4.48$, $p < 0.05$, $\eta^2 = .04$. Students in undergraduate-level courses ($M = 3.47$, $SD = 1.10$) were found to have significantly less interaction with their classmates, as opposed to those in graduate-level courses ($M = 2.65$, $SD = 1.09$), $F(2, 105) = 4.93$, $p < 0.01$, $\eta^2 = .08$.

Table 6

One-Way ANOVA of Gender on Predictor Variables

	Male		Female		$F(1, 106)$	η^2
	M	SD	M	SD		
Learner-learner	2.44	1.28	2.99	1.07	4.48*	0.041
Learner-instructor	3.75	0.88	3.88	0.95	0.38	0.003
Learner-content	3.80	0.98	3.96	1.03	0.54	0.005
Internet self-efficacy	5.53	1.12	5.27	1.36	0.74	0.007
Self-regulated learning	3.97	0.77	4.06	0.82	0.24	0.002

Table 7

One-Way ANOVA of Class Level on Predictor Variables

	Undergraduate M SD	Under/graduate M SD	Graduate M SD	F(2, 105)	η^2
Learner-learner	2.65 1.09	2.84 1.15	3.47 1.10	4.93**	0.086
Learner-instructor	3.79 0.94	3.75 1.11	4.10 0.72	1.08	0.020
Learner-content	3.91 1.09	3.87 1.09	3.94 0.75	0.37	0.000
Internet self-efficacy	5.37 1.28	5.35 1.48	5.20 1.30	0.16	0.003
Self-regulated learning	4.05 0.80	4.15 0.99	3.93 0.67	0.39	0.007

The number of hours spent online per week was significantly associated with Internet self-efficacy and self-regulated learning; the magnitude of this effect was medium (see Table 8). Students who spent less than 5 hours online each week (M = 5.78, SD = 1.11) had a significantly higher level of Internet self-efficacy than those who spent more than 20 hours online (M = 4.27, SD = 1.73), F(4, 103) = 2.48, $p < 0.05$, $\eta2$ = .08. Students who spent 11-15 hours online per week for coursework (M = 4.36, SD = 0.67) were significantly more self-regulated as opposed to those who spent less than 5 hours (M = 3.70, SD = 0.93), F(4, 103) = 2.72, $p < 0.05$, $\eta2$ = .09.

Table 8

One-Way ANOVA of Hours Spent on Predictor Variables

	< 5 hrs M SD	6-10 hrs M SD	11-15 hrs M SD	16-20 hrs M SD	> 20 hrs M SD	$F(4, 103)$	η^2
Learner-learner	2.39 1.19	2.90 1.10	3.18 1.03	3.02 1.24	3.33 1.04	2.16	0.077
Learner-instrutor	3.83 0.82	3.78 0.99	4.10 0.93	3.79 1.25	3.67 0.72	0.55	0.021
Learner-content	4.09 0.78	3.93 0.99	3.94 1.12	3.37 1.38	3.88 1.25	0.79	0.030
Internet self-efficacy	5.78 1.11	5.35 1.35	5.10 1.17	5.27 1.21	4.27 1.73	2.48*	0.088
Self-regulated learning	3.70 0.93	4.15 0.70	4.36 0.67	4.03 0.75	3.79 0.89	2.72*	0.096

Discussion

The purpose of this study was to analyze the effect of important predictor variables on student satisfaction in online settings. The model of this study was built upon Moore's interaction model with the addition of two variables, Internet self-efficacy and self-regulated learning, which were assumed to be important in this study. The results confirmed the importance of interaction (Bray et al., 2008; Chejlyk, 2006; Keeler, 2006; Rodriguez Robles, 2006). All three types of interaction were significantly correlated with student satisfaction. Among the three types of interaction, learner-instructor interaction and learner-content interaction significantly contributed to student satisfaction while learner-learner interaction was a poor predictor of student satisfaction.

Learner-content interaction was the strongest predictor of student satisfaction, which confirms the findings of Chejlyk (2006) and Keeler (2006). Learner-instructor interaction followed as the second strongest predictor that significantly contributed to student satisfaction. This result suggested that the design of online content may be the most important contributor to student satisfaction. Online learners may spend most of

their time reading and digesting content through thinking, elaboration, and reflection. Organization of content, document layout, and ease of accessing online content may influence learners' interaction with course content. Inclusion of media tools or interactive videos (Anderson, 2003; Havice, Davis, Foxx, & Havice, 2010) may stimulate learners' motivation to learn and in turn increase student interaction with course content.

To increase learner-content interaction, it is necessary to understand the attributes of technologies that support interaction and instructional design that fits specific learning contexts (Anderson, 2003; Wagner, 1994). Compared to other settings (e.g., synchronous, hybrid), learner-content interaction has greater influence on learning outcomes in asynchronous settings (Bernard, Abrami, Borokhovski, Wade, Tamim, Surkes, & Bethel, 2009). Inclusion of tasks that involve collaboration and searching online resources may help enhance learners' interaction with content. For instance, problem-based learning would encourage online learners to apply their information search skills to resolve authentic problems, which in turn increases learners' interaction with the content as well as their problem solving skills (An & Reigeluth, 2008).

Course design would affect learners' interaction with the content and their instructor (Moore & Kearsley, 2005). Course design with low flexibility leads to reduction of learner-instructor interaction (Eom & Wen, 2006; Giossos, Koutsouba, Lionarakis, & Skavantzos, 2009). The more rigid a course, the less autonomy a learner has. A highly-structured course design may be preferred by some online learners as it provides basic course information (e.g., course objectives, teaching strategies, evaluation methods) as well as specified guidelines along with each task or assignment (Lee & Rha, 2009).

Learner-learner interaction was not a significant predictor for student satisfaction, which is contrary to the studies from Jung et al. (2002) and Rodriguez Robles (2006) where learner-learner interaction was found to be the strongest predictor in web-based learning environments. This finding appears to be reasonable since this study was conducted in fully online environments where students may not have many opportunities to interact with their classmates. In the study of Jung et al. (2002), collaborative activities were designed as part of the online courses, resulting in a significant influence of learner-learner interaction on student satisfaction. The amount of collaborative learning design in online settings seems to be an important factor that leads to the effect of learner-learner interaction on student satisfaction. In terms of social constructivist perspectives, collaborative projects and group assignments enable the processes of conversation, discussion, and negotiation among learners (Woo & Reeves, 2007). The online courses collected in this study were eight-weeks long and were offered in summer. This type of accelerated online course may decrease instructors' willingness to involve a great amount of group activities given the time constraints.

The significant influence of Internet self-efficacy on student satisfaction was supported in this study, which is contrary to previous research where Internet self-efficacy was not

found to be a critical factor of student satisfaction (Rodriguez Robles, 2006). Given the results, it may be helpful for institutions to provide appropriate training regarding Internet skills to improve students' Internet self-efficacy before online courses are implemented. Research has shown that students with a higher level of Internet self-efficacy have better information searching skills (Thompson, Meriac, & Cope, 2002) that may increase their confidence in utilizing the Internet as well as trouble shooting during learning.

Contrary to the study of Puzziferro (2006), self-regulation was neither correlated with nor predictive of student satisfaction. The capability of managing learning pace did not seem to be a critical variable to student satisfaction. However, there were not many studies investigating the effect of self-regulation on student satisfaction in web-based settings. More research may be needed to verify the effect of self-regulation on student satisfaction.

This study also examined the effect of student background variables on three types of interaction, Internet self-efficacy, and self-regulation. Female students were found to engage in more learner-learner interaction than male students. Students in graduate-level courses had more interaction with their classmates than those in undergraduate courses. Students who registered for advanced courses such as those offered in graduate school may come from similar professional backgrounds and have similar interest in the content area. It may be easier for them to share and exchange ideas with their classmates or brainstorm on content-related topics, which in turn helps the acquisition of content knowledge.

The finding of the association between time spent online and Internet self-efficacy was interesting. It seemed to make sense that students who spent less than 5 hours online had higher Internet self-efficacy than those with more than 20 hours. Students who were more confident in using the Internet for their coursework might have spent less time online; on the contrary, those who were not familiar with the Internet at all might need to spend more time going through the tasks required for the course.

The amount of time spent online per week also significantly influenced students' self-regulation level when comparing the students who spent less than 5 hours with those who spent 11-15 hours. Based on the result, students spending 11-15 hours online per week were more self-regulated than those who spent less than 5 hours. It seemed that 11-15 hours were an adequate amount of time for students to properly manage their learning pace to complete an online course, as opposed to those spending less than 5 hours. Students who spent less than 5 hours online might have rushed through the course content and finished the required tasks without acquiring a deep understanding of the content, given that a more self-regulated person would have better skills in applying appropriate learning methods and managing the learning process to ensure better acquisition of knowledge.

Limitations and Suggestions for Future Research

Given the small sample size of this study, future research is recommended to verify and generalize the findings among diverse students. Employing the measurement scales in future studies in alternative contexts may provide additional evidence of the validity of these instruments. In addition, other variables (e.g., class size, course structure, learning style, and so on) that may affect student satisfaction should be included and examined in web-based settings to expand the understanding of online learning (Lee & Rha, 2009; Zacharis, 2011).

The design of the courses in which students were enrolled was not assessed. This makes it possible that the nature of the course designs led to our finding that learner-learner interaction was not a significant predictor of student satisfaction. Future research should assess the design of online courses and use this as a moderating factor in the prediction of student satisfaction. Such research could shed further light on whether learner-learner interaction is a consistent predictor of student satisfaction.

Conclusions

This study indicated that the interaction framework with the inclusion of two predictors (i.e., Internet self-efficacy, self-regulation) was valid. Learner-instructor interaction, learner-content interaction, and Internet self-efficacy were significant predictors of student satisfaction in fully online learning settings, while learner-learner interaction and self-regulated learning did not predict student satisfaction. Learner-content interaction was the strongest predictor among those significant predictors of student satisfaction. The importance of interaction in online learning was confirmed. Additionally, gender and class level significantly influenced learner-learner interaction. The effect of time spent per week online was substantially influential for Internet self-efficacy and self-regulation.

The practical implications of this study are that both instructors and course designers should pay attention to content design and organization given that learner-content interaction substantially contributes to student satisfaction. Instructors should pay attention to students and provide feedback to students in a timely fashion or encourage students to ask questions through different mechanisms. Implementing a technology training orientation before online courses start may help increase students' confidence in performing Internet-related tasks required by the course and in turn enhance student satisfaction. Gender and class level seem to be good indicators of the amount of interaction among learners. Instructors are encouraged to design more collaborative activities in undergraduate courses to enhance learner-learner interaction. Time spent online may inform instructors about students' Internet self-efficacy and self-regulation level.

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On-the-Job E-Learning : Workers' Attitudes and Perceptions

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Abstract

The use of e-learning for on-the-job training has grown exponentially in the last decade due to it being accepted by people in charge of businesses. Few papers have explored virtual training from the workers' standpoint, that is, the perception they have about the different training methodologies (face-to-face vs. virtual) and the attitudes they have towards on-the-job learning. Training, in this context, is an investment for both the two participating agents: businesses and workers. It seems logical that knowing the perceptions and attitudes shown by the targets of the training is, at least, as important as knowing the advantages for the companies.

To analyse workers' perceptions and attitudes we conducted an online survey of 2,000 employees of the leading European savings bank, CaixaBank (http://www.caixabank.com/index_en.html), on training habits, perceptions, motivations, and disincentives of undertaking face-to-face or online instruction.

The results reveal that workers perceive e-learning as a more flexible and up-to-date training methodology. On the other hand, face-to-face training continues to be perceived as a more motivating methodology compared to virtuality and with better explanations from the course trainers. As regards motivations given by the workers when it comes to training, there are three main groups of attitudes: those which are more affective and social, those which reveal poor adaptability or fear of the new training requirements, and, finally, those linked to the knowledge society.

Such results state that while the benefits of distance methodology can be clearly identified from the company's point of view (i.e., as a flexible and efficient methodology to develop the employees' skills and knowledge), from the employees' standpoint, the

advantages of virtual training are not so clear and depend to a great extent on their attitude towards the use of virtuality.

Keywords: E-learning; on-the-job training; worker's attitudes nd perceptions; ICT; perceptual map; factor analysis

Introduction

Training of workers has become, since the final third of the 20th century, one of the key factors of company competitiveness within an economy that Castells (2003) describes as informational and global. Massive incorporation by business of information and communication technologies (ICT) has changed production processes as well as business activity itself (Valdaliso & López, 2000). Simultaneously, and in a reciprocal way, it has speeded up economic globalization processes. This broader penetration of ICT has entailed an increase in the use of knowledge as both a business input and output. This has, at the same time, led to a profound change in the conditions and characteristics of the labour market (Vilaseca & Torrent, 2003).

Changes to the workforce in OECD countries are causing changes to companies: more flexibility for companies when creating job titles, more frequent developments in labour activity, modifications of worker responsibilities within the company and even within the economic sector as a whole. Companies and workers face an increasing need to recycle knowledge and skills (Carnoy, 2001). A consequence of this process of business digitalization is the increase by companies in the demand for new job skills. Thus, for jobs that require higher levels of training, more worker autonomy and new management skills are favoured (Bresnahan et al., 2002). This new demand, dubbed self-programming work by Castells (2003), requires workers with autonomy, initiative, and the capability to make decisions, as well as the ability to reprogram their skills and knowledge according to the different tasks that they are entrusted with in the ever-changing business environment.

Massive incorporation of knowledge into business activity and increasing labour market malleability has, in recent decades, led to a generalized increase in the need for continuous vocational training (Castells, 2003). The entirety of training activities developed by companies, workers, or their representing organizations must be directed to improving the professional competencies and skills of active workers, so that they may face the needs of a changing and digitalized global reality.

The importance of learning is primarily because of the need for organisations to respond to rapid and continuous change in the organisation's external environment (Coetzer & Perry, 2008). Also, the need for ongoing employee training requires a learning environment that makes it possible to progress professionally and, at the same time, to acquire general and firm-specific skills and new competencies (Fan & Wei, 2010). The

training environment that favours direct linking with real labour experience is training in the workplace.

In the report *Learning for Jobs*, edited by the OECD (2010), the four main advantages of workplace learning are, firstly, a high-quality learning atmosphere that allows students to acquire practical and updated skills with trainers who are familiar with working methodology and the use of new technologies. Secondly, workplace learning makes bidirectional flow of information between potential employers and employees easier, which makes possible later recruitment much more efficient and less costly. Thirdly, the fact that companies train their workers is a sign that a vocational training programme is valuable in the labour market. Finally, workers trained on the job can make a productive contribution to the company.

The consequences of traditional management, production, and working methods in a knowledge-based economy are that they have a direct impact on people's lives by making labour relationships more flexible, either voluntarily or by imposition, thus requiring openness to innovation as an essential value in the company as well as a continuous vocational recycling process. Such constant processing of knowledge, updating of skills, and continuous relearning favours the use of e-learning as an essential methodology that guarantees the perfect symbiosis between work and training (Batalla et al., 2010).

Within the framework of e-learning for on-the-job employee training, this research aims at studying what the workers' perception of e-learning is as well as the motivations that make them pursue training with this methodology. The main purpose of this paper is to answer these two questions related to on-the-job e-learning, questions which have been tackled by very few studies.

To this end, the next section is a brief review of literature on use of in-company e-learning, stressing the workers' perceptions and motivations. Subsequently, we will explain the methodology and finally we will discuss the main results and the conclusions reached.

Conceptual Framework

Before outlining the theoretical framework of this paper, it is appropriate to explain what we understand as e-learning. E-learning has been defined by many authors in recent decades (Wilson, 1996; Piccoli, et al., 2001; Rosenberg, 2001; Nisar, 2002; Ruipérez, 2003; Taylor & Osorio, 2005; Bates, 2008; Sangrà, et al., 2012). In our paper, following research by Piccoli, et al. (2001), Ruipérez (2003), Taylor and Osorio (2005), and Sangrà, et al. (2012), we define e-learning as the distance training methodology based on the use of information and communication technologies that allows interaction and asynchronous communication amongst participants as well as the

access to a broad set of teaching resources. Thus, the student becomes the centre of the training process, managing his/her own learning with the help of external tutors.

The use of on-the-job e-learning, in constant growth in recent decades, is a relatively new form of providing training to workers (Lim & Kim, 2003; Brewer et al., 2008). Likewise, most of the scientific community recognizes e-learning as an efficient and valid strategy (Nisar, 2002). The goal of e-learning is to ensure that technology contributes effectively to developing the workers' skills and knowledge and to support their career progression (Pantazis, 2002; Ong et al., 2004).

According to Nisar (2002), e-learning allows an efficient response to the following specific objectives: (1) to identify and record training needs of workers, so as to facilitate the development of ad-hoc training processes; (2) to provide up-to-date training and support to workers who need it, allowing a personalized interaction between user and tutor; (3) to evaluate through digital technologies the established training objectives, via a process of continuous assessment in order to facilitate the assimilation of knowledge acquired by the worker; and, finally, (4) to establish a registry and record of training activity and of each participant's assessment.

Several studies have identified the main benefits that e-learning can bring to organizations which use this methodology (Carnoy, 2004; Wang et al., 2006; Hodges, 2009). These can be divided into four categories: cost reduction, flexibility and adaptability, permanent updating, and personalized attention. According to Grollman and Cannon (2003), a well-designed e-learning course is usually as efficient as face-to-face training and much less costly if applied to large groups. Other cost reductions commonly quoted by scientific literature refer to the reduced cost of trips, the minimization of lost working hours and, consequently, of less productivity loss (Clarke et al., 2005; Shankar, 2007; Wurtmann & Galli-Debicella, 2008). There is also more flexibility regarding the time taken for employees to plan work (Clarke et al., 2005) and also the possibility of adjusting each individual's pace of work (Ashmalla et al., 2001; Grollman & Cannon, 2003; Shankar, 2007). These are the main benefits associated with e-learning. Pulley (2005) further underlines that e-learning is the only methodology which allows workers to take part in the training process from their workplace, including from different and distant geographical locations, in a synchronous or asynchronous way. Such asynchronicity makes access to learning resources possible 24 hours a day 365 days a year (Childs et al., 2005). Zhang and Nunamaker (2003) estimate that skills and knowledge used by a worker today will be obsolete in three to five years time, whereas corporate education using virtuality allows the worker to keep his/her skills continuously updated. E-learning facilitates the customization of learning according to each worker's needs, choosing the most suitable learning materials and making continuous updating possible (Shankar, 2007) due to the fact that electronic content makes it possible for teachers to update content instantly and easily through the network (Grollman & Cannon, 2003).

A study by Ruiz et al. (2006) suggests that e-learning is more effective in the acquisition of new skills and attitudes than face-to-face methodology. Bachman (2000) states that training based on virtuality has between 50-60% better results than face-to-face due to the fact that there is greater control over the learning process. E-learning can deal with individual differences by virtue of the wide blend of resources and activities which can be utilized, such as games, tests, and practice exercises, among others (Shankar, 2007; Peretti, 2008).

According to the above evidence, it appears clear that, from the point of view of the organization, virtual learning has many advantages, but what are the perceptions of e-learning from the employee's standpoint? And, which are the workers' motivations regarding training received in-company? The worker can evaluate the received training, whether face-to-face or virtual, according to perceptions of the training components; this may depend to a greater extent on the company (Rabak & Cleveland-Innes, 2006) and tend to be in line with

the attitudes, beliefs, and personal values linked to the training which are more difficult to distinguish (Daneshgar, et al., 2008).

Among the features, external to the worker, attributed to virtual training, we can include course design, the ability of teachers to attract and maintain the attention of the participants, the existence of interactive and collaborative training activities, how up-to-date and relevant the content is, and the flexibility and adaptability of courses (Bonk, 2002; Baldwin-Evans, 2004). Academic literature identifies several intrinsic motivations that the worker possesses in order to take part in training activities. Bonk (2002), in a study of over 201 companies who invest in training, in which both employees and employers participated, concludes that personal growth and the feeling of belonging to the organization are two highly valued aspects. Doo and Hyunjoong (2003) include emotion among the motivational variables that they identify in their research. This has an influence on employee attitudes when it comes to being trained. Emotion depends on the corporate atmosphere or culture, the viewpoints of fellow workers and of management, and personal attitudes to change, and so on. Baldwin-Evans, in research carried out in 2004, points out several aspects that have an influence on a worker's motivation to be trained, such as the obligatory nature of the training offered by the company and the career progress they can expect to attain.

Research Purpose, Methodology, and Results

Research Purpose

While from the point of view of the organization, there are abundant studies which have analysed virtual learning determinants, few papers have explored virtual training from

the workers' standpoint (i.e., their motivations and perceptions). In order to investigate the purpose of this study, several research questions were developed.

1) What are the perceptions that workers have towards virtual training received in the workplace? Are there any differences between these perceptions and those associated to face-to-face training?

2) What are the intrinsic attitudes or motivations of the worker towards training received in the organization?

Methodology

In order to answer these research questions, a survey of CaixaBank employees who had attended several virtual training courses was conducted. In the context of large companies in the financial sector, CaixaBank has been one of the pioneers in introducing e-learning as a method for training its employees[1]. Data were gathered by means of an online questionnaire sent to the email addresses of 2,000 CaixaBank workers. They had attended two kinds of virtual training, which Jauregui (2002) describes as follows.

• *New employee training (NET).* This is a plan specifically for training new employees in the organization and is managed by the Central Services human resources team. The training lasts one year, during which the worker is employed on a temporary contract. Once the training has been completed, if there is agreement between both parties, the contract becomes permanent.

• *Training for professional promotion (TPP).* These are ongoing training processes aimed at employees who have been working with the company for a long time. This training is often transformed into customised training, with the objective of meeting the different needs and characteristics of each banking entity's delegation. The training is managed by the regional human resources team.

Table 1 shows the survey methodology and Table 2 describes the respondents' profile.

Table 1

Survey Methodology

Universe	Employees who had taken training courses as new employees (NET) or for professional promotion (TPP). Total universe: 6,000 employees for NET training and 3,328 for TPP training.
Methodology	Online survey, structured questionnaire, sent to the personal email addresses of the selected sample. Completion time, approximately, 15 minutes.
Sampling plan	Stratification of the sample by type of training undertaken by employees. Two strata, NET and TPP.
Sampling error	The sampling error was ± 4.78% for global data in the case of maximum indetermination (p = q = 50) for a confidence level of 95.5%.
Resulting sample	A sample of 2,000 cases made up of 1,500 on the NET stratum and 500 on the TPP.
Response rate	20.65%. Number of interviews completed: 413.

Table 2

Respondents' Profile

	New employee training	Training for professional promotion
Gender	Male: 37.5% Female: 62.5%	Male: 46.4% Female: 53.6%
Age (average)	27.2 years old	31.6 years old
Years in the company	Less than 1 year: 34.3% Between 1 and 3 years: 65.7%	Between 3 and 5 years: 25.7% Between 5 and 7 years: 48.6% Between 7 and 9 years: 14.3% More than 10 years: 11.4%

Results

Employees' perceptions concerning face-to-face and virtual training.

The perceptions of employees regarding face-to-face and virtual training have been obtained through the association of these training methods to a series of attributes related to the contents of the training courses (i.e., to their adaptability and applicability to the trainee's professional activity and the ease of communication with the course instructor/tutor). These aspects have been extracted from the literature regarding e-learning referenced in the theoretical framework in this work. Table 3 shows the percentage of employees that associated which aspect with which type of training (virtual, face-to-face), to both types equally, or to neither of them.

Table 3

Association of Attributes to each Type of Training (% of Employees)

	Online training	Face-to-face training	Both	None
More comprehension of theoretical framework	21.3%	32.4%	45.8%	0.5%
More practical focus	8.2%	65.7%	25.6%	0.5%
Updated contents	58.0%	10.8%	30.9%	0.3%
Contents-profession link	6.3%	42.4%	51.1%	0.3%
Facilitates learning	6.6%	43.7%	49.7%	0%
Allows clearing up problems with tutor	8.4%	77.9%	13.4%	0.3%
Better quality of tutor's explanations	2.6%	83.2%	13.9%	0.3%
More motivating	2.6%	65.5%	31.3%	0.5%
Adaptable to the trainee's pace of study	49.1%	16.4%	33.0%	1.6%
Flexible timetable	87.1%	3.9%	8.2%	0.8%
Allows more in-depth training	40.8%	20.8%	37.9%	0.5%

From these data we can highlight the main attributes linked to each of the methodologies. Thus, workers associate virtual training, in a higher percentage, with *time flexibility* (87.1%) and *updated contents* (58.0%). On the other hand, face-to-face training is more associated with *perception of the quality of the tutor's explanations* (83.2%) or *allows clearing up problems with the tutor* (77.9%). However, the

interviewed workers state that both virtual training and face-to-face training share a set of features. That is to say, a *good link between contents and professional activity* can be attained with both methodologies (51.1% of workers associate this aspect to both the virtual and the face-to-face training), or both *allow more in-depth training* (49.7%) and the *understanding of the theoretical framework* of training programmes (45.8%).

To take a more in-depth look at associations between the different characteristics of training and the two methods observed in this study, a simple correspondence analysis was carried out. Benzecri (1982) explains that this analysis endeavors to discover the structural dimensions that are latent in a set of data. This aims to analyse the relationship between two sets of variables, in this case training attributes/characteristics and training methodologies (online, face-to-face, both), as well as to go deeper into the perceptions of the CaixaBank workers with regard to face-to-face and virtual training. This is done by evaluating each of the different training methods' images and positioning by means of a series of characteristics. Moreover, this analysis also allows the simultaneous representation of both sets of variables within the same two, three, or more dimensional spaces, which makes interpretation of the results easier. To do this analysis, we have taken into consideration the association of attributes with virtual training, with face-to-face training, and with both. We omitted information regarding the association of attributes with none of the two methodologies. The starting point of the correspondence analysis is a matrix of non-negative values, such as the cross-tabulation matrix (Table 4). The values represent the number of times each type of training is rated as being characterized by that attribute. Thus, higher frequencies indicate a stronger association between that training and the attribute in question.

Table 4

Cross-Tabulated Frequency Data of Attributes Descriptors for Online Training, Face-to-Face Training, and Both

Attributes	Online training	Face-to-face training	Both
Theoretical framework comprehension	81*	123	174
More practical focus	31	**249**	97
Updated contents	**220**	41	117
Association contents-profession	24	161	**194**

Facilitates learning	25	166	**189**
Allows clearing up doubts with the tutor	32	**296**	51
Perception of the teacher's explanations quality	10	**316**	53
Motivation	10	**249**	119
Adaptable to the trainee's pace of study	**186**	62	125
Timetable flexibility	**331**	15	31
Allows in-depth knowledge	**155**	79	144

* **81 CaixaBank workers associated attribute** *Allows better understanding of theoretical framework of the course programme* to online training.

Table 5 shows the eigenvalues and the cumulative and explained percentages of variation for each dimension, corresponding to the two factorial dimensions taken from the analysis of correspondences.

Table 5

Eigenvalues and Percentage and Cumulative Explained

Dimension	Eigenvalue (singular value)	Inertia	Percentage explained	Cumulative percentage
1	0.64621	0.4176	82.0%	82.0%
2	0.30235	0.0914	18.0%	100%
Total		0.5090	100%	100%

The symmetric relationship between factorial axes makes it impossible to take out more than K factorial axes, being K = min (I, J) − 1, where I is the number of attributes and J the number of training methodologies analysed (Hair et al., 2010). Thus, in this case, the maximum number of factors to be taken out is 2 (2 = min (11, 3) − 1). It can be seen that the first factor or dimension explains the overall data to a great extent, 82%, whereas the second dimension explains the remaining data, 18%.

Table 6 shows the coordinates of the items analysed and the types of training and their contributions to training on the two factorial dimensions. We can see that the attribute *flexible timetable* has much weight in the first dimension, along with virtual training methodology. As regards the second dimension, there is no primary contributor; however, the type of training does have an influence when it comes to explaining it, particularly the two types of training methodology, face-to-face and virtual.

Table 6

Coordinates and Contributions of the Attributes to the Inertia of Dimensions

	Attributes	Coordinates		Contribution to inertia	
		Dim1	Dim2	Dim1	Dim2
	More comprehension of theoretical framework	-0.008	-0.586	0	0.103
	More practical focus	-0.619	0.272	0.054	0.022
	Updated contents	0.969	-0.086	0.132	0.002
Aspects of training	Link between contents and profession	-0.42	-0.749	0.025	0.169
	Facilitates learning	-0.427	-0.691	0.026	0.144
	Allows clearing up problems with tutor	-0.736	0.767	0.076	0.177
	Better quality of tutor's	-0.909	0.762	0.117	0.175

explanations

	More motivating	-0.732	0.057	0.075	0.001
	Adaptable to the trainee's pace of study	0.739	-0.165	0.076	0.008
	Flexible timetable	1.649	0.743	0.382	0.166
	Allows more in-depth training	0.513	-0.323	0.037	0.031
Training method	Virtual training	1.254	0.314	0.647	0.087
	Face-to-face training	-0.731	0.403	0.35	0.228
	Face-to-face and virtual training	-0.078	-0.816	0.003	0.686

The data obtained highlights the importance of one of the analysed attributes, *flexible timetable*, in the contribution on the horizontal axis. This attribute would be positioned close to online training and far from the rest of the attributes on the positioning map. With the aim of determining if the elimination of this attribute would give rise to a clearer interpretation of the relationships between the attributes and the types of training, the analysis was repeated excluding this attribute. The resulting perceptual map (Figure 1) shows that the attributes that in the previous analysis did not appear to be clearly associated to either training method are "captured" by virtual training, giving it characteristics related to flexibility (*adaptable to the trainee's pace of study*, *more in-depth learning*, and *updated contents*).
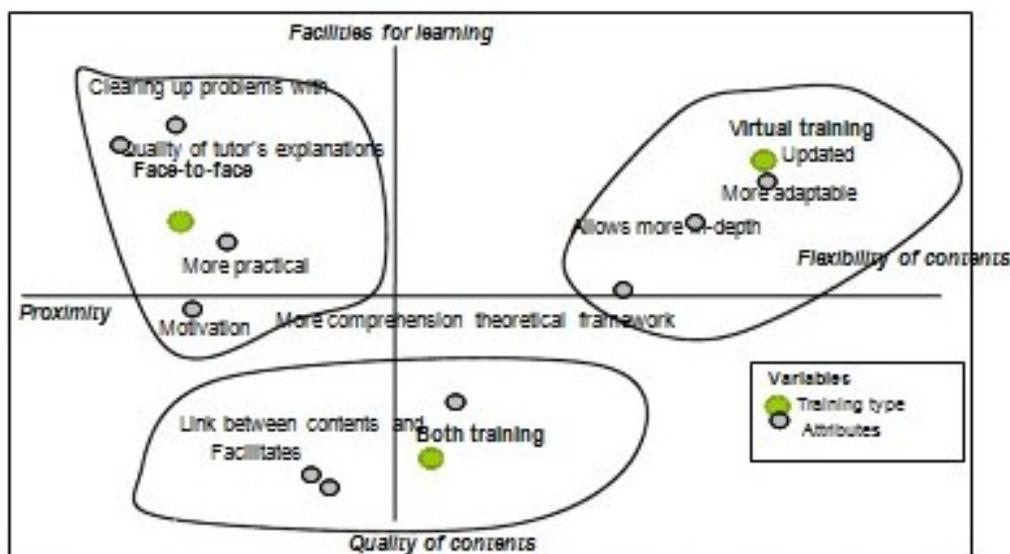
Figure 1. Perceptual map of attributes associated with virtual training, face-to-face training, and both methods, excluding the attribute *flexible timetable*.

The map's abscissa axis places at one extreme the characteristics related to proximity in the learning process, such as the *possibility to clear up problems with a tutor*, *perception of the quality of the tutor's explanations*, *more practical focus*, and *more motivating*. At the axis' other extreme the attributes related to flexibility of contents appear: *updated contents*, *more adaptable to the trainee's pace of learning*, and *allows more in-depth training*. In this way, the face-to-face method is positioned close to the proximity attributes, and virtual training is positioned close to flexibility attributes. The ordinate axis places at the positive extreme aspects related to learning facilities and at the negative those related to quality of the contents. The aspects linked to the quality of content, such as *learning facilities*, *link between contents and profession*, and *comprehension of the theoretical framework*, are shared by both methods.

Employees' motivations for participating in on-the-job training.

A 10-point scale (ranging from 0, *strongly disagree*, to 10, *strongly agree*) was used to measure questions about employees' attitudes towards the training received. The perception of CaixaBank workers concerning the training received was, in general, very positive. Therefore, the level of agreement shown with the positive aspects evaluated is notable, while the most negative associations were not shared by the majority of employees. It is remarkable that 92.5% of employees were quite or completely in agreement that training offers an opportunity; 96.3% of respondents perceived training as a way to progress professionally; 92.7% considered it a way to keep their job; and 83.6% thought that training links them to the company.

Likewise, employees who have been at the company for less than two years had an appreciably more positive opinion of training than more veteran employees (a group which includes those who trained as TPP). With respect to the consideration of training

as a cause of stress, in the case of the TPP trainees, 25.7% of them were quite or completely in agreement with this statement. By contrast, only 10.3% of NET trainees agreed with this opinion. The perception of training as a factor linking an employee to the institution was also markedly different depending on the kind of training undertaken: almost 87% of NET trainees completely agreed with the existence of this link, as opposed to 77% of employees who took part in TPP training. Finally, there are some motivational aspects where there are no statistically significant differences depending on the group that received the training (among these aspects, we can find *I enjoy being up-to-date with everything related to my work*, *I feel the institution obliges me to do training*, *I think that training is part of my job,* or *The use of ICT is an added value for professional enrichment*). Table 7 shows the percentage of workers who strongly and quite agree with each one of these motivations, according to the training undertaken by the employees (new-employee training or training for professional promotion).

Table 7

Employees' Attitudes towards On-the-Job E-Learning by Type of Training Received (Quite or Completely in Agreement with each Statement)

	Variables	New employees' training (NET)	Training professional promotion (TPP)	Total	Signification level
V1	The opportunity to train is an opportunity offered to me by CaixaBank	93.7%	82.9%	92.5 %	Chi Sq = 5.115 Sig = 0.037
V2	Job training is a cause of stress in my professional responsibility	10.3%	25.7%	13.6 %	Chi Sq = 4.820 Sig = 0.033
V3	To keep my job, ongoing training is indispensable	92.7%	91.4%	92.7 %	Chi Sq = 0.063 Sig = 0.501
V4	Training is a good way to progress in my career	98.8%	88.6%	96.3 %	Chi Sq = 6.641 Sig = 0.030
V5	The opportunity to follow training programmes makes me	86.4%	77.1%	83.6 %	Chi Sq = 1.136

	feel linked to the institution				Sig = 0.200
V6	I enjoy being up-to-date with everything related to my work	98.7%	100.0%	98.8%	Chi Sq = 0.469 Sig = 0.641
V7	I feel the institution obliges me to do training	18.9%	20.0%	19.9%	Chi Sq = 0.001 Sig = 0.564
V8	I think that training is part of my job	94.0%	100.0%	93.9%	Chi Sq = 2.464 Sig = 0.102
V9	Fear of "missing the boat" with respect to my colleagues	36.5%	31.4%	37.3%	Chi Sq = 0.561 Sig = 0.289
V10	Meet other colleagues in my profession	62.1%	51.4%	61.3%	Chi Sq = 1.557 Sig = 0.143
V11	The use of ICT is an added value for professional enrichment	94.7%	91.4%	93.9%	Chi Sq = 0.426 Sig = 0.357

In order to confirm the existence of interdependent relationships between the variables that measure employee motivations for training, a factor analysis was carried out. We employed this multivariate technique from an exploratory perspective to identify a structure among the set of items analysed. Standard methods of performing factor analysis (i.e., those based on a matrix of Pearson's correlations) assume that the variables are continuous and follow a multivariate normal distribution (Hair et al., 2010). In our research, the variables were measured on a 0 to 10 scale, so we took this ordinal metric into account and examined the dimensionality of the scale using factor analysis based on a matrix of polychoric correlations[2], following the recommendations made by Panter et al. (1997).

To justify the application of factor analysis the Barlett test of sphericity and the Kaiser-Meyer-Olkin test were applied. KMO measure of sampling adequacy was good (> 0.80); and the Bartlett test of sphericity was statistically significant ($p < 0.05$). Table 8 shows the results of these tests.

Table 8

Adequacy of the Correlation Matrix

Bartlett's statistic	1182.4	$df = 55$
		$p = 0.000010$
Kaiser-Meyer-Olkin (KMO)	0.84237	

The analysis used principal components to extract the maximum variance from the items. According to the results, the number of factors suggested based on the polychoric correlation matrix is three when mean of random eigenvalues is considered. Table 9 contains the information regarding the 11 possible factors and their relative explanatory power as expressed by their eigenvalues.

Table 9

Results for the Extraction of Component Factors

Variables	Eigenvalues		
	Total	Variance explained	Cumulative percentage
1	3.81634	34.7%	34.7%
2	1.48917	13.5%	48.2%
3	1.15159	10.5%	58.7%
4	0.82095	7.5%	66.2%
5	0.69853	6.4%	72.6%
6	0.65059	5.9%	78.5%
7	0.60855	5.5%	84.0%
8	0.53305	4.8%	88.8%
9	0.49276	4.5%	93.3%
10	0.41955	3.8%	97.1%
11	0.31891	2.9%	100%

Finally, to minimize the number of items that have high loadings on any given factor, and in order to determine the interpretation of factors, a Varimax rotation was applied. Table 10 shows the Varimax-rotated component analysis factor matrix, where each variable's correlation coefficient with each of the main components are found. Interpretation of the rotated component matrix allows us to identify and interpret three main factors, obtained from grouping the initial 11 variables.

Table 10

Varimax-Rotated Factor-Loading Matrix

		Factor		
		1	2	3
1	Training is a good way to progress in my career	0.753	-0.215	0.277
	To keep my job, ongoing training is indispensable	0.741	0.020	0.204
	The opportunity to train is an opportunity offered to me by CaixaBank	0.724	-0.236	0.073
	The opportunity to follow training programmes makes me feel linked to the institution	0.704	-0.154	0.364
	Meet other colleagues and people in my profession	0.618	0.132	0.085
2	Job training is a cause of added stress in my professional responsibility	-0.187	0.763	-0.003
	Fear of "missing the boat" with respect to my colleagues	0.288	0.696	-0.099
	I feel the institution obliges me to do training	-0.266	0.666	-0.128
3	I enjoy being up-to-date with everything related to my work	0.081	-0.117	0.751

I think that training is part of my job	0.237	-0.023	0.744
The use of ICT is an added value for professional enrichment	0.246	-0.064	0.741

The analysis of factorial loadings allows the factors to be interpreted. Each factor is named based on the variables with significant loadings.

Factor 1. More affective and social motivations (34.7% of variance)**.** This first factor has a more identifiable interpretation. On the one hand, it relates training to an affective link with the company and, on the other, it includes the only relational motivation for training (training for meeting other colleagues). This feeling of belonging to a group or an institution is complemented by the perception that training is, clearly, an opportunity offered by the company and a good way to progress in their careers.

Factor 2. Motivations that demonstrate poor adaptability or fear of the new training requirements (13.5% of variance). The motivations loaded on this second factor transfer training responsibility and initiative to the company (the employees do not have personal interest in their training) or imply that training is motivated by fear of being left in a detrimental position at work. In any case, this factor includes the perception that training is a focus of tension and not personal enrichment.

Factor 3. Motivations linked to the knowledge society (10.5% of variance). This third factor includes motivations concerning ongoing training that correspond to current training requirements, the need for lifelong training, and identifies training and profession as a unity and not as two separate stages. The use of ICT is already considered as an added value of training. Similarly, the variables loaded on this third factor clearly describe the reality of the current labour market: the constant need to learn and unlearn.

With the aim of validating the results obtained to the factor analysis, the sample was randomly divided into two parts and the analysis was applied to each of them. The resulting rotated component matrices showed that structures were equivalent, so we can conclude that the results are strong enough for their stability.

Conclusions

Throughout this case study we have attempted to explore workers' attitudes and perceptions of on-the-job e-learning. The benefits of the distance methodology are clearly identifiable from the company's point of view: as a flexible and efficient

methodology to develop skills and employee expertise. From the employees' standpoint, the advantages of virtual training are not so clear. The positioning map obtained from the association made by workers of different attributes to the two types of learning methodologies showed three main groupings, each corresponding with one type of training or both. Thus, the grouping of attributes related to face-to-face training are *more motivating*, *clearing up problems with tutor*, *more practical focus*, *quality of the tutor's explanations*. Attributes related to online training consist of *more updated content*, *more adaptable to the rhythm of the participant*, and *allows more in-depth training*. The last set of attributes contained the characteristics that workers associated to both methods: *facilitates learning*, *link between content and profession*, and *more comprehension of theoretical framework*. Based on these results, we conclude that most of the benefits of virtual training in the workplace raised by Nisar (2002), Carnoy (2004), Wang, et al. (2006), or Hodges (2009) are perceived by workers of the financial institution.

By analysing the attitudes of employees regarding on-the-job training and their motivations for actively following the training courses, we can also conclude that there are three main groups of attitudes: those more affective and social motivations, those which reveal poor adaptability or fear of the new training requirements, and, finally, those linked to the knowledge society. These results highlight the need to break with the reluctance expressed by some of the workers from the fact that training is essential in the business world. To do this, we consider that the use of e-learning facilitates the development of training activities in the company, reducing training costs and achieving more flexible learning processes. As a final conclusion, employees must have an open attitude towards online training in order to achieve higher levels of efficiency in an on-the-job distance learning environment. On-the-job e-learning is most beneficial in situations where there is a great similarity between approaches to learning and to working, where a career in the intensive use of ICT is developed, and where up-to-date learning content is required.

Endnotes

1   According to the report *Learning for Jobs* (OECD, 2010), there are multiple on-the-job training typologies, of a punctual nature or structure and of longer length, aimed at inexperienced trainees, or with the purpose of their career promotion. Different training practices are described and classified regarding length of time and their level of structuring. At the shorter end of the time spectrum there is "Job shadowing" and at the longer end there is "Apprenticeships". Likewise, the typology aimed at students entering the labour market is called "Service learning", at which end we can find "Employee training". This work focuses on the workers included in the latter training typology, "Employee training", directed at workers who hold a permanent or temporary contract, with well- structured contents and carried out entirely in the workplace.

2   Tetrachoric and polychoric correlations are based on the assumption that the response categories (dichotomous or ordinal scales, as Likert scale) are proxies for unobserved and normally distributed variables. Factor analysis of tetrachoric or polychoric correlation matrices are essentially factor analyses of the relations among latent response variables that are assumed to underlie the data and that are assumed to be continuous and normally distributed (Panter et al., 1997). For computing polychoric correlations, the *Factor program* by Lorenzo-Seva and Ferrando (2012) was used.

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An OER Architecture Framework : Needs and Design

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Abstract

This paper describes an open educational resources (OER) architecture framework that would bring significant improvements in a well-structured and systematic way to the educational practices of distance education institutions of India. The OER architecture framework is articulated with six dimensions: pedagogical, technological, managerial, academic, financial, and ethical. These dimensions are structured with the component areas of relevance: IT infrastructure services, management support systems, open content development and maintenance, online teaching-learning, and learner assessment and evaluation of the OER architecture framework. An OER knowledge and information base, including a web portal, is proposed in the form of a series of knowledge repositories. This system would not only streamline the delivery of distance education but also would enhance the quality of distance learning through the development of high quality e-content, instructional processes, course/programme content development, IT infrastructure, and network systems. Thus the proposed OER architecture framework when implemented in the distance education system (DES) of India would improve the quality of distance education and also increase its accessibility in a well-organised and structured way.

Keywords: Open educational resources (OER); distance education system (DES); open and distance learning (ODL); technology enhanced learning (TEL); information management

Introduction

The distance education system (DES) in India is one of the biggest educational systems in the world. Presently this system comprises 14 open universities (OUs), and about 200 open and distance learning institutions (ODLIs) provide education through distance mode to 3.7 million students in India (DEC, IGNOU, personal communication, 2012). While only a few of the ODLIs have succeeded in providing distance education of reasonable quality, there are many others that cannot do so due to several problems and constraints. There has been little work done in the Indian DES to explore an appropriate organisational system and mechanism that can achieve the wider goal of providing quality distance education to its learners and of increasing access to distance education and training.

Challenges Faced and Solutions Proposed

The major challenges which have resulted in poor participation of the learners and teachers at various stages of the teaching-learning process in education institutions have been identified (UNESCO, 2010) as follows:

- lack of appropriate business and educational models, due to which the study material or open content developed becomes difficult to follow, and this, as a result, reduces the enthusiasm of learners for their studies;

- lack of any clear quality assurance mechanism, which has resulted in unclear standards and poor quality of distance education;

- teachers lacking in the pedagogical competence to effectively develop and use teaching content and techniques of reasonably good quality;

- non-availability of the required finances and a shortage of educational resources needed to support the teaching process;

- lack of an appropriate level of physical capacity and of the financial resources required to accommodate the maximum number of students and thus increase and/or widen participation in the educational system;

- lack of support from the relevant governing bodies, which are already exhibiting poor participation brought about as a result of the lack of appropriate human and infrastructure capacity.

However, the broader challenge that has affected teaching, learning, research, and collaborative intellectual activities as related to the DES of India for years has been that of increasing access to quality distance education and training programmes. It is partly as a result of the lack of any clear educational structure and partly due to the imprecise meta-tagging process that accompanies the lack of proper infrastructure, education

dissemination, and also improper sharing of distance learning technologies and techniques (Betaman, 2006).

In other words, ODL institutions in India are inadequately organized. To support open and distance learning in ODLIs in an effective way, effort is required to explore some reasonable solutions to address the above mentioned challenges. In recent times, one of the most promising developments in the field of education and training is the concept and growing reality of OER.

Literature Review

The term open educational resources first came to use in 2002 at a conference hosted by UNESCO. OER may broadly be considered as teaching, learning, and research resources with an intellectual property license that permits them to be reused, reworked, remixed, and redistributed (D'Antoni, 2009; Hilton, Wiley, Stein, & Johnson, 2009; Plotkin, 2010; Wiley, 2009).

OER has been defined by Hylén (2006) as "digitised materials offered freely and openly for educators, students and self-learners to use and re-use for teaching, learning and research."

UNESCO and COL describe the concept of OER as any educational resources (including course materials, textbooks, curriculum maps, streaming videos, multimedia applications, and podcasts, etc.) that are openly available for use by educators and students, without an accompanying need to pay royalties or licence fees (Butcher, 2011). However in recent times OER have become a major focus of attraction within educational circles, particularly in those educational systems which are related to distance education institutions. They have also been found to be capable of changing the discourse around the educational systems as they can offer a great value and impact for improving such systems (UNESCO, 2010).

In 1994, the term *learning object* was introduced by Wayne Hodgins, which received immediate acceptance by educators and instructional designers and allowed easy reuse in a wide range of teaching and learning situations. However, OER evolution started with MIT Opencourseware and its impact was further strengthened when organisations like UNESCO, COL, ICDE, OECD, BCCampus (Canada), SCORE (US), EDNA (Australia), OERZN (New Zealand), JISC (UK), OPAL (EU), and foundations such as Hewlett, Mellon, Ford, and Gates funded various OER initiatives worldwide. In addition to the various OER initiatives and their potential implications worldwide, educators have developed e-learning, conceptual, and consortium models and frameworks.

The study in the present article pertains to an OER architecture framework for ODL institutions in India. According to MODAF (2005) "An Enterprise Architecture is the formal description of the structure and function of the components of an enterprise,

their interrelationships, and the principles and guidelines governing their design and evolution over time." An architectural framework is a specification of how to organize and present architectural models. Using an architectural framework, architectures can be developed for the smallest subsystem or for an entire enterprise. In other words, frameworks provide a structure and systematic approach to designing systems (Tang, et.al, 2004).

According to Lloyd et al. (2004), a framework is a set of pre-fabricated building blocks with a reusable design that developers can use, extend, or customise to suit their applications. With frameworks, creators do not have to start from scratch each time to build an application. This inherent flexibility enables the rapid creation and development of solutions for the constantly evolving education environment. In addition to this the result of using a framework for n-tier applications is that the quality of OER applications increases dramatically, while decreasing the total cost of ownership and accelerating the delivery time. Also, frameworks capture technical expertise and best practices necessary to solve a particular class of problems with no need to reinvent the wheel.

Margulies (2005) has developed a conceptual model for open sharing for MIT Opencourseware. The concept consists of tools (OSS, LMS, CMS), content (MIT OCW, Google Scholar), and implementation resources (Creative Commons, documentation). Anderson (2009) emphasized that the technical integration of pedagogical, administrative, social, and personal aspects is essential for effective OER applications. Conole and Alevizou (2010) reviewed about twenty key models and frameworks that describe different theoretical perspectives and have been used in e-learning. They indicated that the terms *models* and *frameworks* be considered synonymous since these terms are contested and appear to be used fairly interchangeably in educational contexts. Diallo, Wangeci, and Wright (2012) suggested a consortium model, which highlights collaborative planning, decision making, and OER development across educational institutions that have different political, geographical, cultural, and language backgrounds but that share a common vision to address the needs of their learners. The African Virtual University (AVU) developed a conceptual framework and architecture to meet the needs of learners, teachers, and researchers in Africa and to join the OER movement worldwide. Betaman (2006) emphasizes that AVU OER architecture shall provide space for future developments as the OER movement has yet to mature and will inevitably develop beyond its current limits.

In the context of university education the OER movement leads to a radical rethinking as to how course material and educational resources are to be produced, shared, and reused (Conole & Culver, 2009; Lane & McAndrew 2010, McAndrew, 2010). Lane and McAndrew (2010) give emphasis to the discussion and ask if open educational resources are systematic and appropriately organised for learning practices. McAndrew (2010) argues that it is time for a new educational paradigm (i.e., by creating an appropriate OER framework). Also, if university course material is made more visible, there will be several benefits for all interested parties: good material will be widely used, thus

heightening the teacher's and university's reputation; potential students will be able to preview the programmes they wish to take; and freely available material will enhance the field of distance learning.

One impediment to the increased use of OER in universities and ODL institutes is the difficulty in finding relevant resources. This is mainly due to the lack of an effective and consistent organised system/mechanism such as an appropriate framework in which the relevant resources are organised and become easily traceable without any wastage of time and effort. Another challenge is to find some appropriate organised mechanism for student support services including academic credit for distance learners. Daniel (2010) expressed the view that students seek flexible study opportunities and also want their achievement recognized in credible credentials.

During the past decade, a number of concepts, initiatives, and strategies have emerged worldwide to support the development and use of OER, but in India these are comparatively invisible. Many of the OER which have the potential to reduce costs, improve quality, and increase access to education opportunities (Daniel, 2011; Plotkin, 2010) are presently untapped in the DES of India. The creation of an OER architecture framework is one vital answer to meet the above mentioned challenges and to ensure better accessibility for distance learners. Equality and access to learning and education are supplementary aspects (Atkins, Brown, & Hammond, 2007). It would also assist in more appropriate and effective delivery of distance education.

The OER framework thus established would play a leading role in systematic development and organised use of OER in the DES of India. The OER framework would further provide a unique opportunity to deploy Indian experts to harness the concept of OER to the benefit of distance educations systems, ODL institutions, and associated educators and learners all across the country. The OER framework would provide a wealth of information and educational resources, which could be applied in a variety of face-to-face or distance education environments. There is strong evidence of growing interest in OER but still a great deal of work needs to be done before OER become mainstream practice in the DES of India.

From the above discussion, it may be inferred that an OER framework has gained global prominence within educational circles, particularly those related to open and distance education. Its adaptability in DE would suit the teaching-learning conditions of providing quality education to distance learners. Many organisations (BC Campus OER, 2011; JISC OER, 2010; Betaman, 2006; Stacey, 2011) have worked in the field of OER so as to improve the quality of education to be provided to their learners. However, presently OER are not adequately organised in ODL institutions of India, although there is an urgent need to organise OER in a manner capable of increasing access to distance education and improving its quality. The major challenges faced by ODL institutions in India can be quickly addressed through the use of an appropriate OER framework as it can significantly change the discourse around the existing educational systems and can also improve the availability, affordability, and accessibility of knowledge bound up in

the open educational resources involved. Thus to have a more systematic and good learning environment in ODLIs, it is desirable to establish an appropriate OER architecture framework.

Accordingly in this article an OER architecture framework is presented. The OER architecture framework is based on existing theories concerning open content, open education practices, and the authors' local experiences. These form the theoretical and empirical elements used to populate this architecture framework for establishing OER processes and systems for India. The OER architecture framework is designed as a standard set of six dimensions pertaining to the distance learning environment, all of which have been further integrated with various components involved in the key activity areas of ODLIs. In addition, the authors propose a knowledge and information base and a web portal in the form of a series of knowledge repositories that are built by integrating the ODL-related OERs into a web system. The various advantages obtained by implementing such a system are discussed. The present study offers an approach to refine strategy and tactics associated with OER initiatives for their adoption and long-term sustainable future. Further, it outlines how to start and work iteratively to set up such an educational framework to facilitate the creation of an appropriately structured and highly needed OER-based organisational system for the DES of India.

OER Architecture Framework

The architecture framework (Figure 1) contains six dimensions: pedagogical, technological, managerial, academic, financial, and ethical (Khan, 2001). The dimensions are structured with component areas of relevance: IT infrastructure and services, management support systems, open content development and maintenance, online teaching and learning, and learner assessment and evaluation.
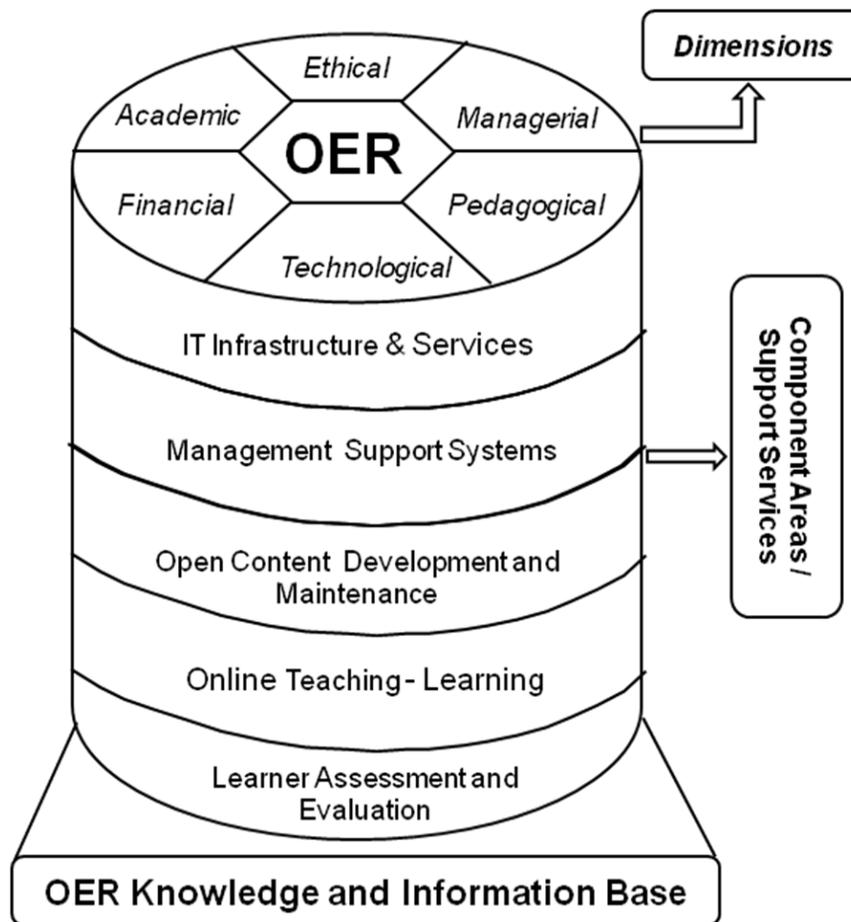
*Figure 1.*The OER architecture framework.

From this basic framework while integrating the characteristic dimensions with key activity areas, the OER knowledge and information base has been created in the form of a group of knowledge repositories.

The Characteristic Dimensions

Pedagogical.

The pedagogical dimension of the OER framework refers mainly to OER-based open initiatives such as open online courses, openly public teaching and learning, open study groups, and so on. This dimension pertains to issues concerning open initiatives such as content analysis, goal analysis, design approach, organisational methods, and ODL strategies.

Technological.

The technological dimension of the OER framework refers to the technological infrastructure of distance learning environments, including issues such as infrastructure planning, designing hardware and software, and technical design for learning

programmes, such as page and site design, content design, animation, multimedia, navigation, and usability testing.

Managerial.

The managerial aspect of the OER framework is mainly concerned with the planning and management of administration and other educational activities required for fostering a distance learning environment. It also includes the execution of open management policies along with opening up access to the institution's managerial information and data. Further to this, management involves framing educational policies and decision making with regard to development and maintenance of a good learning environment, delivery of quality distance education, distribution of associated information, and so on.

Academic.

The academic dimension of the framework involves the creation and use of online courses and programmes and teaching and learning materials and techniques, including open text books and SLMs (self-learning materials), for the benefit of students.

Financial.

The economic/ financial dimension mainly refers to budgeting (i.e., management and availability of finances for the development, implementation, and maintenance of educational systems based on OER). It would also involve developing a sustainable and cost-effective business model, educational systems, and processes for the associated OER initiatives.

Ethical.

The ethical considerations of open and distance learning relate to geographical diversity, learner diversity, legal issues (such as licensing), and information accessibility as related to the general institutional information.

Key Component Areas and Support Services

IT infrastructure (services and networking).

An appropriate OER-based IT infrastructure is required for the proper operation and management of the concerned ODLI. The IT infrastructure should further help in proper dissemination, sharing, and utilization of OER so as to provide good quality course/programme content, e-content, instructional processes, web-based systems, and others. Using an appropriate IT infrastructure, several systems and solutions are to be developed and made available by the relevant services deployment and delivery departments. So, OER-supportive IT infrastructure services would involve open source education technologies that support the development of tools, techniques, and processes

for the distance education system, including the creation of online systems to provide support for online learners. As such the IT infrastructure would involve open source software (OSS) and their applications, Internet, open web, online systems, learning management systems (LMS), and others.

In the context of IT infrastructure services, the OER framework would be employed firstly to establish VPN networking of all ODLIs in the country and subsequently interlinking them through a national/ international telecommunication backbone. The national framework would work through the VPN system with the required IT solutions to be provided by the IT departments. Such a network with required bandwidth would be established with the purpose of providing quick data transmission, retrieval, and free flow of other information. This networking would serve for the DES of India the objectives of online centralised services (such as student admissions and instant confirmation); online assignment generation and online results; increased interactivity; quality promotion; telecounselling; teleconferencing and telecollaboration in strategic matters among associated DE institutions (i.e., all partner institutions [PIs] across India).

Management support systems.

The management support system (MSS) works mainly through the use of FOSS for coordinating and managing the various functions and activities pertaining to the DES in India. The implementation of an OER approach by the MSS leads to adopting the open pedagogies that would leverage open source educational technologies, online instructional design, and open practices of teaching and learning. Thus considering the above mentioned functions the MSS would plan to establish an OER-based organisational system in the DES of India which would streamline its functional activities in such a way that the OER materials would be developed, shared, and adapted efficiently and effectively.

The policy of open management is adopted by the MSS. It is mainly concerned with open access to the institutional managerial information and data. Open management makes management more transparent and open in its activities, ensuring that the associated stakeholders can get better information about the work and activities of the management and the concerned ODLI. In addition it would promote transparency and would be able to stimulate creative and innovative activities around the use of such information so as to deliver significant social and economic benefits.

Open content development and maintenance.

One of the main tasks to be performed under this OER architecture is to make appropriate arrangements for the development of open content of reasonably good quality. Such open content would mainly be used for teaching-learning purposes and include materials related to courses and course components such as learning objects, teaching content, manuals related to practical labs, textbooks, and so on. It may also

include production of audio, video, and animated educational programmes. In addition to this, it may develop new OER and also make use of existing OER (available locally or globally) to subsequently create complete online credit-based academic programmes. Each academic programme would be in the form of a suite of several interconnected applications, structured and presented in a wiki system (Srivathsan, 2009). The OER-based open content is to be developed in two groups, namely an open course guide (OCG) and an open program guide (OPG). The overall TEL components for a programme to be developed would broadly include the following: an open program guide, an open course guide, a wiki, a discussion forum, querying services, SMS, m-learning services, and so on. However, it is suggested that every academic programme of an ODLI may establish the OPG and associated OCG(s) for each course.

Open (online /public) teaching and learning.

Using OERs, educators can undertake the work of teaching by using blogs and wikis. The course syllabus, modules, activities, and assignments would be publicly visible. Students can be officially enrolled in any course and their learning would be viewable by the public. An efficient OER-based TEL system of open e-learning is required to be established so as to provide support for all educational programs/courses offered by the concerned ODLI. Every ODLI would be required to set up various technology systems, such as Web sites, Internet, TV channels, EduSat, IP-TV, mobile, and community radio, so as to have an efficient DES which can help distance learning students. Such a TEL system is also required to support the delivery of various programs/courses offered.

Learner assessment and evaluation.

Learner assessment is involved in certifying the academic level of performance achieved by the students in a particular course of study. A course evaluation system (CES) would be developed for learner assessment through the use of OCG/OPG. OCG/OPG would be set up in the wiki areas (Srivathsan, 2010) of the DES and cover details such as course prospectus, facility for course registration, links to course wiki, querying system. It would also support a testing and evaluation system along with the associated learner database management system. Arrangement for practical, design exercise, and term papers, and timely evaluation of answer scripts and term papers would be ensured.

Thus a learner assessment and evaluation system would initially be a part of the design and conduct of the particular course with its course content and resources to be made available through OCG/OPG. Subsequently the various facilities including automation would be added for an examination and evaluation system. This complete system is to be structured to enable greater interactivity and assured engagement of learners in learning and assessment.

OER Knowledge and Information Base

A knowledge and information base in the form of a series of knowledge repositories involving ODL-related OER would be developed as follows:

1. Establish a dynamic collection of Indian and global OER: Tag and upload available OER, including those currently under development and others that are yet to be developed for inclusion in a DES OER collection.

2. Establish a database involving open pedagogies: Design and build a database involving open pedagogies as related to the DES in India. Also constitute a series of OER monographs as related to the creation, organisation, dissemination, and utilization of OERs and other related Indian open content.

3. Establish a database related to ODL activities: Create and implement a DES-OER research database related to ODL activities in India to ensure the appropriate implementation of OER-based activities and associated academic/educational study programmes in the DES of India.

4. Establish a database of OER practitioners: To extend the support required for the efficient working of an OER community of practice in India, identify competent OER practitioners including experts/authors who can write a series of OER monographs related to the DES in India.

5. Establish a learning object repository: Establish a comprehensive and powerful backend 'database of OERs' featuring a learning object repository of Indian resources.

Information Management in an OER Framework

A knowledge repository would serve as an information management and processing tool for decision makers to address policy issues pertaining to the various aspects of the country's DES. Such a knowledge repository also focuses on identifying and providing for priority needs and available resources of information as inputs in order to promote quality online education provisions through ODL. The tool is to be targeted towards decision makers and would be of value to a wide range of ODL professionals such as instructors, curriculum developers, software engineers, and instructional designers (UNESCO, 2004). A powerful indexing service is to be implemented that would allow federated/browse searches by employing appropriate browsers. Thus a series of knowledge repositories based on the OER architecture framework would support in an organised way the regional and cross-sector development of ODL through a systematic sharing of educational resources.

Creation of Web Repository

The DES knowledge and information base would ultimately be subsumed into an integrated web-based information system (Khanna & Basak, 2011) while creating an OER web repository. A series of learning materials pertaining to various fields of study would be developed and included in the repository. In order to increase reusability, the learning materials would be developed preferably as simple videos or photos, which could be used as materials in online courseware. A subset of metadata, based on IEEE LOM (learning object metadata) or any other suitable technology, is to be tagged to each OER, and different information, such as copyright, quality, and educational characteristics, would be included. Such an approach helps to achieve significantly improved search results and also to realize new value-added services. In other words a developmental process is to be adopted in which the quality of content and metadata would be improved and assured. The standardized curriculum is thus established and the associated web repository is created.

DES-OER Web Portal

The DES-OER web portal would be created for the ODL institutions by adopting a developmental process strictly in accordance with the proposed OER architecture framework. Such a web portal would offer print resources and audio-visual materials and provide telelearning and teleconferencing facilities. This portal would help not only to promote open education but also to supplement the existing teaching-learning process for online distance education.

Benefits and Application

The benefits of using OER in ODL systems as reported in the literature (BC Campus OER, 2010; Daniel, 2012; JISC OER, 2010; Betaman, 2006; Stacey, 2011) are enormous. However, these benefits are further enhanced when the OER are employed in a DES in a well-organised and systematic way (i.e., in the form of an OER architectural framework). Some of the benefits that can be accrued from employing the OER architecture framework as presented in this article are as follows:

1. The educational content is open and free, and teachers while involved in their teaching pursuits can concentrate on the design of learning rather than wasting time and effort creating content. Also using OER, one can build upon other people's work in an ODL system and so improve upon teaching and learning pursuits conveniently and effectively.

2. Copyright of OER can be made available easily under an open license and also can be shared conveniently with the global community for collaboration and further improvement. This process would support learning and would also help

in further enhancement of the module/course developed during its review process.

3. The use of OER in a DES would enable the learners to have access to a wider range of student support activities. Thus,

- The students' learning experiences should improve when they have convenient access to resources like pictorial presentations, photographs, videos, and so on.

- Students can share and access OER and develop case studies as part of their development. OER can help students make their own academic plans.

- Details of the courses would be available before they take up the course for study. The latest and most widely reviewed materials would be available which would improve their knowledge and understanding while pursuing their courses.

- OER would provide major cost benefits. Also their accessibility would be 24 x 7.

- OER can be modified, mixed and matched, and enhanced.

- For learners, whether as formal students, doing non-formal work related training, or studying informally as self-directed lifelong learners, the greater availability and accessibility of such resources should help them to learn new things, to take decisions, and to create or revise OER.

Conclusion

In conclusion the adoption of an OER architecture framework in the DES of India should bring about significant improvements in educational practises and systems pertaining to ODLIs. The proposed OER framework would enhance the quality of distance learning through the development of high quality e-content, instructional processes, course/programme content development, IT infrastructure, and network systems, all of which are considered essential for realising excellence in distance education. The OER framework would improve the existing capabilities of ODLIs and bring standardisation, efficiency, and effectiveness in a systematic and structured way so that they can provide distance education of reasonably good quality.

With full implementation and use of the OER architecture framework, integrated web system, and networking of ODLIs in India, all the associated distance education institutions would be able to share on a national basis the available physical and intellectual resources, evolving a common pattern and structure for high quality distance learning programmes all over the country. Additionally, it would help to integrate and streamline the delivery of distance education around the country by

systematically developing new educational content and resources. Thus, it would pave the way to build an appropriate educational system in India, which would provide equity and quality in distance education at the national level.

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Athabasca University

Development of ODL in a Newly Industrialized Country according to Face-to-Face Contact, ICT, and E-Readiness

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Abstract

A large number of unqualified and under-qualified in-service teachers are holding back socio-economical development in South Africa, a newly industrialized country. Open and distance learning (ODL) provides an innovative strategy and praxis for developing and newly industrialized countries to reach their educational and socio-economical objectives through professional development and training. In order to examine factors which affect the success of ODL offered by the North-West University in South Africa, a qualitative and quantitative research approach is used. Factors examined include face-to-face classroom contact, the implementation and use of ICTs, and e-readiness. The relationships between these factors are also discussed. A questionnaire was administered to 87 teacher-students in four Advanced Certificate in Education (ACE) programs to collect quantitative data regarding aspects of their classes and the e-readiness of students. This data was qualitatively elaborated upon by three semi-structured, open-ended focus-group interviews. Besides descriptive statistics, Spearman's rank-order correlations (r) were determined between variables pertaining to negative feelings towards face-to-face classroom contact, ODL as students' choice of delivery mode, and students' positive attitude towards information and communication technology (ICT). Combined quantitative and qualitative findings were used to evaluate the effectiveness of contact classes as well as the e-readiness of students towards the attainment of ODL development Phase D. This phase refers to UNESCO's description of ICT implementation, integration, and use. Relationships (Spearman's rank-order correlations) between ODL, as teacher-students' choice of educational delivery mode, and aspects of their e-readiness suggest that the e-readiness of teacher-students is

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implicit to their choice of ODL as educational delivery mode for professional development.

Keywords: Open distance learning; ODL; development phases; pedagogical support platforms; contact classes; information and communication technology; ICT; e-readiness; m-learning; mobile learning; South Africa; North-West University

Orientation, Problem, and Aim

As of 2011, South Africa has been listed as a *newly industrialized country* (NIC) by the International Monetary Fund (2011). NICs are characterized by (i) an economy that has not yet reached 1st World status but has, in a macroeconomic sense, outpaced it's developing counterparts; (ii) rapid economical growth that is export-oriented; (iii) an increasingly open-market economy that allows free trade; (iv) ongoing industrialization; (v) migration of populations to cities to work in industries, factories, and mines; (vi) increased social freedom and civil rights, and so on (International Monetary Fund, 2011). Albeit this achievement, a large number of unqualified and under-qualified in-service teachers are holding back socio-economical development in the country. In 1994 there were an estimated 85,000 unqualified and under-qualified teachers within the South African Education System, and in 2004 there were still 20,000 unqualified teachers (Pandor, 2004). Since 2005, the Department of Education has released no further statistics in this regard. Distance education (DE) is often the most practical educational mode to deliver professional development to the majority of these teachers who predominantly operate in rural areas. In order for these teachers to enroll full-time at on-campus universities, it is necessary to temporarily halt or abort their teaching responsibilities at already under-staffed schools, which is demographically and financially difficult or impossible (Cilliers, Basson, Kirschner, & Rutherford, 2000; Pandor, 2004; Van Zyl & Spamer, 2010). In 2004 the School for Continuing Teachers' Education (SCTE) was established on the Potchefstroom Campus of the North-West University (NWU) in order to deliver a constructive contribution to improved education in South Africa. Since 2005, SCTE has provided training and professional development via open distance learning (ODL) to unqualified and under-qualified in-service teachers, who predominantly work in rural areas.

Edwards (1995) and Picciano (2000) promote open distance learning (ODL) as a new educational delivery mode that diverges from DE. DE makes teaching over distance possible to a mass market through the use of curricula and mass-produced course materials that are lecturer-centered. ODL, on the other hand, is student-centered, focusing on the individual needs and expectations of students and local requirements, rather than delivering pre-pact curricula for the masses (Edwards, 1995; Picciano, 2000). According to Moore and Kearsley (2004), ODL has unique characteristics: Students can enroll for a course or program if they meet the required enrolment criteria,

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and students can start with a course or program at any location or time of the year. Students may be able to design their own unique curriculum to meet specified credits. According to the United Nations Educational Scientific and Cultural Organization (UNESCO, 2002), there is a growing interest in ODL, usually supported by the implementation and use of various forms of information and communication technology (ICT).

The implementation and use of ICT in education refers to the implementation and use of various types of technology (i.e., both hardware and software), including the Internet, to transmit knowledge, particularly to students who are not already highly motivated to learn or well versed in the art of using and interpreting information (Carnoy, 2004). UNESCO (2002) describes the development of DE and ODL according to four phases of ICT implementation, integration, and use (Table 1). In ODL, the use of ICT makes the transference of knowledge and skills possible to large numbers of students, regardless of space and time (Keegan, 1996; Moore & Kearsley, 2004).

Table 1

UNESCO Development Phases of DE and ODL according to ICT Implementation, Integration, and Use

Development phases of DE and ODL	ICT implementation, integration, and use
Phase A	Correspondence systems based on written and printed documents, often accompanied by audio-visual material that is send via postal service
Phase B	Educational television and radio systems that use a variety of innovative technology for teaching and learning communication, e.g., landlines, satellite and cable TV and the broadcasting of direct or prepared lectures to individual home-based students or student groups in distant classrooms
Phase C	Multimedia systems that include text, audio, video, and computer-based materials, as well as personal contact to groups and individuals to certain extend. Specialist teams are involved in the presentation and distribution of programs to a large number of students who are often spread over an entire country

Development phases of DE and ODL	ICT implementation, integration, and use
Phase D	Internet-based systems through which multimedia materials (text, video and graphics) are delivered through computers to individual students in electronic format, as well as access to data-bases and electronic information systems (libraries). Also, creates space for contact classes and vacation schools in which lecturers/facilitators support and provide students with study guidance

E-learning refers to the use of electronic technology (i.e., ICT) to deliver educational material and learning (Law, Pelgrum, & Plomp, 2008). Rosenberg (2001) limits e-learning to the use of Internet technology to enhance the learning and outcomes of students. Web-based learning is increasingly being used to deliver essential practical skills training as more applications, such as specialized software simulations for scientific laboratory experiments, become available and are being integrated and used by ODL institutions as part of their e-learning. E-readiness refers to students' readiness to make use of ICT and e-learning within their studies (Du Toit, 2010), including how to access, evaluate, and adapt resources for teaching and learning, establishing a blog or Web site, and so on. Since 2005, the SCTE has implemented various ICT innovations in support of curriculum outcomes and contact classes, including television broadcasts, short message services (SMSs), educational digital video discs (DVDs), as well as Internet access and interactive whiteboards at study centers. Some, such as television broadcasts, were found to be impractical and not financially viable.

NWU (SCTE) undertook various international audits to evaluate and ensure the quality of the academic programs it offers; however, it became essential to evaluate various components that influence the overall development and success of the ODL delivery mode being used at the institution. According to Peters (2000), Tait (2000), and Zheng and Smaldino (2003), the development and success of DE and ODL are determined by various components: (i) curriculum and interactive study material specifically developed for the unique context of DE and ODL students, recognizing their unique educational needs and expectations, barriers, and socio-economical context; (ii) an academic contract, explicit or implicit, between lecturers and students to work towards the achievement of specific learning outcomes; (iii) an effective two-way communication network between lecturers and students; (iv) face-to-face classroom contact; (v) the implementation, integration, and use of various types of ICT; (vi) student e-readiness; (vii) effective logistics; (viii) continuous research and reflection; (ix) delivery mechanism; (x) frequency of feedback; (xi) testing; (xii) interactivity, and so on.

According to Guri-Rosenblit (2005), many DE/ODL programs make use of additional face-to-face classroom/tutorial contact during vacations (e.g., summer schools). Note also that face-to-face contact classes contribute to the success of ODL because they deliver important additional pedagogical support to ODL students as contact classes provide an opportunity to interact with and receive support from lecturers/facilitators and other students (Garrison & Vaughan, 2008). Attendance at face-to-face classroom contact is usually non-compulsory because of its pedagogical supportive function. The SCTE (NWU) presents additional, non-compulsory face-to-face classroom contact over weekends and during school holidays within a radius of 100km from each student's home/workplace. During these face-to-face tutorials of approximately one hour per module, lecturers and facilitators review difficult and important module content, while students are assisted with their problems and have the opportunity to network with each other. Students are encouraged to form study groups.

Previous impact research conducted by the NWU on its ACE-programs delivered via ODL (e.g., Kok, Rabe, Swarts, Van der Vyver and Van der Walt, 2010) found that students are satisfied with the quality of module content. The current investigation found that 93.2% of students who attended face-to-face classroom contact and 88.4% of those students who did not attend any contact classes reported that they are satisfied with module content and the study material they received.

The scope of the current investigation entails specifically the fourth, fifth, and sixth components listed above by formulating the following research aim: to evaluate the development and success of ODL, as the educational delivery mode used by the SCTE at NWU within the context of a newly industrialized country, according to face-to-face classroom contact, the implementation and use of ICT, and the e-readiness of students.

Research Design and Methodology

This investigation used a sequential developing research design (Leech & Onwuegbuzie, 2009; Onwuegbuzie & Leech, 2005) that made use of mixed-methods which included both quantitative and qualitative research methods for data collection and analysis (Onwuegbuzie & Leech, 2005; Tashakkori & Teddlie, 2003).

Quantitative and Qualitative Sampling

The study sample is representative of the students registered in four Advanced Certificate in Education (ACE) programs (i.e., Foundation Phase, Learner Support, Mathematics Education, and Geography). These programs were delivered by the SCTE via ODL to students throughout the nine provinces of South Africa. A computer-based random selection was performed to identify 200 students. Of these students, 100 attended one or more contact sessions at one of the 29 study centers throughout South Africa during February, March, May, August, and September 2009, and 100 students

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attended no contact sessions during this period. The 200 students were selected from an initial pool of 1,310 students who wrote the ACE examination during October 2009. Of the 200 students who were invited to voluntarily participate, 87 students participated in the study. Forty-four of these students attended no contact classes and 43 attended one or more contact classes. Table 2 provides the demographical information of the students involved in the quantitative research sample.

Table 2

Demographical Information of the Quantitative Sample (N = 87)

	Attended no contact classes		Attended one or more contact classes		Totals	
	n	%	*n*	%	*n*	%
ACE programs						
Mathematics Education	12	27.3	7	16.3	19	21.8
Learner Support	17	38.6	19	44.2	36	41.4
Foundation Phase	14	31.8	16	37.2	30	34.5
Geography	1	2.3	1	2.3	2	2.3
Total	44	100	43	100	87	100
Gender groups						
Female	33	75	36	83.7	69	79.3
Male	11	25	7	16.3	18	20.7
Total	44	100	43	100	87	100
Age groups						
31–40	17	38.6	12	28.6	29	33.7
41–50	23	52.3	24	57.1	47	54.6
51–60	4	9.1	5	11.9	9	10.5
61 and older	-	-	1	2.4	1	1.2

Total	44	100	42	100	86	100
Regions (provinces)						
Eastern Cape	8	18.2	13	30.2	21	24.1
Free State	1	2.3	1	2.3	2	2.3
Gauteng	2	4.5	-	-	2	2.3
KwaZulu-Natal	5	11.4	4	9.3	9	10.3
Limpopo	5	11.4	9	20.9	14	16.1
Mpumalanga	6	13.6	7	16.3	13	14.9
North-West	8	18.2	-	-	8	9.2
Northern Cape	3	6.8	3	7.0	6	6.9
Western Cape	6	13.6	6	14.0	12	13.8
Total	44	100	43	100	87	100

In order to collect in-depth context sensitive data regarding student experiences, expectations, needs, and fears concerning face-to-face classroom contact, the implementation and use of ICT, as well as their e-readiness, three groups of students comprising eight students per group were selected to participate in qualitative focus-group interviews. Members of these focus groups were representative of the four ACE programs and of both gender groups. Approximately 50% of those in focus groups attended one or more contact classes and 50% attended no contact classes.

Mixed-Methods Data Collection

Data was collected using quantitative and qualitative data collection methods and procedures. A five-point Likert-type questionnaire (scales: *totally agree, agree, do not know, disagree*, and t*otally disagree*) was designed by the researchers. The questionnaire design and items were evaluated and approved by the Department of Statistical Consultation Services at NWU. The questionnaire comprised a demographical section, followed by 49 items regarding various aspects of contact classes, including quality, perceived value, and problems experienced. The questionnaire also included a section on the e-readiness of students (16 items). Besides

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the Likert-type items, the quantitative questionnaire also included open semi-structured questions that collected qualitative data in the form of written responses (personal narratives) regarding the opinions and experiences of students regarding contact classes. The questionnaire was mailed, together with a self-addressed pre-paid envelope, to the respondents. A research letter that accompanied the survey described the nature and objectives of the study as well as an invitation to voluntarily and anonymously participate. No time limit was prescribed to complete the questionnaire. As very few participants have access to fax machines (which are very expensive in South Africa) they were not asked to fax the questionnaires back. Participants were asked to mail their completed questionnaires back to the researchers using the self-addressed pre-paid envelope. The slowness and efficiency of the mail system were taken into account and could have been contributing factors for the return rate of 43.5% ($N = 87/200$). The identities of research participants were unknown to the researchers as the questionnaire did not collect any data that could identify participants. A Microsoft Office Excel™ file captured the data for analysis.

The qualitative focus-group interviews were guided by a semi-structured open-ended series of questions. Students were contacted by telephone and invited to voluntarily and anonymously participate at two contact centers on pre-arranged dates. Two interviews were conducted at the Potchefstroom study centre, another at the Rustenburg study centre. Students completed permission and consent forms. Interviews were captured with digital data-recorders and transcribed by the researchers. Qualitative data collected by the questionnaire (personal hand-written narratives) was combined with focus-group interview data into an integrated qualitative dataset. The textual responses and interview transcriptions were captured in a Microsoft Word™ file for qualitative data-analysis.

Data Analysis

A professional statistician from the Department of Statistical Consultation Services (NWU) used Statistical Package for the Social Sciences (SPSS™) to perform the quantitative data-analysis. Although distinction was made between students who attended one or more contact sessions and those who did not, from the findings it became clear that those students who did not attend any contact classes answered the questions pertaining to contact class attendance as if they did attend. These students most likely attended contact classes in the past (before February 2009). Besides descriptive statistics, Spearman's rank-order correlations (r) were determined between variables (items) on the five-point Likert scale of the questionnaire as these items exhibit rank-order. Spearman's rank-order correlations (r) are interpreted as follows: $r = 0.1$ (small effect); $r = 0.3$ (statistical medium effect that tends towards a practical significance) and $r \geq 0.5$ (a large effect indicative of practically significant correlations).

One of the researchers used Atlas.ti™ to analyze the integrated dataset according to the constant comparative method of content analysis (Glaser, 1965), which identified data

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categories and themes relating to students' perceptions, experiences, problems, challenges, and expectations concerning contact classes, as well as their e-readiness. Coding density of data categories relevant to the current exposition are (i) positive perceptions and experiences of students concerning contact classes─four themes, 159 quotations; (ii) challenges and barriers that prevent students from attending contact classes─five themes, 82 quotations; (iii) problems, negative opinions, and experiences of contact classes─two themes, 66 quotations; (iv) computer literacy─62 quotations; (v) access to technology─21 quotations; (vi) learning with technology─26 quotations; (vii) DVDs─9 quotations; and (viii) mobile learning─5 quotations. Codes, categories, and themes reduced the data to highlight the key issues.

Discussion of Findings

Both quantitative and qualitative findings are integrally reported through the trifocals (i) effective face-to-face classroom contact, (ii) the implementation and use of ICT, and (iii) the e-readiness of students.

Effective Face-to-Face Classroom Contact

Since 2005, the SCTE has used an ODL delivery mode that integrates face-to-face classroom contact/tutorials. Teacher-students have the opportunity to attend scheduled non-compulsory classroom contact (twice a month and mostly over weekends and during school vacations) at any of the 29 study centers. Mixed-methods identified the following findings pertaining to face-to-face classroom contact.

Satisfaction with geographical location of contact centers.

The majority of students (89.5%; 77/86) who answered the questionnaire (i.e., 95.3% of students who attended contact classes and 83.8% who did not) indicated that they are satisfied with the geographical locations of contact classes. However, despite the fact that all students have contact centers located within a radius of 100km, geographical distances seem to remain a challenge for some students who participated in the focus-group interviews, mainly due to travelling costs.

Satisfaction with the quality of face-to-face classroom contact.

In general, 65.6% (40/61) of students reported that they are satisfied with the quality of face-to-face classroom contact. Of the total group of students who attended no contact classes, 31.7% are not satisfied with the quality of contact classes. The qualitative interview data reveals the following factors that possibly contribute to students' dissatisfaction with the quality of face-to-face tutorials: (i) scheduling of classroom contact, (ii) low quality of certain lecturers/facilitators, (iii) advancement of certain students, (iv) language of instruction, and (v) bad relationships with certain

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lecturers/facilitators. Students' dissatisfaction with the quality of face-to-face classroom tutorials contributes to students' negative feelings. From this finding one could speculate that students' dissatisfaction with the quality of contact classes may be a possible reason for non-attendance.

Reasons for face-to-face classroom attendance (motivation and perceived value).

Qualitative findings reveal that students' main motivation for contact class attendance involves the information they receive as well as the opportunity to ask questions to lecturers/facilitators:

> During contact classes I feel positive because I get all the information in my modules and also how to study them and how to do some of my assignment that I was not aware of. I also get the previous questioning styles in each module.

> I feel positive because I get more explanation. I also have a chance to ask questions when I don't understand.

Accordingly, the majority of students' value face-to-face classroom contact/tutorials because of the contact they have with lecturers/facilitators and the personal study guidance they receive from them:

> Contact sessions are of the utmost importance because the lecturers explain all the modules...then students do understand the assignments and the exam.

> ...but my experience from the contact sessions...I sat in one contact session where I was the only student, and it was fantastic, I got special treatment it was a very wonderful contact session, as it was the one that I really needed, it was computers. I was very pleased.

In response to the questionnaire, 90.6% (77/85) of students indicated that they attend contact classes to ask study-content questions to lecturers/facilitators; while 75.8% (47/62) specified that contact classes help them complete assignments. While 86.9% (73/84) of students reported that contact classes help them to prepare for examinations, 81.3% of those who attended, and 70.7% of those who did not, pointed out that they would not merely attend contact classes to receive examination information or tips. Of the total group of students who attended one or more contact classes, 62.8% indicated that they received individual attention at contact classes during 2009.

Students furthermore reported in the focus-group interviews that they attend contact classes to obtain additional information from lecturers/facilitators: "We attend to get information...And we go because we don't have anybody else who can help us."

This seems to have a positive effect on the self-confidence of students: "I felt more confident with the contact sessions."

The overall findings indicate that 79% of students who attended contact classes and 85.7% of students who did not, believe that to study via ODL is the best for students like themselves; while 92.9% of both groups indicated that the NWU must continue to deliver programs via ODL.

Reasons for no contact class attendance (barriers).

The majority of students (74.4% of students who attended contact classes and 72.1% who did not) indicated that personal circumstances prevent them from attending contact classes. Students reported during the interviews that distances to contact classes, financial barriers, and personal responsibilities (e.g., family obligations) were the main challenges preventing them from attending contact classes. These reasons validate why face-to-face classroom contacts should not be compulsory.

> The only challenge is that the centre is very far from where I live.

> What I dislike: contact sessions are too expensive for me because I am travelling from one place to another paying a lot of money for transport and food.

> I feel positive-it is just that I cannot attend regularly due to financial problems, and the distance.

Some individuals are parents with matrics or tertiary students as children which brings along vital primary responsibilities.

It seems that financial barriers are not predominantly the cause for no contact class attendance as 53.4% of students who attended contact classes, and 55.8% of those who did not, indicated that it is not too expensive for them to attend contact classes.

Factors like personal circumstances and responsibilities (74.1%), financial barriers, large distances to contact classes, and circumstances beyond their control seem to be the major reasons that prevent teacher-students attending contact classes. These and other factors are the reasons why face-to-face classroom contact is non-compulsory for NWU ODL students.

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Strangely enough, 58.1% of students who attended face-to-face classroom contact, and 43.9% of those who did not, were of the opinion that students should not have the right to decide for themselves whether or not to attend contact classes. Some students possibly feel that they will attend contact classes if they are forced to do so.

Negative attitude (feelings) towards face-to-face classroom contact/tutorials.

As already noted, 34.4% (21/61) of students are dissatisfied with the quality of face-to-face classroom contact. Despite student dissatisfaction, 93.1% of the total sample of teacher-students experience face-to-face classroom contact positively, while 5.7% experience it negatively. In order to help clarify the underlying reasons for students' negative attitudes, Spearman's rank-order correlations (r) were calculated. Practically significant correlations ($r = 0.8$) were calculated between negative feelings towards face-to-face classroom contact and (i) not being satisfied with the quality of contact classes, (ii) not being satisfied with facilitators' presentation of contact classes, and (iii) not being satisfied with guidance received from facilitators. These correlations show some of the underlying reasons why 5.7% of the total sample ($N = 87$) experiences contact classes negatively. As these Spearman rank order correlations were calculated for a very small sample (5.7% of 87), they should not be generalized.

Students' negative perceptions and experiences concerning various aspects of contact classes were further revealed by the findings of the qualitative research component. Students have a problem with contact classes scheduled on Friday afternoons after school hours as they have responsibilities at their schools that prevent them from attending. Furthermore, time available between various contact classes seems to be a problem:

> The gap between my modules for example when my 1st module is 9:00 (course name) the 2nd is 12:00 (course name) and the 3rd is 15:00 now I have to wait for a long time and feel bored because my modules are so far.

Other students feel that too many modules are presented at a specific contact class session, and that not enough time is allocated for each module to go over important content and discuss problems: "The things that I dislike are that there is no enough time for modules."

Implementation and Use of ICT

As already pointed out, UNESCO (2002) describes the development of ODL according to four phases of ICT implementation and use (Table 1). The SCTE went through the first three development phases (Phases A-C on Table 1). Instead of focusing on the development of Internet-based systems in Phase D, the SCTE's teaching-focus shifted more to personal contact (contact classes) mainly as a result of students' low computer

and Internet access in rural areas (Blignaut & Els, 2009; Law, et al., 2008). Although SCTE installed computers with free Internet at study centers and there is a constant increase in computer ownership and use among students, lack of ICT knowledge and skills still hampers the potential realization of e-learning.

E-Readiness of Students

SCTE has also recently initiated m-learning and a web-based Moodle platform for pedagogical support, with free Internet access and mini-libraries available to teacher-students at 36 study centers. The following findings pertaining to the e-readiness of students is provided below.

Access to computers and the Internet.

Of the total number of students who attended contact classes, 46.5% have access to a computer at home, against 53.5% who do not. Only 29.5% of students who did not attend any contact classes have computer access at home, while 70.5% of them do not. Students who do not have computer access at home also tend not to attend any contact sessions. Of the total sample, 73.6% (64/87) have access to a computer at school/work. Correspondingly, some students confirmed access to computers at home/school during the focus-group interviews, while others indicated the absence of technology access and skills:

> The thing is, there are less computers in our schools that is why most of us are still behind with this technology of computer, because there are few and it is used with administration. You see, so if you are not in the administration it is very difficult for you unless you got your own one.

> So and then the problem is that not all of us are having this computers at our homes, and then not all of us can operate it.

Only 9.3% (8/86) of students have access to the Internet at home, while 29.9% (26/87) have Internet access at school/work. The latter finding possibly reflects the phenomena, reported by Els and Blignaut (2009), that at most schools, especially at those in rural areas, the Internet is exclusively being used by school management and administration.

Computer literacy.

Twenty of 43 students (46.5%) who attended face-to-face classroom contact and 13 of 44 of those who did not attend (29.5%) indicated that they own a computer at home. The qualitative data reveals that some students are not computer literate, while others

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indicated that it is a priority for them to attain computer literacy and that they do not fear this challenge:

> Technology is very important for us [in] the future, we cannot get away from that...Technology is important for whatever you need to do as a person...to type a document or to search for things on the Internet
>
> We feel overwhelmed...we feel pleased. I am not afraid of technology, because...in so many, many ways, people are...trying...to talk with me, with CDs, DVDs, whatever...

And computer literacy promotes their self-confidence: "But going through that course that I was supposed to do, it was such a learning curve...and at the end of it I felt much more confident, and I was able to adjust those assignments."

Providing they receive support and guidance, computer illiterate students tended to be optimistic about their future use of computers: "But I think if someone could show me how to do it, it would help...I will be able to do that...I would be prepared to do that."

While some students indicated that their circumstances forced them to become computer literate, others emphasize the role of socio-economical and geographical contexts for the absence of computer literacy:

> That is another issue, you know, from where I am working...it is a little bit of a farm school. I really want to type it so that it would look very nice for the lecturer...so that the lecturer will see this guy tried his best. Then I write it, but sometimes I would turn to someone and ask, will you type it please? But this cost money...It is a problem.

Learning with technology.

Surprisingly, 70.9% (61/86) of students feel comfortable to use computers, while 65.5% reported they find it easy to type assignments on a computer. The former finding is possibly an indication of students positive attitude towards computers and their future prospects of using computers, while the latter finding could indicate that either it is possible for students to type their assignments themselves or that it is possible for them to let their assignments be typed by someone else. Some students confirmed during interviews that they type assignments on personal computers:

> Yes, I do have my own computer at home.

> I did type mine, I just want to say computers are very much helpful to our lives, because it save more time, and it is neat if you use a computer. Especially for myself, my handwriting's so bad. At least now I have submitted something that is nice. Anyone which can take it, can read it what I've wrote there.

Only 40.7% (35/86) of students feel comfortable to use the Internet, while 64% (55/86) are capable of getting information from the NWU (SCTE) Web site. It can be speculated that more students make use of the Internet, with support from others, than students who use the Internet by themselves. While 45.9% (39/85) of students feel that the SCTE should make more use of the Internet and emails to send information to students, only 34.9% (30/86) feel that the SCTE should make more use of the Internet and emails to send study material to students. Only 32.3% (20/62) of students find it easy to submit their assignments via email. The majority of students (76.2% who attended one or more contact classes and 84.1% who did not attend any) do not use email. Overall, students emphasized the importance of technology for learning: "Technology is very important for us the future, we cannot get away from that."

Mobile learning (m-learning).

The majority of students (78/86; 89.7%) have their own mobile phones. Despite the fact that mobile-learning is restricted by students who own old mobile phone models that lack certain functions (e.g., to receive multimedia messaging services or MMSs) (37.9% in the current investigation), 62.1% (54/87) already own mobile phones that receive photos and MMSs. Students seem interested in m-learning:

> I use my cellphone, especially when I'm doing my assignments.

> I think the technology is more important, especially to get the information from the cellphones, and also we get information from the cellphone and the computer. So it saves our time.

Currently, study information is sent to students' mobile phones, while some students, on their own or assisted by others, use their mobile Internet connection to access relevant study information from the NWU Web site. Of the total sample, 93.1% (81/87) indicated that the SCTE should make more use of mobile communication to send information to students, while 93.1% (81/87) feel mobile phones should be used to communicate timetables to students. Considering that the SCTE already makes use of short message services (SMS) to remind students of contact classes, 96.6% (84/87) of students confirmed that they regularly receive SMSs concerning contact classes. This

finding supports the findings of Turtiainen et al. (2009) that m-learning has an increasingly important role to play in developing and newly industrialized contexts.

Educational DVDs.

During the focus-group interviews, some students praised the educational DVDs that they receive and encouraged the SCTE to make more use of this type of ICT, while others felt that the DVDs were superficial and did not provide sufficient information:

> That is way I'm saying I found them a bit superficial, they were not sufficient, there were not enough meat on them. Once I got them, I have to be honest; I never put them on again. I felt that I got more out of the books and the discussions with the lecturers. And also from extra reading.

Relationship between ODL, as Students' Choice of Educational Delivery Mode, and Aspects of E-Readiness

Meaningful relationships (correlations) were found between variables on the questionnaire, using Spearman's rank order correlations. Figure 1 shows how ODL, as students' choice of educational delivery mode, relates to aspects of their e-readiness by means of the combined Spearman's rank-order correlation results.

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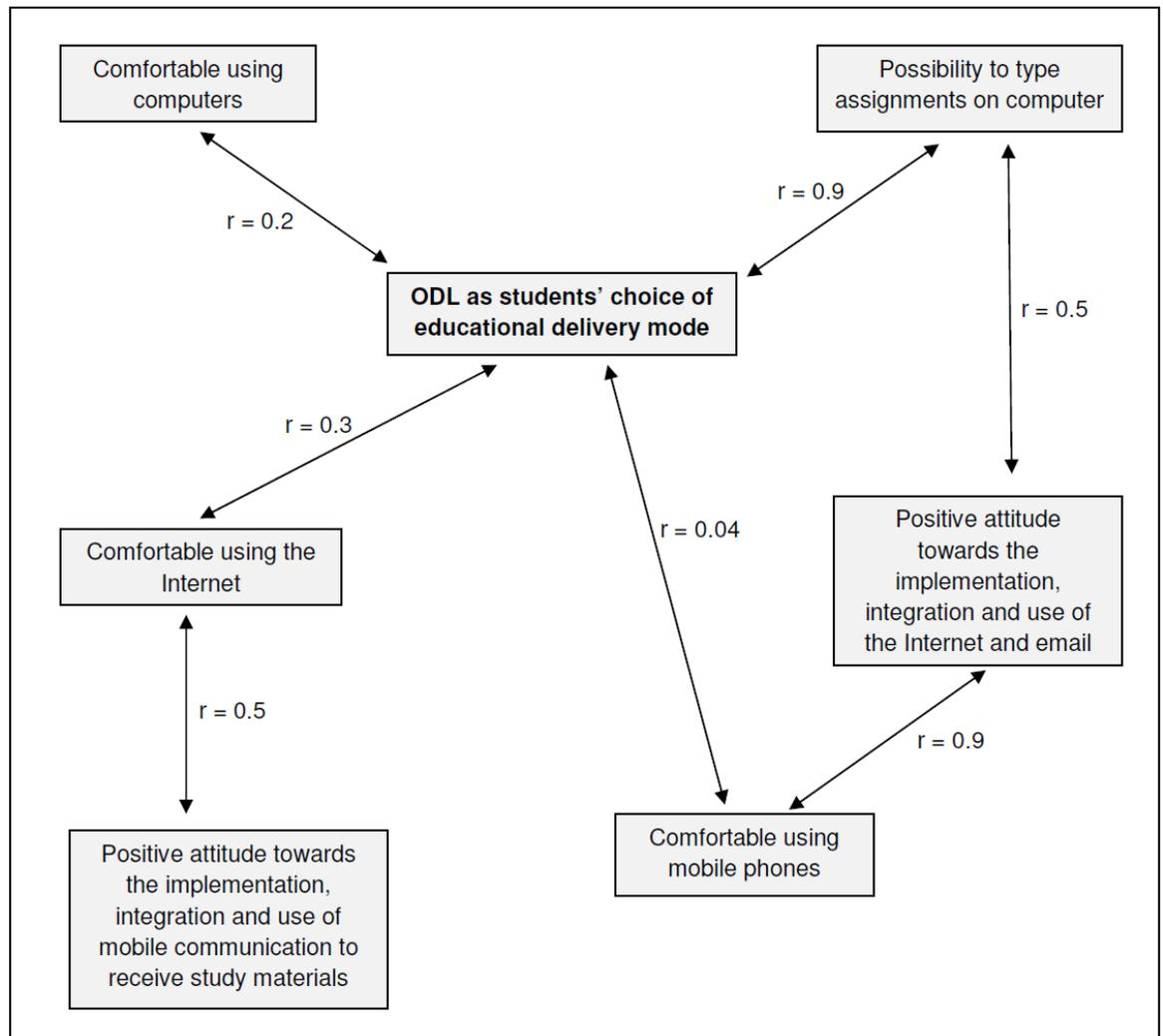
Figure 1. Relationships (Spearman's rank-order correlations) between ODL, as students' choice of educational delivery mode, and aspects of their e-readiness.

As illustrated in Figure 1, a very strong relationship ($r = 0.9$) was found between ODL, as students' first choice of educational delivery mode, and the possibility for students to type assignments on a computer. The latter capability relates to a large extent ($r = 0.5$) to a positive attitude towards the implementation and use of the Internet and email to receive study materials, which has a very strong relationship ($r = 0.9$) to being comfortable using mobile phones. These results, pertaining to the current group of students who choose ODL as educational delivery mode, indicate that most ODL students consider it possible to type an assignment on computer, whether by themselves or through the assistance or service of others. Furthermore, these students have a predominately positive attitude towards the implementation and use of the Internet and email to receive study materials and feel very comfortable using mobile phones. ODL,

as students' choice of educational delivery mode, also relates to a medium extent (r = 0.3) with being comfortable using the Internet, which, in turn, strongly relates (r = 0.5) to a positive attitude towards the implementation, integration, and use of mobile communication to receive study materials (m-learning). These results indicate that most students who feel positive and comfortable using the Internet (currently or in the future) choose ODL as educational delivery mode. Furthermore, these students have a positive attitude towards the implementation, integration, and use of mobile communication to receive study materials.

Interpreted as a whole, these findings suggest that the e-readiness of teacher-students is implicit to their choice of ODL as educational delivery mode for their professional development.

Recommendations

Based on the findings of this report, the SCTE (NWU) could improve its ODL offerings in the following ways.

Effective Face-to-Face Classroom Contact

Although the overall findings indicate that most students are satisfied with the quality of face-to-face classroom contact (65.6%) and perceive additional non-compulsory classroom contact as valuable pedagogical support (96.5%), it is recommended that the SCTE investigates how to increase student satisfaction with contact classes in general. It is furthermore recommended that the SCTE investigate how to improve the quality of facilitators' presentations and guidance. Students also reported qualitatively that the scheduling of face-to-face classroom contact on Friday afternoons (after school hours) is difficult for them as they have responsibilities at their schools that prevent them from attending. Further, the time available between various contact classes is a problem. These negative experiences of students should be taken into account, within reasonable context and practicality, for future timetable planning.

Implementation, Integration, and Use of ICT

With regard to the implementation, integration, and use of ICT, the ODL delivery mode of the SCTE attained the first three development phases (Phases A-C) described by UNESCO (2002), as outlined in Table 3. In Phase D, instead of implementing, integrating, and using Internet-based systems through which multimedia materials (text, video, and graphics) are delivered through computers, the ODL delivery mode of the SCTE shifted its focus more to personal contact (contact classes), with computer and Internet access at study centers throughout all provinces. The constant increase in teacher-students' access to computers and the Internet, their attainment of computer literacy as part of their continuous professional development, and, subsequently, their

e-readiness unlock the opportunity for the ODL delivery mode of the SCTE to fully implement and achieve Phase D development.

Teacher-Students' E-Readiness

Interpreted as a whole, the findings in Figure 1 suggest that the e-readiness of teacher-students is implicit to their choice of ODL as the educational delivery mode for their professional development. Considering the fact that some students still do not have access to computers and the Internet and some lack the necessary computer literacy and general ICT skills, it is highly recommended that the SCTE initiate Internet-based e-learning. Within the specific ODL context of the NWU, e-learning should be implemented as a non-compulsory educational mode for the growing number of students who are already e-ready. Furthermore, the NWU should increasingly implement, integrate, and make use of m-learning, while continuing with already established face-to-face contact classes, using both printed paper-based study material and various ICT to deliver quality ODL programs.

This research was specifically conducted within the socio-economical context of a newly industrialized economy. Accordingly, the findings not only contribute to ODL scholarship in newly industrialized economies, but also indicate to developing contexts what to expect. Developed contexts, on the other hand, could compare the findings with their own contexts to explore the impact of development.

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Employability in Online Higher Education : A Case Study

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Abstract

Over the past 15 years, learning in distance education universities has become more interactive, flexible, collaborative, and participative. Nevertheless, some accounts have highlighted the importance of developing more instrumental and standardized educational practices to answer the challenges of employability. In fact, the choice of skills that are important to learning communities and the labour market has been the subject of controversy because it involves heterogeneous motives among different groups.

This paper compares the perceptions of employability skills in a sample of teachers from the Universidade Aberta and a sample of students who attend a local learning centre at this University. The research focused on the following dimensions: a) the most important employability skills, and b) the employability skills to be developed in online undergraduate degrees. To collect the required data, a questionnaire was prepared and applied to students and teachers, taking the theoretical model of Knight and Yorke (2006) as its main reference. In spite of the specificity of each group, the results revealed some similarities between students and teachers with regard to employability. The conclusions also highlighted the need to promote research on this matter in online education.

Keywords: Online higher education; employment; qualifications; lifelong learning

Introduction

The digital society requires individuals to develop generic skills over their lifespan which, combined with personal skills and the knowledge acquired, they should be able to apply to the world of work. As agents of an increasingly competitive market, employers have contributed to the debate, challenging the education systems of many European countries. The new labour market requires graduates to have a different attitude towards their career management since the expectation of a 'job for life' has lost its meaning in the context of organizational changes. Thus, the roles of education and training are essential in preparing students for an active working life.

As agents of education and training at tertiary level, universities are required to devise new educational and training models which can enhance access to employment and improve the graduates' work performance. One of the main issues with the definition of learning goals is how to identify the skills that truly prepare the individual to enter the labour market.

Within the Bologna Process in Europe[1], employability is part of the Lifelong Learning paradigm, which emphasizes the continuous learning process individuals develop throughout their lives and takes place in formal, informal, or nonformal contexts. In this domain, distance and online universities are seen as key organizations in preparing adults to fulfil the expectations of the labour market.

Lifelong Learning and the Labour Market

In the European context, interconnecting education and training is possible by identifying different learning procedures. The Qualifications Framework for the European Higher Education Area (QF/EHEA) and the European Qualifications Framework for Lifelong Learning (EQF) devised, albeit with different formulations, a systematic set of qualifications described in terms of learning outcomes, which functions as a reference to guide individuals in the management and organization of their education and training.

Both tools, the QF/EHEA and EQF, contribute to facilitating the recognition of qualifications. By systematizing the learning outcomes in a more understandable and

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[1]   The main goal of the Bologna Process is to "create a European Higher Education Area (EHEA) based on international cooperation and academic exchange that is attractive to European students and staff as well as to students and staff from other parts of the world". The European Higher Education Area must (a) facilitate the mobility of students, graduates and higher education staff; (b) prepare students for their future careers and for life as active citizens in democratic societies, and support their personal development; (c) offer broad access to high-quality higher education, based on democratic principles and academic freedom. (The official Bologna Process Web site, http://www.ehea.info/).

intelligible manner, they allow individuals to reorganize and redirect their education and training, fostering more credible and transparent mobility within the European Higher Education Area. However, a general framework covering higher education, school education, and vocational training has been lacking in the European context. The figure below shows some convergence in terms of benchmarking in this regard.
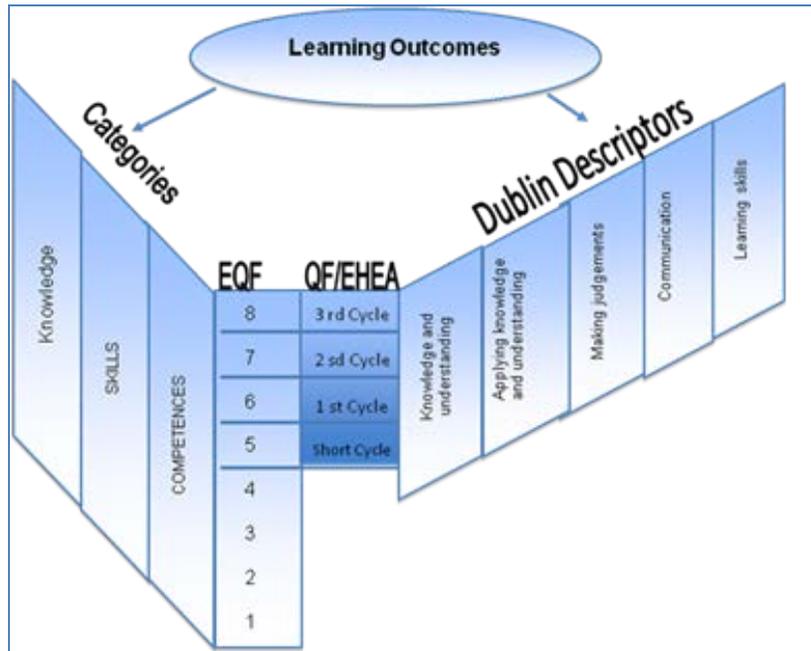
Figure 1. Benchmarking between Qualifications Framework for the European Higher Education Area (QF/EHEA) and European Qualifications Framework for Lifelong Learning (EQF) (Lourtie, 2009).

The two frameworks point to different levels. The QF/EHEA comprises four levels that correspond to grades defined by the Bologna Process, whereas the EQF has eight levels, ranging from basic education to higher education, in which the last four correspond to the QF/EHEA (levels 5 to 8). The five categories of the Dublin descriptors are used in the Qualifications Framework for the European Higher Education Area, while only three are used in the European Qualifications Framework for Lifelong Learning: knowledge, skills, and abilities (comparing QF/EHEA to the EQF: Short Cycle – 5th Level; 1st Cycle – 6th Level, 2nd Cycle – 7th Level, and 3rd Cycle - 8th Level, respectively).

The frameworks mentioned above play an important role in the design of higher education programs and their internal and external assessment. Therefore, it is important to understand how these frameworks have been adopted in distance and online universities.

Organizations and New Skills

A few years before the Bologna Process was implemented, the UK had already rethought the purpose of higher education taking into account training and employment goals. Previously, areas of knowledge (more or less theoretical and/or more or less technical) in the study programmes were considered to be less important than extracurricular attributes. According to Harvey, higher education must be able to i) establish close links with employers, assisting them in identifying and adopting strategies suited to overcoming any lack of qualifications; ii) contribute with solutions for education and training in high-skilled areas with a low number of workers; iii) prepare graduates with effective working skills, ensuring that the employability requirements are explicit in the study programmes (Harvey, 1999, p. 5). The author further stresses how important it is for modern organizations to rely on employees that can cope with change, hence their choice to recruit graduates who add value to the organization and, at a higher level, have "transformative potential" for the evolution of the organization itself. To this end, he proposes three types of profiles: adaptive, adaptable, and transformative.
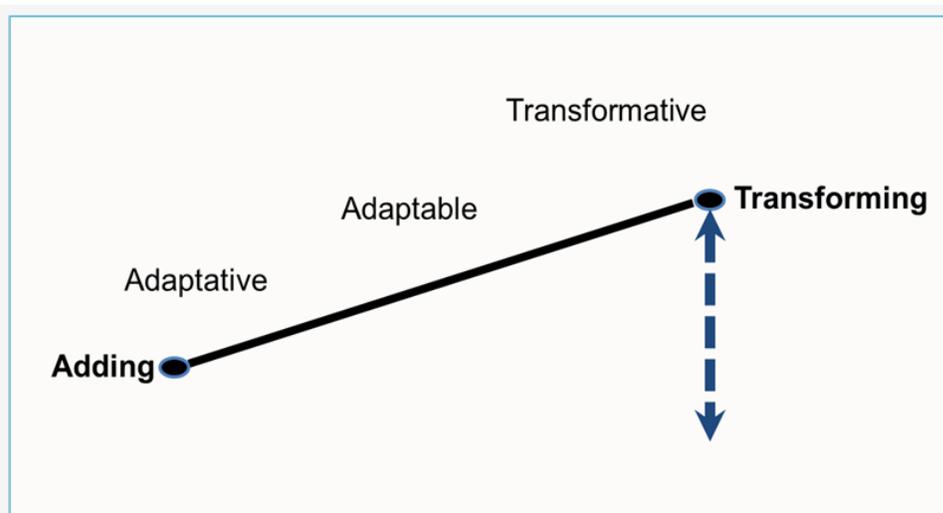
Figure 2. Enhancement continuum (Harvey, 1999, p. 16).

The adaptive profile reflects a competent performance, in which the workers take small risks and avoid questioning the company's procedures; they adapt to the culture of the organization (Harvey, 1999, p. 16). The adaptable profile refers to individuals who are willing and able to learn; they are willing to acquire new knowledge and skills, and they show initiative, ability, and confidence to use their full potential to change and improve the organization. This profile is also guided by the ability to motivate teams, which involves the ability to communicate at several different levels. Finally, the more sophisticated profile is the transformative. It includes the use of higher skills: analyzing, criticizing, and synthesizing. This profile also reflects the capacity for leadership rather

than the strict control of management tasks (i.e., getting the best out of workers, maximizing their potential and ideas).

The capacity to identify individuals who have the transformative potential is far from linear since it is not certain that an intellectually brilliant graduate will be able to provide continuing strength in the organization. Intellect and knowledge, whilst important, are not direct indicators of the potential transformer.

It can be concluded that three types of profiles are needed for two reasons: i) not every area within an organization requires the more sophisticated profile; and ii) organizations are different and, therefore, have different needs and require different skills profiles. On this matter, in 1991 and 2002, Robert Reich identified the need for two types of advanced profiles in advanced economies: the first focuses on the discovery and the second focuses on the exploitation of the discovery made by others, through knowledge and application of available interpersonal skills in a given medium and context (Yorke, 2006, p. 5).

Reich calls individuals who are recognized as imaginative and creative *symbolic analytics*, those who demonstrate a high understanding of the subject content and generic skills, which, when combined, give rise to excellent performances. Reich, cited by Knight, states that higher education can contribute to national development through graduates who may have a good performance at work. This means that the curricula for students should be concerned with four areas: 1) abstraction (theory and/or empirical data on theory and/or use of formulas, equations, models, and metaphors); 2) system of thought (insert/see a larger context); 3) experimentation (intuitively or analytically); 4) collaboration (involving communication and teamwork skills) (Knight, 2003, p. 3).

With respect to online students, the literature notes that autonomy and flexibility are two basic dimensions of adult and online learners (Knowles, 1970; Garrison & Anderson, 2003; Conrad, 2009). It is for this reason that our study is focused on examining these profiles in students at the Universidade Aberta from an empirical perspective.

Employability in Online Higher Education

Yorke defines employability as "the set of achievements – skills, understandings and personal attributes – that make graduates more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy" (2006a, p. 8). Similarly, Lourtie (2009) argues that employability should be a goal of any training in any cycle, be it first, second, third, or even short cycle. The aim is to increase the graduate's chances of obtaining employment and being successful in his/her occupation.

To define the concept of employability, Yorke emphasizes that employability depends on several factors, making it difficult to accurately define the interference of each of these

factors in the final result – the job you get. Knight (2003, p. 5) highlights the following determinants: 1) Employability is probabilistic because it is related to the uncertainty of external factors, socioeconomic variables such as the state of the national, regional, or local laws of supply/demand for employability skills; 2) Getting a job and succeeding at work are different situations; some specific aspects of the world of work may not be legitimately addressed in higher education; 3) For many graduates, the first job does not reflect the occupation they are looking for and which would encourage their skills development; in situations of shortage of employment, graduates accept the jobs available under the circumstances.

For the research conducted, employability is considered both in its theoretical and practical dimensions. At the theoretical level, employability is the students' potential to adapt and make their knowledge, skills, and attitudes flexible towards the labour market, promoting their social inclusion and ensuring their quality of life. At a practical level, employability is the potential students bring into practice through their skills to become employed.

The USEM model by Knight and Yorke highlights four interrelated components, understanding, skills, efficacy, and metacognitions, showing close links between all four. In this model, the authors attribute crucial importance to the efficacy (E) component because of its major influence on the other contributions to employability, as shown in the diagram below.
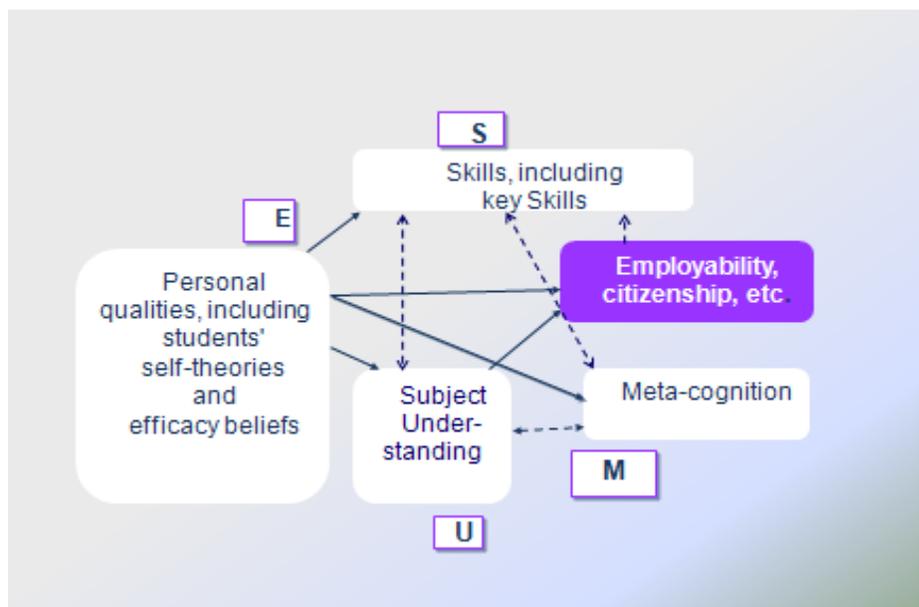
Figure 3. USEM model (Knight & Yorke, 2003, p. 3).

This model has been tested in higher education. The Skills Plus Project is an example of its application at this level. Based on an extensive table of skills (39 dimensions of

employability), it aimed to find common points of reference based on the dialogue established between students and teachers, thereby supporting the development of employability in higher education.

The model suggests that employability is influenced by 1) the understanding people have on a subject area or professional field and specific and general skills; 2) the belief in their efficacy and that they will be able to make a difference; (3) and metacognitive fluency (i.e., the awareness they have about the way they act, learn, and develop their skills) (Zulauf, 2006, p. 135).

Universities can improve the employability of students by focusing on the development of their metacognitive abilities, that is, by helping them to learn how to learn and by promoting their self-confidence.

In the context of lifelong learning, a personal development plan (PDP) is fundamental for individuals to explore and capitalize on all learning acquired (formal, nonformal, and informal), making a better connection between their expectations and actual work, guaranteeing not only their growth and development, but also their social integration. To this end, employability skills have to be embedded in the curriculum and learning strategies and assessments should be available upon their application. The university's strategies may be supplemented by work internships, short-term and nonmandatory, during the years of study with the aim of preparing students for the world of work (Zulauf, 2006, p. 136).

In Europe, distance universities are an integral part of the European Higher Education Area (Bologna Process) and the national policies with regard to lifelong learning and employability. Flexibility, accessibility, personalization, and collaboration, priority dimensions in employability, are also priority principles in distance and online education programs (Knowles, 1970; Garrison & Anderson, 2003). Thus, it was important to understand how these principles are interconnected at a specific distance education university like the Universidade Aberta.

Universidade Aberta: Students and Teachers' Perspectives on Employability

The Universidade Aberta (UAb) is a public distance education university and was founded in 1988. It is the only Portuguese public university to teach all undergraduate, master's, and PhD degrees based on an e-learning system. All the degrees have been adapted to the Bologna Process. Its diversified educational offer is based on a self-developed pedagogical virtual model that emphasizes the following principles: i) student-centred learning, ii) flexibility, iii) interaction, and iv) digital inclusion. These principles guide teaching procedures, the roles of students and teachers, the planning, design, and management of learning activities, the materials used, and the assessment of the acquired skills (Pereira et al., 2007, p. 10).

At the UAb, the student is at the centre of the university's pedagogical model, taken as an active individual, the builder of his/her own knowledge and integrated within a learning community (Aires, 2007, p. 21). At its different levels, education should facilitate the acquisition and development of interlinked skills required by the digital society as well as of specific skills in the area of knowledge chosen by the student.

The planning of teaching and learning activities is meticulous, giving priority to the development of skills in each subject (Pereira et al., 2007, p. 10). Additionally, the results of student learning derive from a combination of autonomous and collaborative learning. Collaborative learning prepares students for the needs of organizations whose obligations are based primarily on work in multidisciplinary teams and the joint construction of knowledge (Pereira et al., 2007, p. 11).

The principles of the UAb virtual pedagogical model meet the challenges currently facing higher education in the field of employability. The primacy of providing students with flexibility, autonomy, reflexivity, and a critical guide to the development of metacognitive skills, developing their perceptions of self-efficacy and knowledge about their mechanisms of action, thought, and development, are all dimensions that are closely linked to the skills required for employability.

To summarize, our study was based on the following question: "What are the perceptions of online higher education students and teachers about the skills required for employability?" The following section presents the methodological design of the empirical research.

Method

The central goals of our research consisted of "recognizing which skills for employability are most highly rated by students and teachers at a distance university" and "exploring the perceptions of teachers and students at the Universidade Aberta on the skills required for employability". We opted for a design case study (Yin, 1994), considering that this method would be most suited to explore the informants' conceptions of the phenomenon of employability at the Universidade Aberta. It was not our intention to build generalizable knowledge, but to obtain an in-depth understanding of this matter from a public university that offers all of its courses through e-learning.

Instruments

The instrument used was a survey, based on the dimensions of the theoretical model by Knight and Yorke (2006, p. 7). This was the selected model because it was assumed that the perceptions of groups about the skills for employability are inextricably linked to the students' and teachers' social contexts or each individual's own specificities.

For the empirical study, two questionnaires were constructed: one for online students and the other for online teachers. The scale of Employability Dimensions (Knight & Yorke, 2006, p. 7) was crucial to the design of the questionnaires (groups I and II). The aim was to use a common reference for the respondents to identify the most relevant skills for the labour market. The 37 competencies addressed were organized into three groups, as illustrated in the following table: personal qualities, core skills, and process skills.

Table 1

*Thirty-Seven Dimensions of the Knight and Yorke Model (*Knight & Yorke, 2006, p. 7)

PERSONAL QUALITIES	CORE SKILLS	PROCESS SKILLS
Malleable self-theory	Reading effectiveness	Computer literacy
Self-awareness	Numeracy	Commercial awareness
Self-confidence	Information retrieval	Ability to work cross-culturally
Independence	Language Skills	Prioritising
Emotional intelligence	Critical analysis	Planning
Adaptability	Self-management	Problem solving
Management Stress	Creativity	Resolving conflict
Initiative	Listening	Decision making
Willingness to learn	Written communication	negotiating
Reflectiveness	Oral presentations	Team work
	Explaining	Acting morally
	Global awareness	Applying subject understanding
		Coping with ambiguity and complexity
		Influencing
		Arguing for and/or justifying a point of view

Participants

Students and teachers of the Universidade Aberta (UAb) (the Portuguese Open University) participated in this study. The students were attending the Local Learning Centre of Grândola (Grândola LLC) and were selected from among those living in the surrounding area of the Grândola LLC (one of the university's 13 LLC). The teachers work at the Universidade Aberta.

Results

The Grândola LLC had 62 students at the time the questionnaire was administered, all of whom were invited to participate in the study, given that it was a small population. The response rate to the survey was 74% (46 students), of which 76% were female. The average age of the students was 35 years, the youngest student being 22 years old and the oldest 51. The most represented age group was the 20-30 year-olds, accounting for 35% of the total respondents.
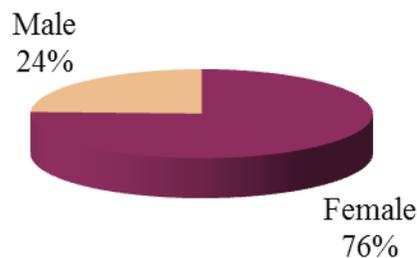
Figure 4. Students' gender.

Most of the participants were in the labour market (91%) and about 9% were unemployed. This is important because, based on experience, the students, employed and unemployed[2], would have a clear idea of the skills that need to be improved to enhance employability.

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[2]   This is an interesting aspect, coincidental with the total unemployed population in the 2001 data for Grândola. The National Statistics Institute does not have more recent data. It has an estimate from 2008, which relates only to the resident population of Grândola, totalling 13 979 at the time. More recent disaggregated information is not available, nor is data which has been analyzed in relation to unemployment or other indicators that have been noted in the study.

Table 2

Courses Attended

Course	Enrolled students	%
Social Services	2	4.3
Social Sciences	17	37.0
Social Sciences (Policies and Administration)	1	2.2
Social Sciences (Psychology)	3	6.5
Social Sciences (Social Services)	1	2.2
Environmental Sciences	2	4.3
Education	7	15.2
European Studies	2	4.3
Management	7	15.2
Computer Sciences	1	2.2
Applied Languages	2	4.3
Modern Languages and Literature	1	2.2
Total	46	100.0

The courses with the highest number of enrolled students was Social Sciences (37%), followed by Education and Management (both with 15.2%).

As with the Grândola LLC students, all of UAb's teachers (totalling 143 in May 2009) were also invited to participate in this study.

The questionnaire was sent to the entire teaching staff population and the response rate obtained was 43.3% (62 teachers), 54% male and 46% female (Figure 5). The average age of the teachers was 45 years, with ages ranging from 35 to 66 years. The data collected on the teachers' professional experience revealed a high degree of variation in the number of years teaching, between 1 and 44 years of experience.
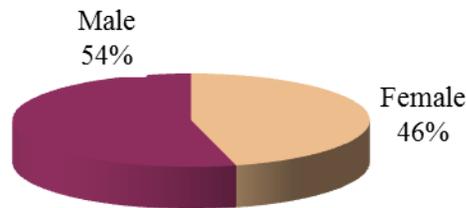
Figure 5. Teachers' gender.

The distribution of teachers in their academic area is represented in the chart below, labelled according to the academic area of origin.
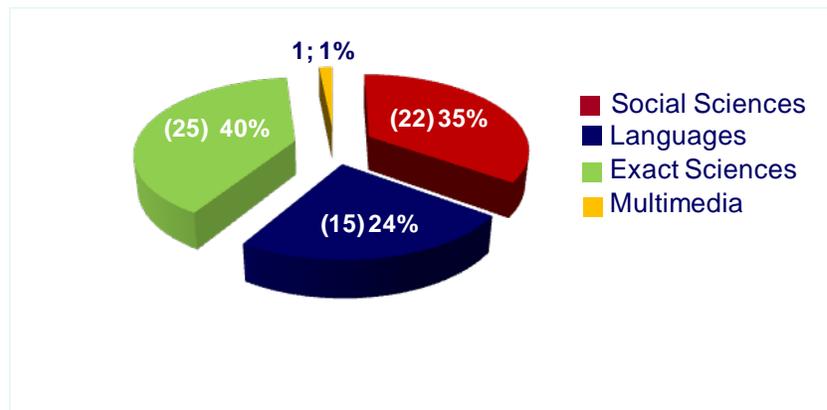
Figure 6. Academic area of origin (teachers).

Among the respondent teachers, 40% came from the Exact Sciences, mainly in the areas of mathematics, computer science, biology, and environment. About 35% of the respondents came from the Social Sciences, which included backgrounds in the social sciences, management, and history. Approximately 24% of the respondents came from the areas of Languages, Linguistics, and Modern Languages and Literature. None of the teachers from the Department of Education answered the questionnaire.

The questionnaires were first submitted to a descriptive statistical analysis, according to the objectives defined in the study. When justified, the data was analyzed based on parametric and nonparametric techniques (Hill, 2008).

The internal consistency of the student and teacher questionnaires was analyzed using Cronbach's alpha coefficient. The value found for the case of the students in 54 items was 0.86, while for the teachers it was 0.695 in 43 items. The first is considered a good result, while the second is lower in reliability, taking into account the reference values (Hill, 2008, p. 149).

From the data collected in this broader research, two dimensions have to be highlighted here: 1) the employability skills students and teachers rated most highly, and 2) opinions on how to integrate employability skills in the online undergraduate courses.

Skills for Employability: Views of Students and Teachers

The respondents' answers on the 10 most important skills for employment can be seen in the following table.

Table 3

The Ten Most Important Skills

Students		Teachers	
Variables	Average	Variables	Average
1. Problem-solving	7.58	1. Creativity	7.31
2. Planning	6.88	2. Problem-solving	6.53
3. Self-awareness	6.36	3. Negotiating	6.50
4. Critical analysis	6.33	4. Decision-making	6.46
5. Decision-making	6.31	5. Computer literacy	6.09
6. Self-management	6.25	5. Listening	6.09
7. Global awareness	6.06	7. Explaining	6.00
8. Applying subject understanding	6.05	7. Reading efficiency	6.00
9. Teamwork	6.04	9. Willingness to learn	5.95
10. Willingness to learn	5.90	10. Planning	5.92

Relating these findings to the three profiles presented by Harvey, previously compared with the skills selected by students and teachers, we found that the respondents' choices fall mostly on the *adaptable* and *transformative* profiles.

This fact is not surprising. Both students and teachers expect higher education to provide the tools for more enterprising and professional performances. This means they need to possess attributes such as "willingness to learn," "acquiring knowledge," "ability to communicate at various levels," "teamwork," amongst others.

At a higher threshold, the worker should be a transforming agent capable of contributing to the potential evolution of the organization, for which, among other attributes, "critical analysis" is important.

Attention has to be drawn to "creativity," selected by teachers as the most important skill. In this regard, Reich argues that individuals who possess this ability, combined with a good understanding of subject content and other generic skills, are excellently placed to produce optimum performances.

Interestingly, the skills chosen in our study are in line with the findings of Harvey and Reich because they reflect the most relevant ones as requirements for higher performances as well as the most suited to the challenges in the labour market.

Table 4 presents a comparison of the ordering of the 10 skills deemed as the most important for employability by students and teachers[3].

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[3]   The student T test was applied to the sample because the values of the respondent student population had been compared with the values of the respondent teacher population, having thus obtained the value of the mean.

Table 4

The Four Common Skills

Students		Teachers	
Variables	**Average**	**Variables**	**Average**
1. Problem-solving	7.58	1. Creativity	7.31
2. Planning	6.88	2. Problem-solving	6.53
3. Self-awareness	6.36	3. Negotiating	6.50
4. Critical analysis	6.33	4. Decision-making	6.46
5. Decision-making	6.31	5. Computer literacy	6.09
6. Self-management	6.25	6. Listening	6.09
7. Global awareness	6.06	7. Explaining	6.00
8. Applying subject understanding	6.05	8. Reading effectiveness	6.00
9. Teamwork	6.04	9. Willingness to learn	5.95
10. Willingness to learn	5.90	10. Planning	5.92

Among the 10 most highly rated skills, four are common to both students and teachers, which represents a degree of agreement of 40%: *problem-solving* (1st and 2nd), *planning* (2nd and 10th), *decision-making* (5th and 4th) and *willingness to learn* (10th and 9th)[4]. It can be said, then, that the teachers' and students' perceptions are quite close with regard to employability skills.

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[4]   In the four skills analyzed, we found that, on average, the difference in importance attributed to each one between students and teachers was not significant (i.e., the degree of importance attributed to each skill is similar in both groups). The chi-square [$X^2 (1) = 1.742$, $p = 0.187$] was used.

Employability in Online Undergraduate Courses

There were no statistically significant differences between students and teachers (i.e., teachers and students considered that the 10 skills were being developed in the subjects taught by the teachers who participated in the study). Very expressively, 91% of students believed that skills for employability should be developed in higher education. In the teacher sample, about 82% considered that employability skills were being developed, and 91.5% agreed that these skills must be developed in the course they teach. It is thus possible to conclude that both groups expressed very similar opinions, both in skills covered in higher education and the recognition of their development in the course taken/given, respectively.

Teachers were also asked whether the skills should be addressed in higher education in elective modules. Teachers responded positively (75%), which indicates that they agree that employability should be addressed both in the formal curriculum and in elective modules. Regarding the importance of consulting employers about the formal structure of the curricula, although online teachers considered that employability should be a purpose of higher education, openness to including the views of employers in the field of study did not receive a positive response (29.3%).

Discussion

Among the 37 skills analyzed by online teachers and students on the basis of our survey, those that stood out were teamwork, written communication, the ability to explain, critical analysis, willingness to learn, computer literacy, and oral presentations.

Both groups considered problem-solving, planning, decision-making, and willingness to learn important skills for employability. It should be noted that these group perspectives could be framed by the UAb's pedagogical model, suggesting that the student develops learning independently but in a cooperative and collaborative environment, developing the skills required for successful integration in organizations, especially in tasks that require work in multidisciplinary teams and knowledge sharing.

An important strategy to boost employability skills could include explicit approaches to these skills in online higher education. Measures could be taken, such as the development of specific modules and a review of the curricula, in order to include the areas of competence, the assessment of noncognitive skills, the integration of professional experience, and practice in real projects, as mentioned in the literature review (Harvey, 1999, p. 22).

Although there is a tendency to develop these skills in higher education, the difficulty still remains in deciding which employability skills should be addressed in the curriculum or which can be learned by other means (Harvey, 1999, p. 22), that is, deciding whether to develop a skill, such as oral communication, as part of a course, for

instance, economics, or to offer a specific module, for example, oral and written expression.

In this respect, it should be noted that the Dublin descriptors include generic skills and/or transferable ones, called *communication skills* and *learning skills*, of which the latter aim to prepare students to learn in an autonomous manner.

The focus of the matter is not so much on skills development, but rather on how we should develop critical skills in students through lifelong learning, which means that employability represents a subset within this set. That is, as the online student is confronted with new challenges, he/she should be able to decide, solve problems, and make choices autonomously.

One way to address the issue is to focus on developing a critical approach to online learning, challenging the preconceptions of both students and teachers (Zambrano, 2007). It is important to think of knowledge as a process and not as an object or something stable and fixed. The online teacher assumes the role of moderator, facilitator, and knowledge-provoker, fostering autonomy and the self-assessment of learning (Harvey, 1999).

Final Remarks

Research on the phenomenon of employability in online higher education needs further development. The challenges currently facing the European Higher Education Area, particularly the complexity of entering the labour market for many graduates, the new paradigm of Lifelong Learning, the Bologna process, and the peculiarities of adult and online learning, justify more research in this domain.

Knowledge must be valued and recognized as no longer being confined to formal institutions; it may have occurred outside the formal systems and be based on life experience, the experience of working in a family environment, or in other structural contexts that have contributed to the development of the individual. Thus, distance and online universities may play an important role in changing traditional perspectives about *why*, *where,* and *how* adults learn. Planning, problem-solving, decision-making, and willingness to learn are important referents of pedagogical narratives about online adult education (Garrison & Anderson, 2003; Conrad, 2009). In this sense, when we discuss the previously mentioned employability skills, we are also discussing the core principles of adult and online learning.

In this new framework, the creation of referential skills leads to interconnections among different levels of education and serves to identify and understand the learning that takes place; learning by the individual is enhanced, and mechanisms are set in place to recognize and certify the knowledge acquired.

The challenge facing higher education institutions is reflected in the importance of finding common ground, capable of integrating and combining the recognition of

acquired knowledge and skills, offering training that prepares students for employability and for lifelong learning.

In this research, the concept of employability reveals particularities when it is transposed to online higher education. It should be noted that obtaining employment is not a valid indicator for measuring employability; it depends, among other factors, on economics, including the supply and demand of employment, which vary over time. The role of higher education in improving employability is concerned with developing the students' potential and flexibility to adapt their knowledge, skills, and attitudes to the labour market. In view of this, distance universities may have an important role in designing and implementing accreditation standards for employability.

It is widely acknowledged that higher education plays a key role in preparing graduates for the labour market and constitutes a lever for the economic development of countries, through the development of profiles geared towards high performance and able to respond to the needs of organizations, under strong competitive pressure. However, with rare exceptions, there are very few studies in this field in Portugal. It is therefore hoped that this study will provide relevant insights on the matter.

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Identifying Barriers to the Remix of Translated Open Educational Resources

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Abstract

Remix is touted as one of the most important practices within the field of open educational resources (OER). But remixing is still not mainstream practice in education and the barriers and limitations to remix are not well known. In this article we discuss the design and development of a print and web-based booklet created to introduce the topic of OER to schoolteachers. The guide, the first of its kind available in Portuguese, was created through the remix and translation of existing resources available in English. Choosing design-as-remix raised a series of concerns related to licensing, attribution, context, and technical standards. In this article we review the concerns related to culture and inequity within the OER movement, followed by the design choices and procedures, and finally the implications of these issues for the open educational resources movement.

Keywords: Open educational resources; remix; translation; culture; instructional design

Introduction

The open educational resources (OER) movement has led to a series of initiatives focused on the potential of the exchange, sharing, adaptation, and modification of content. This has lead to exciting new ways to think about how educational content is created and used in formal and non-formal educational settings. At the same time we have come to realize that OER can potentially sustain divides, such as the division between those who traditionally create and those who consume educational resources. Without due attention we face a neo-colonization and one-way flow of content based on the massive amount of content published by those in richer nations. In effect, we cannot expect that the expansion of infrastructures will automatically promote more equitable exchanges in educational content if we do not build systems and capacity so that minority and marginalized groups can effectively contribute (CERI, 2007; Reich, 2011; Reich, Murnane, & Willett, 2012).

This concern became the basis of the investigation into the design of a resource entitled *Open Educational Resources (OER): A guide for teachers* written in Portuguese. In order to promote OER and its inherent practices, the guide was developed as an OER itself, using open-source software and distributed with an open license. Moreover, instead of creating a new resource from scratch the publication was assembled from the revision and remix of existing resources.

Below, we briefly discuss the field of OER and the importance of remix, followed by an explanation of the design process while highlighting some of the benefits, barriers, and concerns that came to the fore when creating the booklet. Our goal was of a very practical sort: to design a reference/instructional resource all the while investigating this practice. The question that guided this study was: What design choices and challenges does one face when one decides to create a work through the remix of translated open educational resources?

Open Educational Resources

The OER movement is often associated with the concept of learning objects (LO), part of a research and development program aimed at creating an ecosystem (both educational and economic) for the development of modular media for education (for a review see Downes, 2001). The two terms are still used by many interchangeably. Much of the difference between the two programs is focused on the concept of openness. According to Wiley (n.d.), "open" means an ability to reuse (unaltered, as is), revise (adapt and modify the content, such as a translation), remix (combine the original content or revisions, creating something novel), and redistribute (share copies of the original, revised or remixed content). These four terms have come to be known as the *4Rs*. The terminology is not yet consolidated and these four terms and others (such as repurpose and adapt) are used differently in diverse contexts and by different authors (see for example Gunn, Woodgate, & O'Grady, 2005). For our purposes, OER can be defined as

> ...teaching, learning and research materials in any medium that reside in the public domain and have been released under an open licence that permits access, use, repurposing, reuse and redistribution by others with no or limited restrictions...The use of open technical standards improves access and reuse potential. OER can include full courses/programmes, course materials, modules, student guides, teaching notes, textbooks, research articles, videos, assessment tools and instruments, interactive materials such as simulations and role plays, databases, software, apps (including mobile apps) and any other educationally useful materials. The term 'OER' is not synonymous with online learning, eLearning or mobile learning. Many OER — while shareable in a digital format — are also printable. (UNESCO/COL, 2011)

Remixing Educational Resources

The two-tiered level (technical and legal) of openness emphasized above is essential to remix practices. The concept of remix in education is grounded upon the idea that people should have not only greater access but also greater freedoms in what they can do with educational resources. These activities have the potential to take innovative form in more open, commons-based peer production models (Benkler, 2005; Simon & Vieira, 2008). Educationally one could trace this trend to earlier conceptions of how schooling itself should be structured (Papert, 1980) and the importance of promoting production and creation in fostering media literacy (Erstad, 2008).

There are great barriers to promoting these participatory activities. In a study conducted within higher education Collis and Strijker (2003) indicated that "...there has been little success with bringing instructors close to an actual authoring process: instructors do not have the time, interest, or skills" (p. 5). These concerns are in line with historical problems in the adoption of educational technologies and educational change at all levels of formal schooling (Tyack & Cuban, 1997).

Existing educational sites and repositories contribute to this concern. Most are focused on the distribution and dissemination of resources and provided little guidance or tools for those who wish to make revisions or remix existing resources. There are notable exceptions, which include open wiki-based sites (such as Wikipedia and Wikieducator) and those that explicitly support remix such as Connexions (CNX, www.cnx.org). In Connexions users can upload resources and construct courses or modules. One can remix existing content in order to create derived versions within the platform. A recent study of CNX by Ochoa (2010) indicates that, among other findings, "A third of the material (34%) is never reused inside a course and 44% is only used once. The 22% remaining is reused between 2 and 8 times" (p. 18). There is an increasing amount of

content in CNX, but reuse, while practiced, might still be limited. In another study involving CNX, Petrides and colleagues (2008) indicate that in spite of possible technical challenges and a resistance to using third-party content there is evidence that users engage in making modifications to other's content, creating new "versions" of existing modules.

New platforms such as OER Glue (now http://www.opentapestry.org) or Open Author (http://www.oercommons.org/contribute/) can help to break down some of the technical barriers associated with remixing, evident in most of the more popular web-sharing sites (for a review, see Seneviratne & Monroy-Hernández, 2010).

While these technical barriers do exist, many difficulties are extra-technical and related to structural changes in organizations, reward and merit systems, competencies (beyond tools), availability of resources, and other concerns that must be addressed concomitantly (Malcolm, 2005; UNESCO/COL, 2011). Promoting participation and activity in OER therefore also means revisiting often forgotten socio-technical concerns in regards to the infrastructures necessary to use, produce, and disseminate resources (for a discussion, see Warschauer, 2002) and the often undermined issues of culture in instructional design (Parrish, 2010).

An increasing number of studies focuses on remix, and there is flourishing research activity in areas such as music (Mizukami & Lemos, 2008). In education there is "…still a limited understanding of how to move beyond some of the encumbrances—specifically with regard to reusing others' content as well as more complex reuse behaviors that lead to new configurations of existing content" (Petrides et al., 2008, p. 352). In this study we describe the design of one such resource created partially through the reuse of third party works. Next we detail the design procedures and some of the challenges and lessons learned in the process.

Method

A traditional designer of a new resource might survey the field to identify existing resources as a source of inspiration or reference, but copyright limitations or an emphasis on novelty might prevent one from envisioning these as elements to be incorporated beyond citation or reference (Johnson-Eilola & Selber, 2007). The OER cycle, on the other hand, begins precisely with the idea that resources can be adapted and adopted.

Our aim was to design, through remix, a booklet for teachers in order to provide an overview of OER. Implicit in the idea of localization and remix is an interpretivist epistemology and a constructivist stance towards the design of educational resources. A resource created through remix and promoted as a "remixable" work is meant to address some of the limitations of traditional instructional design, particularly the need to cater to multiple contexts and learner needs (Amiel, Squires, & Orey, 2009).

The audience for the booklet was composed of public school teachers at the K-12 level in Brazil. This is a wide and varied audience to consider, and attending to the needs and anxieties of such a wide group would be problematic. In order to provide context for development, a small group of teachers participated in a seminar focused on OER and were able to informally share their questions and ideas regarding the field. The work-contexts of these teachers, which were known to the designers from research and previous collaborative studies, were used as the scenario for the development of the booklet (Pezzo et al., 2011). Constraints, resources, and possibilities were considered from the standpoint of these scenarios. Working within the limitations and constraints of real activities differs substantially from imagined, prototypical, or generic target groups (for a review of the issues for instructional design, see Amiel, 2011).

At the time we found no existing guides or books in Portuguese focused on explaining the domain of OER, which limited "reuse" in principle. We looked for other openly licensed guides that we could revise. In doing so we found five potentially useful resources from credible sources. Out of these five, two contained a table of contents with very sparse content, and the other three were full-fledged resources.

One was a table of contents created within a UNESCO-led community (http://oerwiki.iiep.unesco.org/index.php/UNESCO_OER_Toolkit), and a second was created by the OER-Brazil community (http://br.wikimedia.org/wiki/Recursos_educacionais_abertos/Cartilha).

The three complete resources were created by Wikieducator (http://wikieducator.org/OER_Handbook/educator_version_one), JISC (https://openeducationalresources.pbworks.com/ w/page/24836480/Home), and Curriki (http://tinyurl.com/5r2u8lf), all well-known organizations within the OER movement.

Table 1

Identification of Common Themes in OER Guides

Section	Common	OER-Brazil	WikiEducator	UNESCO	JISC	Curriki
	License	CC-BY-SA	CC-BY	Not identified	CC-BY-SA	CC-BY
Introduction	OER concepts	OER concepts	Defining OER & OER life cycle	Background	What are OERs?	OER commons tutorial (wiki has no terms of use, but OER Commons is CC-

						BY-NC-SA)
	Why OER	Why OER	Why OER?	Benefits of OER	Why OER? & An interesting OER metaphor (OER myths)	Use: Motivation
	Examples	Finding and using resources	Find OER	Example projects	Overviews & guidance	Find/search: General repositories
	How OER can help me	Why OER	Use: Integrating OER in teaching and learning	Beyond the classroom	Learning & teaching considerations	Use: Integrating OER into your classroom
Educational practice	Finding OER	Finding and using resources	Find OER	Finding and using OER	Finding OERs	Find/search
	How to create OER	Creating and publishing OER	Compose OER	Creating and sharing OER & technical standards that facilitate sharing	-	Create: OER
	Adapting OER	-	Adapt OER	-	Cultural considerations	Remix
	Using OER	Finding and using resources	Use OER	Finding and using OER	OER use and reuse	Use: Integrating OER into your classroom
	Sharing OER	Creating and publishing OER	Share OER	Creating and sharing OER	-	Use: Using and sharing OER

	OER tools and software	OER software	Compose OER	Software tools to create content	-	Create: OER
	Accessibility	-	Accessibility (adapt, use, share)	-	Technical accessibility	-
Licenses	Copyright	Rights	Copyright clearance & copyright paradox	Copyright	Legal aspects	Licensing: Objective 1
	Creative Commons	Open licenses	Creative Commons	Copyright alternatives	Intellectual property rights	Licensing: Objective 3 & fair use
	Defining licenses for resources	Choosing tools for creation and distribution	Adding a Creative Commons license	How to license content	-	Licensing: Objective 4

First, we began by listing the topics covered by each of these guides through their major headings (Table 1, first phase of the design process). The items in the table of contents provided us with a wide panorama as to the areas that were considered a priority in introducing the field of OER. Second, we filtered these common areas of interest categorizing according to commonalities or themes, a common practice in the analysis of qualitative data. The topics themselves indicate what each author/organization considered relevant to newcomers to the movement, and repeated elements would be considered of most importance. Third, we highlighted elements that were exclusive to each of the guides (Table 2). This step helped us avoid simply following the average. It also helped us in identifying elements we would likely not have considered on our own and which were of potential relevance to our scenario. For example, the JISC guide included an "OER myths" category that was unique and deemed of interest. Fourth, these elements were then either subsumed under an existing category, considered as a topic on its own merit, or ignored due to a misalignment with our scope and objectives (such as "Management" under JISC). We also benefited from the regional topics included in the OER-Brazil guide. Issues related to access, national projects, and

particularities of Brazilian legislation were important to our audience and were included.

Table 2

Exclusive Topics from each Guide

OER-Brazil	WikiEducator	Unesco	JISC	Curriki
Barriers and incentives	Copyright paradox	How should it be hosted?	Management	Fair use
			OER myths	
The question of access	OER life cycle	Technical standards that facilitate sharing		
	The future of OER		Quality considerations	
National projects		Social learning and networking tools	Sustainability	
Brazilian laws and educational policies			Overcoming barriers and finding enablers	

Fifth, we considered elements that were not included in any of the guides but were thought to be of importance because of our working scenarios. These steps provided the initial framework for the booklet and helped us identify what were considered imperative elements (commonalities), important themes (unique), and other relevant topics (inexistent).

Once the categories were created, the relevant content from each existing resource was examined. Sections of each work were pasted under the appropriate heading. Our goal was to benefit as much as possible from the existing resources, so we aimed first and foremost to make use of the existing works. Once the most appropriate texts were selected we followed a six-step process in identifying what to do with each contribution:

1. in complete form attempting to maintain the original meaning and context (revision);

2. adapting language to reflect local meaning and needs (revision/remix);

3. modifying substantially to the point of departing from the original source (remix);

4. only as a source of inspiration, demonstrating a need to create content based on the principles and ideas but not borrowing directly from the source itself (reference);

5. identifying instead other, more compatible resources (search);

6. developing entirely new content when none was available (create).

We found that using resources in complete form was not the norm. As we moved from step 1 through 6 for each section we identified a series of design choices and concerns, which we highlight below.

Results

Licenses

When remixing resources a series of considerations have to take place, which are not necessarily at the forefront in a traditional process of design. First off, one needs to be sure to select resources with more open licenses. The three sites that were selected for remixing did not have the same license for their materials (see Table 1). Licensing imposes a series of benefits but also challenges for remix. Often resources using more open licenses incorporate or refer to media that are made available using a more restrictive license. For example, the CC-BY Curriki site made reference to an OER Commons page that upon inspection was deemed to be a CC-BY-NC-SA licensed resource. The complexities, costs, and time-constraints in analyzing license compatibility are often undermined (for an example, see MIT OCW, s.d.), and much debate still takes place regarding the risks and benefits of choosing different licenses (see for example, the discussion surrounding "non-commercial" in Klimpel, 2012). Choosing a more restrictively licensed resources will limit the openness of the final work and its attractiveness to future remix.

But what are the possibilities when more strictly licensed resources must be included in the final product? In the academic tradition making partial use of the work of others is generally protected by copyright exceptions and limitations or *fair use* clauses. Quoting and referencing is a practice essential to the progress and permanence of science and culture (Lessig, 2004). But examining this task from the lens of *remix* rather than *quoting* can complicate the process of determining the final document license. For example, within the framework of Creative Commons, remixing a resource licensed with a CC-BY-SA license limits the new resource to start from this same minimum (CC-BY-SA). But within academic work, quoting a block of text from an article demands only

that attribution to the original author be made. This is regular practice in academic writing and in literature where authors liberally cite blocks of text, phrases, and sections in order to compose their own work and publish results.

In the process of designing the booklet, an academic and free (cost) publication, we translated sections of other documents in order to include them in the final work. Some of these resources were more restrictively licensed, but our final choice for publication of the translated and adapted resource was a more open, CC-BY license. The use of "incompatible content" is a major problem for the practice of remix, even when exceptions and limitations (which vary from country to country) might apply (ccLearn, 2009). This is a legal concern, but also a cultural clash between a more liberal consolidated social practice (in this case, academic) and the established and often confusing regulatory sphere (Mizukami & Lemos, 2008).

These are not trivial decisions and may lead certain designers of resources to produce from scratch rather than remix in order to avoid possible legal conflicts or takedown notices (ccLearn, 2009). Sites are also malleable and licenses often change without a clear history or notice to users. These complications, common within the practice of remix, led to two design decisions. First, we opted to prioritize sources with a more open (CC-BY) license and only sparsely made use of other works in order to avoid possible conflicts. Second, this also impacted the design of the resources itself. Faced with these concerns ourselves, we found it imperative to include a license compatibility chart in our teacher guide in order to assist our readers in navigating the complexity of license compatibility.

Attribution

Concerns over licensing are further complicated when dealing with revisions to content. The process of translation-as-revision is a case in point and can serve as an example. As Coracini (2007) reminds us, translation is based on active engagement, not a mechanical process. In this sense the translator must identify what is *meant* rather than what is *being said*. This involves the persona of the translator, the context in which the text will be read, and many other often-implicit considerations. In revising text to be included in the booklet we struggled to remain faithful to the original meaning while attempting to conform to the audience and context where the final product would be used. In doing so, the final revised product is often quite different than the original text. In this case, should one attribute the result to the original authors? This is a double-edged sword. On the one hand, one might risk not providing credit to those who created the text; on the other, one might misleadingly credit the original author for something he or she might not have intended to say. When remixing and revising OER in the same language, one could (optimistically) assume that the reader will have access to the original source and will be able to judge the quality of the attribution. This appropriation is particularly delicate when one considers that the final audience usually will not be able to compare the translated to the original version due to language

barriers. The designer must therefore take extra care in describing what attribution means in each case.

In effect, decisions regarding attribution are expanded and take considerable effort in OER related practices. We opted for attributing every substantial portion of text that was revised as a footnote. When the revision was judged to be relatively faithful to the original and the text was short, a simple reference was made as would be done in traditional academic writing. When substantial changes occurred a mention was made that the revision was only *based on* or *inspired by* the original work, with further descriptive commentary when appropriate.

There is shifting ground in how people identify attribution, in line with changing conceptions of authorship. Its implications go beyond the realm of formal education as the practice of remix sustains a principal component of digital culture, what Deuze (2006) approaches through the concept of bricolage:

> Most scholars in media and cultural studies invoke bricolage when describing the remixing, reconstructing, and reusing of separate artifacts, actions, ideas, signs, symbols, and styles in order to create new insights or meanings. Originality, or a modernist emphasis on "first things" as an emblem of quality, is thrown out the window in favor of an attitude that prefers an assemblage and tweaking of multiple good copies over a single bad original. (p. 70)

There is evidence that machine-attribution (linking) is not equated by many to be similar to descriptive human-recognition or credit (Monroy-Hernández, Hill, Gonzalez-Rivero, & boyd, 2011). There is perhaps greater technical and human need for recognizing and describing the quality of the attribution itself. The complexities of design-as-remix, particularly when involving translation, further support the need for more contextualized credit in order to inform the reader in his or her native language.

Language

Revision also involves a substantial amount of thought into the process of localization. In the case of revision-as-translation, the linguistic concern is of primary importance. An often-ignored barrier to remix and revision is the English-language and western bias of the Internet and particularly OER. In a recent review of the world-wide OER landscape, West and Victor (2011) suggest that one of the most important challenges in the field of OER is the question of language and propose that "technologies that support OER need to support multiple languages and alphabets or scripts" (p. 35). There is a need to foment the production of local knowledge and indigenous ways of knowing in order to foster adequate learning opportunities. Importantly, the 2012 Paris Declaration on OER asks governments to

> *Encourage the development and adaptation of OER in a variety of languages and cultural contexts.* Favour the production and use of OER in local languages and diverse cultural contexts to ensure their relevance and accessibility. Intergovernmental organisations should encourage the sharing of OER across languages and cultures, respecting indigenous knowledge and rights. (UNESCO, 2012)

The process of remix is usually associated with four steps: finding, relating, creating, and sharing resources (see Shneiderman, 2002). We have found that linguistic concerns permeate each of these steps and, consequently, one's ability to revise and remix. Finding resources in Portuguese is a much more restrictive business than finding those in other languages (Pimienta, Prado, & Blanco, 2009). Many of the online portals, which contain more openly licensed resources either do not have alternative language interfaces or metadata, which impacts both finding and sharing resources in these sites. Connecting and creating resources depends on the availability of tools that have interfaces in local languages, which is not the case for much software. These are important barriers when considering who is remixing and the limitations a wide audience has in engaging in OER-related practices.

Context

When presenting OER development and use, many of the restrictions derived from our working scenario came to the forefront. In many cases, the source guides assumed a reader with substantial access to computer-based resources. Our context of work included a computer laboratory that had been closed for three months, limited printing and photocopying in school, and students with limited access to computers at home. At the same time, students had limited access to *internet cafés* and teachers had easy access to computers at home. These limitations prompted considerable revision to the materials provided in the original texts.

References were made to software available in school computers whether open source or not, though priority was given to explaining the relationship between free and open-source software and OER. While teachers do not have the autonomy to install software in the computers available in their schools they do so in their own homes. Because of these limitations, references to "creating resources" were often made within the scenario of a schoolteacher working at home at his or her own computer. References to OER portals and digital libraries were also adapted to focus on Portuguese-language sites, even though there were few particularly good examples available at the time (Rossini, 2010). While better and more sophisticated examples and references were available in English our working scenario mandated that different choices be made.

If one seriously attends to these contextual elements, introspection in the process of design necessarily leads to a constant process of revision based on cultural concerns

(Thomas et al., 2002). Every time a unique group with unique characteristics is assembled in a learning situation revision takes place though one might not recognize this practice (Amiel, 2011). A resource simply being reused might be an indication of time or financial constraints or a poor design decision. If it is reused as part of a larger set of resources or different *practices* than originally intended then it is clearly part of a remix. We contend that once a resource travels from its initial design context, "reuse" necessarily implies "revision". Reuse is perhaps reminiscent of the rhetoric around learning objects as they were presented as blocks of media that could be reused and assembled for different contexts, a metaphor that did not hold in practice (Fulantelli et al., 2008; Gunn et al., 2005).

Considering the context and scenarios of use can help locate socio-technical impediments to active participation and remix activities (see Kling, 2000). When access to resources is limited, the knowledge and ability to make use of alternative software is curbed, and/or linguistic barriers are at play, one can swiftly understand reasons for making use of "ready-made" (legally or illegally) resources rather than remixing open resources.

Technical

The use of more open licenses is considered a necessary condition to define a resource as OER. An important concomitant step is the use of open standards and formats. Making the original source file available in an open format greatly increases the potential for revision and remix of existing materials. Though one can always attempt to contact the original authors in order to ask for a source file, this is an added burden similar to having to request permission to make use of copyrighted material. Providing an easily editable file is not only a facilitating process, it is also a recognition that others too can create and produce.

Within the OER movement, reducing technical barriers is only an emerging practice and has not received the same attention as open licensing. Open formats encourage and enhance the ability of individuals to openly translate and share resources. One such example is the *Bound by Law* comic book which includes the resource in multiple formats including individual book pages and images without text to facilitate translation (Aoki, Boyle, & Jenkins, 2006). Other emerging tools that facilitate the process of revision-as-translation of web-based video include Universal Subtitles (http://www.universalsubtitles.org).

These concerns are directly related to the degree of openness a designer is willing to provide, and function in tandem with the choices associated with selecting an open license:

> It is important to recognise that 'openness' is not a dichotomous concept; rather, there is a continuum of openness. Designers of OERs should decide early on

whether they wish to facilitate reuse and redistribution only, or if they also want to enable revising and remixing. Those who wish to facilitate reuse and remix of OERs should license their works accordingly. In addition, technical aspects of OERs will affect how 'open' they really are. Creators of OERs who wish to promote revising and remixing should ensure that OERs are designed in such a way that users will have access to editing tools, that the tools needed will not require a prohibitive level of expertise, and that the OERs are meaningfully editable and self-sourced. (Hilton III, Wiley, Stein, & Johnson, 2010, p.43)

In other words, the legal and technical choices for OER work in collaboration and in tension. Selecting a very open license (such as CC-BY) implies a willingness to make the resource "open", which can effectively be limited by the technical standards used to provide the resource. If the intention of the author is indeed to support remix then there is little reason not to include the source files or data available. Moreover, in alignment with the concerns over linguistic barriers, providing files in open formats substantially enhances the possibility that minority groups can adequately remix resources through free and open software. In our case, this impacted two design decisions. First, open-source software and open formats were used to create the booklet and make it available. The booklet can be accessed as plain text (in an open wiki), as PDF (formatted, an open standard), and in its original, editable format (formatted in Scribus, open-source software). Second, original graphics were provided in open standards but also with their original source files available for download.

Conclusions

This study aimed to contribute to the understanding of some of the barriers designers may face in remixing open educational resources, particularly through the process of translation. 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.

Two limitations of this study should be acknowledged. First, no comparisons were made between the efficiency or quality of a "remix" versus a "design-from-scratch" strategy.

Indeed, this article is focused on the process of design and remix concerns, and its scope does not permit us to expand on the theoretical contrasts between traditional instructional (systems) design and design-as-remix models. Second, this report does not discuss the impact or use of the resource; this is left to future study.

Still one can contend that remixing can be conducive to creating a better product. This stems essentially from "borrowing" from the expertise and know-how of other colleagues and reaping the fruits of their design reflections, which is implicit in their final products. The decisions that go into the design (content, examples, structure) are implicit testimony to the design process. When one engages in remix, one is borrowing not only the content, but also the expertise and the thought process that is embedded in design.

There is an effective need to promote the sorts of ecosystems that will allow local groups to create, remix, and share resources. There is still great disparity in the amount and quality of resources and tools available to different peoples around the world. The discussions around inequity, reminiscent of the digital divide debate, will continue to afflict us. Participatory practices hold great promise and should be further promoted. These practices can not only provide access to an increasing number of local resources but, importantly, incentivize investigation on what constitutes knowledge, who produces knowledge, and how it is constructed – discussions that go beyond financial and time costs associated with translation and localization processes (for a discussion, see Banks, 2004; Wanderley, 2010).

As valuable as it may be, remixing opens up a set of legal, technical, linguistic, and contextual issues that if ignored may oversimplify and discourage remixing activities and the benefits they bring about. Open educational resources provide us with new and exciting opportunities but also present unique challenges that must be recognized. Disseminating design experiences can help us understand barriers and find ways to promote more open practices.

Acknowledgement

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Uses of Published Research : An Exploratory Case Study

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Abstract

Academic publications are too often ignored by other researchers. There are various reasons: Researchers know that conclusions may eventually be proved wrong; publications are sometimes retracted; effects may decline when studied later; researchers occasionally don't seem to know about papers they have allegedly authored; there are even accusations of fraud (Cohen, 2011). In this exploratory case study, 10 papers were examined to determine the various ways they were used by others, whether there were cases of reported effects declining, and whether, among those who referenced the papers, there were suggestions that anything in the papers ought to be retracted. Findings showed that all the papers had been referenced by others (337 user publications were found, containing a total of 868 references). Other findings include the following: *Single references* were far more common than *multiple references*; *applications/replications* were the least common type of usage (23 occurrences), followed by *contrasts/elaborations* (34), and *quotations* (65); unlike reports regarding publications in the sciences, whether the paper was *solo-* or *co-authored* did not affect usage; appearance in a *non-prestige journal* was actually associated with more usage of some kinds; and well over 80% of uses were in heavily scrutinized sources (*journal articles* or *theses/dissertations*). The paper concludes with recommendations to writers about how to avoid producing publications that are ignored.

Keywords: Distance education; publishing; interaction analysis

Introduction and Background

In addition to the long-lamented, generally poor state of distance education research (Keegan, 1985; Moore, 1985; Cannell, 1999; Saba, 2000; Gibson, 2003; Zawicki-Richter, Backer, & Vogt, 2009), there are increasing problems with published academic papers, from a range of disciplines, being ignored after publication (Lehrer, 2010), eventually being proven wrong ("Publish and be wrong," 2008), being retracted for various reasons by their authors or publishers (Groopman, 2010), or being accused of fraud ("Liar! Liar!," 2009). The problem even plagues summaries of research in the popular press, where readers are warned that if they do not see subsequent confirmation of research they should suspect that the original, innovative findings "may have fallen by the wayside" ("Journalistic deficit disorder," 2012). It is also not unusual for effects observed initially to decline when studied later, the "declining verification" problem (Ioaniddis, 2005; Coyne, 2010).

This paper explores these issues in specific reference to my own work. It is an exploratory case study, raising issues which appear not to have been addressed before in regard to published research in open, distance, or general education research. It is intended to illustrate cases (uses of publications by others) and to provide an initial process for evaluating publications against problems reported elsewhere with academic research. To conduct it, I consulted *Google Scholar* (http://scholar.google.ca/) to determine how 10 of my papers, the *target papers*, published between 2000 and 2007, had been used by others. A similar process, also employing results found in Google Scholar, was previously reported by Rourke and Kanuka (2009). Google Scholar is a convenient and thorough way to determine when one's research has been cited by others; in addition, it provides access to the using work which, as described below, was central to the present study. Most were written by me alone (8), most were peer-reviewed (8), and all were old enough to have garnered attention from the field (if they were ever to do so).

References by others were found in 337 publications, the *user papers*, which contained a total of 868 references to something in one of the 10 target papers (I didn't count references I made myself). I examined these uses by looking at how the target papers were used by others and what specific conclusions others may have reached about them. The major purposes of the study were: 1) to explore the various uses others had made of the target papers; 2) to determine whether any of the effects reported in the target papers were found by others to be "declining" in any way; and 3) to ascertain whether anyone had called for anything reported in a target paper to be retracted, based either on new findings or on further examination of target paper data, reported findings, processes, or conclusions.

As noted earlier, lack of use has plagued academic research publications for some time, for various reasons. Lehrer (2010, p. 56) recently reported that fully a third of published studies are not even cited, much less replicated, by others. For example, in 2011 it was noted that of the 16 papers produced by the University of Vermont's

literature department, described as "a fairly representative institution," 11 had virtually been ignored, subsequently receiving a total of between zero and two references by other authors ("University challenge," 2011).

In addition to the lack of replication, publications sometimes do not survive subsequent research. Ioannides (2005) has asserted that, based on further examination and the gathering of more data, most initial research can be shown to be "false." He also criticized the practice of declaring an issue definitively resolved on the basis of a single study, noting that this practice is likely both to inhibit replication and to result in the refutation of results in subsequent studies because emphasis is given to small discrepancies (p. 696). In the same article, he was also critical of the practice in many fields of publishing only positive results, a problem especially when robustness of results is a goal. Lehrer (2010) reported in this regard that in 1959 the statistician Theodore Sterling noticed that 97% of all published psychological studies with statistically significant data found the effect they were looking for, leading him to conclude that psychologists were either extraordinarily lucky or they published only outcomes of successful experiments (p. 55). This is an early occasion of criticism of the predilection of researchers to offer for publication, and for editors to consider, only positive results.

More recently, Weisman (2011) described a similar "bias" of editors for positive results, which might later be found false (or trivial) through further experimentation. (Patton had earlier made the same criticism [1975, p. 25].) Weisman cites "beginner's luck" findings and regression to the mean as possible explanations for outcomes that are later rejected. Lehrer (2010) writes that Schooler, who first reported the "declining verification" phenomenon, was at a loss to explain why; he eventually blamed causes like "habituation." Myers (2010), while listing several possible explanations (i.e., investigator bias, population variance, simple chance, para. 5 to para. 11), criticized the tendency of some industries (e.g., pharmaceuticals) to attempt deliberately to profit from outliers (para. 8).

There are other explanations for the fact that research is often later disproved, contradicted, or even retracted (Cohen, 2011). The research might not be well done: Rovai and Barnum (2003, p. 58) reported that only 5% of the research in distance education published from 1993 to 2003 was valid enough to support any conclusions about (in their case) the effectiveness of using technology in teaching. As another example, in biomedical research samples are typically small due to the nature of the field and its research; this fact, however, weakens the likelihood of subsequent corroboration (Ioannidis, 2005; "Journalistic deficit disorder," 2012). Added to these problems is the fact that academic researchers are often not good at clearly expressing their discoveries or their thinking (Holdaway, 1986). The bias of editors toward positive results, rather than more nuanced, even "no significant difference" findings, has already been mentioned.

Academics ideally should publish in order to have their work read and used by others, their procedures and findings checked or corrected, and their ideas elaborated. While alternative views of thinking or unexpected findings should be welcome, as testing and applications by others may better approximate "the truth" about whatever is studied (Moonesinghe, Khoury, & Janssens, 2007), in practice (including distance education) use and disagreement are actually not common. For example, Schwier, Morrison, Daniel, and Koroluk (2009) examined 15 elements of the online interactions of graduate students. In their analysis, the least common type (at 3 occurrences) was *argument/disagreement*, while the most frequent type (40 occurrences) was *agreement*. Manley (2008) reported that *disagreement* was tied for seventh in a list of fifteen kinds of comments in an online forum he examined. When Jeong (2003) studied disagreement in online interactions among distance students, he concluded that "... statements of disagreement were rare" and that most commonly "disagreement occurred when arguments and counterarguments were exchanged" (p. 37).

The problems, then, are that the design, conduct, and reporting of academic research, and academic writing and communications generally, are often weak, and that some academic research is so faulty (or poorly written up) that it may have to be retracted, or substantially revised, after publication. The phenomenon of *failed publication*, for whatever reason, ironically makes reliance on the published literature, in practice or subsequent research, a risk for users.

The Study

I consulted Google Scholar regarding 10 of my papers (the target papers), published from 2000 to 2007, to determine their fate and whether problems existed: 1) whether others made use of them; 2) whether others reported any occurrences of "declining effects" in the target papers; and 3) whether there were calls for retraction of any of the works, or of any of the specific published findings. User publications (as revealed by Google Scholar) were grouped for analysis into the following categories:

- *conference presentations and proceedings*;

- *journal articles*;

- *theses and dissertations*;

- *university publications* (unreviewed reports, papers, statements, summaries, and brochures);

- *books, book chapters, or publications otherwise not available for download as full-text* (and therefore often not fully examined in the field).

Google Scholar provides direct links to most using works, usually making the full text of user publications available (the exception is books and book chapters, which are typically not available in full-text form). In total, of the 337 using publications I was able to obtain full-text copies of all but six of the publications through direct links or through the Athabasca University library's subscription services.

Factors Investigated

Analysis of the use by others of the target papers focused on the following:

1. type and frequency of occurrence of

    a) *mentions* of the target papers;

    b) *quotations*, exact words taken from one of the target papers;

    c) *applications or replications*, use of an instrument, procedure, process, or finding from any of the target papers;

    d) *contrasts/elaborations*, a finding or approach different from, contrasted with, or diverged from something originally reported in a target paper;

    e) *multiple references*, a reference in the form of *one of several in a series* (e.g., Fahy, 2010; Smith, 2002; Jones, 2003), the target paper then listed in the using paper's bibliography;

    f) *single references*, a sole, stand-alone reference to a single, specific publication (e.g., Fahy, 2010), the target paper then listed in the using paper's bibliography;

    g) usage by others influenced by the target paper's

        i) *solo-* or *co-authored* status;

        ii) appearance in a *prestige* journal (one of the "gold standard of quality and utility for online educators" (Elbeck & Mandernach, 2009) or one of "the most prominent and recognized journals in the field of distance education" (Zawicki-Richter, Backer, & Vogt, 2009);

        iii) *geographic location* of the using publication;

2. reports of *declining verification,* as described by Lehrer (2010);

3. calls for *retraction* of any of the target papers or any findings, or suggestions of *fraud*.

Analysis of user publications was conducted using SPSS and Excel (for quantitative questions) and ATLAS.ti (generally, for qualitative questions, though summaries of some elements, such as those presented in Table 3, were also conducted with this tool).

Findings

Question 1: Usage of target papers.

Use of the target papers by others is shown in Table 1 (from Google Scholar, as of September 2011).

Table 1

The Target Papers and Use by Others

Target paper author(s), date of publication	Number of others' papers with at least one mention of target paper (from Google Scholar)	Target paper originally appeared in
Fahy, P. J., Crawford, G., Ally, M., Cookson, P., Keller, V., & Prosser, F. (2000)	29	*American Journal of Distance Education*
Fahy, P. J., Crawford, G., & Ally, M. (2001)	72	*International Review of Research in Open and Distant Learning*
Fahy, P. J. (2001)	49	*International Review of Research in Open and Distant Learning*
Fahy, P. J. (2002a)	27	*Journal of Distance Education*
Fahy, P. J. (2002b)	36	*American Journal of Distance Education*
Fahy, P. J. (2003)	61	*International Review of Research in Open and*

		Distance Learning
Fahy, P. J. (2005)	23	International Journal of Instructional Technology and Distance Learning
Fahy, P. J. & Ally, M. (2005)	28	American Journal of Distance Education
Fahy, P. J. (2006)	10	European Journal of Open, Distance, and E-learning
Fahy, P. J. (2007)	2	Distance Education
Total publications	337	10

As shown above, every target paper received some use, ranging from 2 to 72 references by others. Usage findings show an analysis of the 868 total references in 337 publications produced by others. The findings, as shown in Table 2, include the following:

- Single references were more common than multiple references by a ratio of more than 2 to 1;

- Applications/replications were the least common type of usage (23 total occurrences, and no occurrences in relation to half of the target papers; more is said about applications/replications below);

- The 65 quotations included 24 (37%) by one user article, in reference to one target paper;

- All but two of the 10 target papers (the two most recently published) experienced some contrasting or elaborating use by another user.

Table 2

Types of References Received by the Target Papers

Target paper (publish date)	Quotations	Applications/ replications	Contrasts/ elaborations	Multiple references	Single references
2000	3	1	4	17	60
2001	11	11	8	58	130
2001	11	5	1	35	88
2002a	5	0	6	48	69
2002b	5	0	8	37	69
2003	6	3	1	37	58
2005	24	3	5	17	80
2005	0	0	1	16	25
2006	0	0	0	6	11
2007	0	0	0	2	5
TOTAL	65	23	34	273	595

Single references suggested focus on specific content within the target paper. Lapadat (2007) argues that reference to specific elements in another's work may indicate a focus on or development of new theoretical models. In this case, single references could be regarded as focused on such specifics, especially in theses and dissertations. To test this idea, the data were examined to determine whether there was any preference among students (thesis and dissertation writers) for use of single quotations. There was a statistically significant difference between theses/dissertations and all other types of

publications in use of single quotations (p = .018). More research is clearly needed on this issue, but it appears that in this study, as the literature predicted, students were more focused than other writers on specifics of the target publications, as revealed by their use of single references.

The specifics of users' references varied widely. Some users simply mentioned a general aspect of a target paper, but made no reference to specific content in that paper (De Wever, 2006; De Wever, Schellens, Valcke, & Van Keer, 2006); others developed their own instruments or procedures based upon the target's models, sometimes with little detailed reference to the original (e.g., Oriogun, Ravenscroft, & Cook, 2006); some mentioned the targets' concerns, but without citing specific instruments or procedures (Valcke, 2009); and some researchers creatively applied the target's tools and procedures to populations not studied in the original paper (Finegold & Cooke, 2006).

Overall, analysis of applications/replications showed the following types of references, and their frequencies, in the user publications (note that some publications contained more than one application/replication).

Table 3

Type, Frequency, and Proportion of References in Applications/Replications

Type	#	%
Neutral reference	34	57.6
Positive reference	19	32.2
Positive quotation	3	5.1
Negative reference	3	5.1
TOTAL	59	100%

Examples of the above:

Neutral reference (statement of facts, without endorsement or comment on value): "To analyze message content of the discussion transcripts, the authors used the Transcript Analysis Tool (TAT) (Fahy et al., 2001), an adaptation of Zhu's discussion content categorization" (Gibbs & Bernas, 2008).

Positive reference (suggests value of concept referenced):   "We found ourselves resorting to what Fahy et al. describe as the inefficient strategy of collaborative coding: very time-consuming" (Cook & Ralson, 2003).

Positive quotation (suggests value of concept quoted): "The instrument was applied to the analysis of the OAD using the sentence as the unit of analysis, following Fahy's (2001) observation that, 'Sentences are, after all, what conference participants produce to convey their ideas, and are what transcripts consist of (p. 4)'" (Murphy, 2004).

Negative reference (denies or questions value of concept referenced; may offer an alternative): "While Fahy revealed that the two methods of analysis are complementary, analysis using two separate methods is time consuming and impractical for application in educational contexts" (Murphy, 2004).

None of the user applications/replications resulted in outright rejection of a finding or a process from the target papers. In terms of usage of the basic communications elements examined in Table 2, above, the user papers that employed applications/replications of material from the target papers differed from the other user papers only in their use of single references and quotations. Again, as noted earlier, this usage may be seen as consistent with the pursuit of new theoretical models (Lapadat, 2007). This finding (and interpretation) should be considered preliminary, and further study is suggested.

The analysis also considered the association of usage with other authorship and publication factors in order to further describe and analyze usage.

Solo vs. co-authored.

In the sciences, collaboration, represented by co-publication, perhaps in response to problems with the perceived integrity of existing published research ("Professor Facebook," 2011), has increased more than 95% in the past 50 years, with the size of teams growing about 20% each decade (Leher, 2012). Zawicki-Richter et al. (2009) noted a trend "towards more collaboration among researchers in distance education," as seen in an increase of over 17% in collaborations from 2000 to 2008, as compared with the period 1991 to 1996 (p. 38). Lehrer also observed that science collaborations are demonstrably related to subsequent usage by others: Science papers by multiple authors receive more than twice as many citations as those by individuals, and "home-run papers" (those that receive 100 citations or more by others) are six times more likely to come from a team of scientists than from individuals (p. 23). As an example of the general ubiquity of collaborations in the present era of social networking, Lehrer cites the fact that most Broadway plays are now constructed by teams (p. 25).

Among the 10 target papers studied here, there was collaboration: Five were co-authored and five were solo-authored. However, there was no significant difference in the type or frequency of references attributable to authorship, suggesting that, in this

instance, collaboration did not produce differences in usage by, or popularity with, others.

Prestige of publication source.

Elbeck and Mandernach (2009) identified five journals that, "...[b]ased upon popularity, importance, and perceptions of prestige... represent the gold standard of quality and utility for online educators" (p. 14). They were (emboldened titles, in the following, appeared in both lists discussed below):

- *International Review of Research in Open and Distance Learning*,

- *Journal for Asynchronous Learning Networks,*

- *eLearning Papers,*

- *Innovate: Journal of Online Education,*

- *American Journal of Distance Education*.

Zawicki-Richter et al. (2009) offered a somewhat different list of journals, with "reputations as the most prominent and recognized journals in the field of distance education":

- *Open Learning,*

- *Distance Education,*

- *American Journal of Distance Education*,

- *Journal of Distance Education,*

- *International Review of Research in Open and Distance Learning*.

Seven of the 10 target papers originally appeared in one of the above-listed journals, five in journals that were in both (prestige) lists, as follows:

- three in the *International Review of Research in Open and Distance Learning,*

- two in *The American Journal of Distance Education,*

- one in the *Journal of Distance Education,*

- one in *Distance Education.*

Table 4 shows usage differences observed between papers appearing in prestige versus non-prestige publications.

Table 4

Usage by Others based on the Prestige or Non-Prestige Status of the Publication in which the Target Paper Appeared

Element	Non-prestige publications ($n = 5$)		Prestige publications ($n = 5$)		X^2	p
	#	Expected	#	Expected		
Quotes	27	18	38	43	11.24	.024
Applications/replications	4	4	19	20	1.35	.245
Contrasts/elaborations	9	6	25	28	.49	.921
Multiple references	40	45	233	228	2.88	.942
Single references	151	133	444	457	34.02	.005
Total references	191	181	677	686	23.50	.216

The above shows that, on two of the six measures explored, target papers which appeared in non-prestige journals had more quotes and single references by other writers than was expected statistically (using the *X^2 test).* These are uses, as argued earlier, that suggest reference to specific elements of the target publications and may be seen as linked to theory-building (Lapadat, 2007). Another use of target papers from non-prestige sources, *contrasts/elaborations,* was also more common than expected in non-prestige publications, but the difference was not statistically significant. There were no statistically significant differences that favoured target papers in prestige journals.

Because in this study those who cited the target papers in non-prestige publications more frequently quoted from them and used more single references than did users of target papers that appeared in prestige publications, there was some evidence that usage focused on single, specific aspects of the target papers. This conclusion, of course, requires more investigation; it is offered here in the spirit of breaking new ground

(Rourke, Anderson, Garrison, & Archer, 1999) and developing a "map of the territory" (Garrison, Anderson, & Archer, 2001).

Questions 2 and 3: Declining verification, and calls for retraction.

No occurrences of declining verification, the phenomenon originally reported by Dodson, Johnson, and Schooler (1997), and no calls for retraction, were found among any of the publications that referred to the 10 target papers. In light of the overall uses made, and especially in reference to specific uses that involved application, analysis, re-publication, and review of results, this suggests that readers can have confidence that the results reported in the target papers have been scrutinized and continue to be regarded as valid, both as initially published and as re-used in further work. If serious errors meriting calls for retraction had occurred in the target papers, it is the conclusion of this review that the uses made of the publications would have detected and reported them.

Further evidence for the above can be inferred from the types of uses observed here. The 10 papers were, in total, referenced (formally, that is, with APA-type citations in the using papers' references section, and informally, that is, mentioned without formal citation) 868 times. Most of the references appeared in journal articles (566, 65.2%), or in theses and dissertations (181, 20.9%), both of which are scrutinized through a formal process of peer-review or faculty over-sight, a central feature of "disciplined inquiry" (Shulman, 1997). And yet, as documented in Table 3, on only three occasions did users express disagreement with anything in the target papers. The overall pattern of review is summarized below; by summing the proportion of journal articles and theses, it can be seen that well over 80% of the target publications were referenced, applied/replicated, quoted, or contrasted/elaborated in a peer-reviewed or otherwise closely monitored publication.

Table 5

Total of Communications Elements by Publication Type

Communications elements	Conf. proceedings (27)		Journals* (222)		Theses* (34)		Univ. pubs (22)		Books, chapters (32)		Tot. (337)
	#	%	#	%	#	%	#	%	#	%	#
Multiple references	7	2.6%	189	69.2%	54	19.8%	10	3.7%	13	4.8%	273
Single references	26	4.4	375	63.0	127	21.3	24	4.0	43	7.2	595
Total references	33	3.8	564	65.0	181	20.9	34	3.9	56	6.5	868
Applications/replications	0	0	13	56.5	6	26.1	2	8.7	2	8.7	23
Contrasts/elaborations	1	2.9	18	52.9	11	32.4	1	2.9	3	8.8	34
Quotations	5	7.7	49	75.4	6	9.2	3	4.6	2	3.1	65

*Usually peer-reviewed or closely supervised by senior academics.

Evidence for the integrity of the results in the target papers also exists in the uses made of them by subsequent authors. Analysis of applications/replications showed that most often only one target paper was cited by a user (though the single paper may be cited several times). This suggests that users focused on single sources, and specific aspects, of the target research. Further, most target papers were cited almost immediately after they appeared: Of the ten target papers, seven were cited for the first time in the same year they appeared, two in the year immediately after publication, and one in the second year after appearance. The target papers also continued to be cited over time: The mean period from publication to last (most recent) citation was 7.4 years. (The target papers were originally published from 2000 to 2007.) These findings show how users accessed, studied, and applied the target papers: frequently, soon after publication, and continuously over time.

Further analysis of uses by others showed variety in the types and sources of the publications that used the target papers in terms of geographic origin, publication type, topics, and intended audience:

- The geographic origins of the using publications were America (40%), Europe (19%), Asia/Australia (17%), Canada (16%), and Great Britain (8%); in reference to distance education publications, Zawicki-Richter et al. (2009, p. 40) found

that 80% of published distance education research came from the USA, Canada, the UK, Australia, and China;

- Twenty-one of the uses were in publications from university departments, individual faculty, or university presses; among other things, it is uncertain whether these uses were peer-reviewed;

- Topic and intended audience might be seen in the titles of the articles or the publications that carried them. The three most commonly used key terms from the users' titles were *computing/technology* (68), *higher education (*14), and *distance (*12).

Summary of Findings

The following summarizes the findings noted above.

1. All of the target papers were used in some way by others.

2. Thesis/dissertation writers (students), more often than other users, engaged comparably in all of the communications elements, except quotations; in this area, journal articles exceeded the others. Writers of theses and dissertations were apparently testing theory and the findings of others by re-application and replication; they also more heavily documented their conclusions and analyses (through single and multiple references).

3. Journal articles were slightly more likely to contain quotations.

4. Usage patterns suggest immediate and ongoing focus on and use of specifics in the target papers.

5. Least likely to contain documentation of sources were conference proceedings (on five of the six communication elements, conference proceedings had the lowest ratio of the communication elements to number of publications).

6. Geographic location of user publications in this study matched closely the pattern reported in other research.

Discussion of Implications

The evidence presented earlier was that research in the social sciences, including distance education, is often not replicated, may not be cited by others, may contain errors that are only detected later, and may even contain fraudulent results or processes (the last two situations, when discovered, invariably resulting in retraction). The fear is that, where close examination does not occur, findings and conclusions may not be examined or verified by others, but may still eventually become part of the "literature." The intent of this study was to assess in relation to 10 published papers of one author

whether there was any evidence that any of these conditions had developed over the life of the publications.

In using the target publications, other researchers tested and, when they did not report egregious weaknesses, or when they referred to the target papers' specific elements positively, affirmed their usefulness. There was no evidence of declining verification in the time the papers had been in circulation, nor calls for or instances of retraction. The majority of uses were in theses and dissertations, and journal articles (together, over 80%), suggesting that the target papers were applied in the context of further research. An advantage of these uses in assessing the validity of the target publications lies in the fact that students' work is usually conducted under, and subject to scrutiny by, senior academics, and journal publications are subject to peer-review. These uses could be seen, therefore, as more corroboration of the soundness of the original papers.

It is probably not surprising that conference publications contain fewer references: Some conferences are not peer-reviewed at all, and therefore including documentation in the resources posted within them is superfluous. University publications, on the other hand, are somewhat harder to explain: On four of the six criteria shown in Table 4, university publications were second last (most often to conference proceedings) in the frequency of use of the communications elements studied. Another poorly documented form was books and book chapters, again for unclear reasons. These findings merit further research and explanation.

There did not appear to be a distinct advantage to publishing in prestige journals in terms of expected versus observed usage (although in terms of numbers, not ratios or proportions, most of the resulting usage did pertain to papers which appeared in prestige sources). The frequency of use of material from non-prestige sources is potentially surprising, but may simply relate to these 10 target papers. Further research in this area is clearly merited. (A question that deserves exploration is, What, in terms of their contents or processes, distinguishes prestige publications, after all?)

Differing from the sciences, usage of these papers by others was not found to be associated with collaborative- or multiple-authorship. (There was no difference in usage by others of co-authored vs. solo-authored papers.) Again, further research should determine whether this finding is common in distance education research or the social sciences more generally.

Patterns of usage suggested that other writers were actively attempting to make use of the various contents (tools, processes, findings, conclusions) of the target papers. Certainly, the researcher who made 10 adjustments to previously published tools or procedures appeared to be diligently engaged in finding either an alternative application or in making the existing target tools and concepts fit new purposes. Statistically, those works that made some application of the target findings averaged more references (6.89 vs. 2.29) than those that did not ($F = 25.25$, $p = .000$).

Conclusion

This case study was motivated by several convictions: that publications should be used by others; that longevity is one of the tests of the validity of published research (if time is also accompanied by scrutiny, which implies, and follows from, use); and that the pattern of usage can indicate how and whether a researcher's work has been received and used over time. It was conducted because the literature indicated that such an examination had not yet been performed in relation to published distance education research.

Publications should be used and tested; the cruelest fate any publication can endure (other than being retracted) is not to be noticed by others. Yet, as was reported earlier, the fate of many publications is just that. Reasons for neglect vary, including researchers' lack of writing skill (Holdaway, 1986) and the preference of editors for work that shows positive results or papers that are more emphatic in their claims (Lehrer, 2010). There is no doubt that results must be relevant and timely and presented in ways that engage readers, especially, as in distance education, where text is the principal (often only) means of communication (Keegan, 1985; Kaye, 1989; Willis, 1992; Khan, 1997; Simonson, Smaldino, Albright, & Zvacek, 2006, 2009; Saunders, 2008). Possible culprits for the poor reception of research (and mistakes to be avoided by distance education researchers) include failure to look to the work of others for guidance; reviewers who are insensitive to the nuances of new research or unconventional findings; and investigators who work again already well-tilled ground. The possible role of readers and practitioners in these processes also bears further examination.

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A Framework for Developing Competencies in Open and Distance Learning

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Abstract

Many open universities and distance education institutions have shifted from a predominantly print-based mode of delivery to an online mode characterised by the use of virtual learning environments and various web technologies. This paper describes the impact of the shift to open and distance e-learning (ODeL), as this trend might be called, on the course design practices of faculty members at a small single-mode distance education university in the Philippines. Specifically, the paper presents and analyses the faculty's perspectives on how their course design practices have changed and issues and challenges arising from these changes. The findings suggest that faculty training programs in ODeL should aim to develop a comprehensive range of ODeL competencies in a systematic and coherent way. Based on the findings, as well as research on practitioner development in teaching effectively with technology, a framework for developing ODeL competencies among faculty is proposed. Aside from covering the four areas of change in course design practice identified in the study, the framework also specifies levels of expertise (basic, intermediate, and advanced), indicating degrees of complexity of the knowledge and skills required for each area at each level. All of the competencies listed for all four areas at the basic level comprise the minimum competencies for teaching an online distance education course.

Keywords: Open and distance e-learning

Introduction

Since the mid-1990s significant changes have been taking place in the field of distance education (DE) as a result of rapid advances in information and communications technology (ICT). Many DE institutions have shifted from a print-based mode of delivery to online delivery characterised by the use of virtual learning environments (VLEs) and various web technologies (Haughey et al., 2008; Bates, 2008). Flexibility and adaptability of design distinguish 21st century DE from older forms of DE (Garrison, 2000; Haughey et al., 2008; Tait, 2010). Industrial era DE deployed "standardised, normalised and formalised procedures for design and delivery" (Peters, cited in Burge & Polec, 2008, p. 238). In contrast, in online DE the boundary between course development and course delivery is increasingly blurred, and "former course development roles... are being deconstructed and reinvented" (Abrioux, 2001, p. 1) as the role of teachers in the design of pedagogically effective learning environments receives renewed emphasis (Anderson, 2008; Bennett et al., 2009). Moreover, DE course designs are increasingly resource-based (Calvert, 2005; Naidu, 2007), that is, featuring online learning activities organised around web-based resources (Jara & Fitri, 2007) and, in some cases, integrated (Mason, 1998) or online discussion-based (Jara & Fitri, 2007), where the course contents are "more fluid and dynamic" because they are created during synchronous and asynchronous online collaborative activities (Mason, 1998).

At the University of the Philippines – Open University (UPOU), resource-based course development has been encouraged since 2003 (Arinto, 2009), and it was bolstered with the university's adoption in 2007 of Moodle, an open source VLE that allows for the creation of courses featuring digital resources and online activities (Blin & Munro, 2008). New courses are being developed under a resource-based course development contract, and faculty assigned to teach (called faculty-in-charge or FIC) already developed courses are encouraged to supplement the print modules (or replace them altogether, if warranted) with open educational resources (OER). FICs are also encouraged to integrate online discussion forums, and they are free to use open source web tools, such as blog sites, media sharing sites, and web-based conferencing applications, to enhance course delivery.

These changes in the design and delivery of courses have led some of UPOU's administrators, most notably the chancellor[1], to coin the term *open and distance e-learning* or *ODeL* to refer to UPOU's DE practice.[2] ODeL highlights the convergence of

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[1]   The chancellor is the equivalent of a rector or vice-chancellor in the UK system.

[2]   In February 2012, UPOU organised the 1st International Conference on Open and Distance e-Learning. More than 200 participants from 20 countries participated. The conference Web site is at http://icodel.upou.edu.ph/

the philosophy of open learning espoused by open universities and the DE and e-learning pedagogies and technologies adopted by these institutions to enable flexible learning, independent learning, and the building of learning communities. ODeL may be considered to be an expansion of the term *open and distance learning* or *ODL*, which refers to "[a] learning system that combines open learning characteristics with distance delivery" (Abrioux, 2006, p, 10), to include the adoption of e-learning or online learning methodologies. In this paper, ODeL is used synonymously with *online DE*.

This paper reports part of the findings of a qualitative study of the ODeL course design practice of 10 UPOU academics. The study looked into the pedagogical rationales for the faculty's use of web technologies and their approaches to and perspectives on ODeL course design, their perspectives on how their course design practices have changed and issues and challenges arising from these changes, as well as the implications of these for faculty development in ODeL across the institution. Based on the study's findings as well as research on practitioner development in teaching effectively with technology, the paper proposes a framework for developing ODeL competencies among faculty of DE institutions that are in transition towards online modes of delivery.

Methodology

UPOU is a single-mode DE institution within the conventional or campus-based University of the Philippines (UP) system.[3] It was established in 1995 "to democratise access to quality higher education" through the offering of DE programmes, especially in disciplines "that contribute to national development" (UPOU, no date). All of UPOU's programmes are designed for part-time students, and they are cohort- and term-based.

The research participants consist of eight regular or full-time faculty members[4] and two affiliate faculty administrators who have been closely involved with the institution since its establishment. The eight regular faculty members comprise about a third of the total number of regular UPOU faculty. All 10 research participants were selected for this study because they are involved in course design and development aside from course delivery, unlike part-time lecturers who are contracted to serve only as course tutors during course delivery; and they have integrated or are integrating in their courses a range of web-based tools and resources, including rich media, blogs and wikis, web

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[3]   Abrioux (2006) refers to this as the "university within a university" model, an institutional arrangement designed to "protect the ODL culture in a dual-mode institution" (p. 5).

[4]   UPOU's faculty complement consists of 27 full-time mostly middle-ranking faculty members (i.e., with the rank of assistant and associate professor [16]), and about 200 part-time faculty most of whom are faculty affiliates from the other UP units.

conferencing, multimedia sharing, and social networking applications. Moreover, they have experienced different 'generations' of course design at UPOU: Three of them were course authors in the mid- to late-1990s, the heyday of the pre-packaged and tutorial-in-print model; three joined UPOU during the transition period from face-to-face to online tutorials in 2001-2003, and they participated in the development of instructional materials for non-formal courses; three joined UPOU in 2004-2006 and have been involved in (online) course delivery (i.e., tutoring) more than in course development; and three joined UPOU in 2007 and they are implementing a web-based course development model.

Three of the participants are male and seven are female, reflecting the predominance of female faculty members in the university as a whole. In terms of rank, three participants are assistant professors, four are associate professors, and three are full professors. Four of the participants have at least 10 years experience in teaching at a distance, two have more than five years experience, and four have less than five years experience. They teach courses from different disciplines: biology, nursing, reading education, media studies, development communication, public management, R&D management, and environment and natural resources management. All teach graduate-level courses, and four teach undergraduate-level courses as well.

Data collection was done through semi-structured interviews because course design is a purposeful activity that involves making deliberate choices of content and instructional strategies to achieve specific curricular outcomes based on the designer's understanding of the learning context, including the nature of the subject matter, the type of learner, and the resources and tools available (Goodyear, 2009); and especially in courses designed by faculty members working alone or independently (instead of in course teams), course design is influenced by the teacher-designer's personal constructs, which consist of personal experiences of learning, including those shaped by culture, gender, and ethnicity; personal views of what makes for 'good' teaching; and beliefs about the purposes of the subject (Leach & Moon, 2000; Banks, Leach, & Moon, 2005). The intentions and personal constructs that influence design are best accessed by asking the designer directly what he/she intended to do or achieve, and why. Thus, research participants were asked questions that were designed to explore their awareness of various elements of online course design, in particular strategies (what web tools and resources are used and how they are used); intentions (why the faculty use these technologies and what they intend to achieve); and perceptions particularly of the factors that shape/influence their actions and intentions, and how their teaching practice has evolved or is evolving.

The interviews were conducted over a one-week period. Each interview lasted between 45 and 90 minutes. They were conducted in UPOU offices that were convenient to the interviewees and which afforded privacy and quiet (e.g., a small conference room, the interviewee's office). All interviews were conducted in English, the official medium of instruction in higher education in the Philippines and one of the country's two official languages (the other is Filipino), and they were audio recorded and transcribed.

During the first stage of data analysis, in addition to the analysis of individual participants' responses to the interview questions, responses to each question from all of the research participants were compared and contrasted in order to identify similarities and differences and formulate categories of responses to each question. This was in keeping with the 'collective case study' (Stake, 1995) methodology where individual case studies[5] are jointly analysed in order "to provide insight into an issue" (Stake, 2003, p. 137) or to formulate an analytic generalisation, defined as "the development of a theory which helps in understanding other cases or situations" (Robson, 2002, p. 177). In this study, the course design practices of 10 academics are examined in order to understand the phenomenon of online distance learning at UPOU. The focus is therefore not the course design practices of individual faculty members per se, but their collective practice of course design and the institutional ODeL 'profile' at a specific historical moment.

In the second stage of data analysis, the faculty's responses to the interview questions were analysed using a framework derived from the theoretical and empirical literature on how teaching with web technologies impacts on DE course design. This includes research on (1) the changing roles of teachers particularly in relation to course design, (2) variation in teachers' approaches to e-learning design, and (3) the development of teacher knowledge of and through e-learning design.

Conceptual Framework

Research on the changing role of teachers in online learning notes that some teaching roles are given greater emphasis or amplified while other roles are reduced as a result of the selectivity of technologies (Kanuka & Rourke, 2008). That is, technologies are designed for particular purposes (referred to as their *intentionality*) and "[t]hey facilitate, emphasise, and enhance particular kinds of experience, while inhibiting, limiting, and sometimes even excluding others" (Swan, 2010, p. 110). The design role of teachers, for example, is amplified in online learning. According to Beetham and Sharpe (2007), while design is a key feature of teaching in general, in e-learning "the need for intentional design becomes more obvious and pressing" (p. 7). While in face-to-face teaching, approaches can be immediately adjusted to fit learners' needs which teachers can gauge directly from learner performance, in technology-supported learning seemingly ordinary pedagogical activities like grouping learners, posing questions, providing resources, and other ways of scaffolding learning in response to learner cues

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[5]   These individual cases are referred to (by Stake, 1995; 2003) as instrumental case studies because unlike an intrinsic case study which is undertaken to understand the uniqueness of a specific phenomenon or case, they are conducted to help provide a general understanding of a phenomenon that extends beyond single unique cases (Harling, 2002).

during the learning process "require forethought and an explicit representation of what learners and teachers will do" (Beetham & Sharpe, p. 7). At the same time, new digital technologies are enabling design 'on the fly' (Oliver, 2004, p. 6). Mason (1995) includes in her typology online DE course models where "less of the course is pre-determined and more is created each time the course is delivered, through the discussions and activities" that take place on the VLE. The focus of design therefore shifts from "the design and delivery of instruction and instructional materials" to "the creation of environments that foster and support active learning in collaborative communities" (Swan, 2010, p. 114). In these "resource- and activity-based learning environments" (Naidu, 2008, p. 250), "university teachers have to think carefully about the design of good learning tasks… as well as about the resources that students will need if they are to stand a reasonable chance of succeeding in these activities" (Goodyear, 2010, p. 4). Thus, the mediating role of the teacher is expanded to include helping learners "to make sense of the wealth of resources which they can, with guidance, find themselves" (Tait, 2010, p. x).

This type of scaffolding of learning that online teachers are called upon to provide is evident in what Siemens (2007) refers to as the curatorial role of teachers in networked learning environments. Siemens proposed the idea of teachers as curators as an alternative to the simplistic dichotomy of sage on the stage versus guide on the side. According to Siemens (2007), the term *curating* underscores the complexity of selecting resources for learning: It is work that involves being a subject specialist with the ability to make decisions about what resources to select, provide expert commentary about each resource or the resources as a group, and showcase resources in ways that highlight each resource as well as the relationships among them. This work has the important effect of facilitating or scaffolding learning particularly of disciplinary canons:

> A curator balances the freedom of individual learners with the thoughtful interpretation of the subject being explored. While learners are free to explore, they encounter displays, concepts, and artefacts representative of the discipline. Their freedom to explore is unbounded. But when they engage with subject matter, the key concepts of a discipline are transparently reflected through the curatorial actions of the teacher. (Siemens, n.p.)

While the design role of teachers might be amplified in online learning environments, a qualitative change in design practice, for example shifting from designing content to designing learning activities, does not necessarily happen unless teachers recognise the need for such changes. This recognition in turn comes from a broadening of the teachers' awareness of the pedagogic opportunities afforded by learning technologies and the development of their knowledge and skills in online learning design. This was found to be the case by Armellini and Jones (2008) in a study on the impact on e-learning design practice of a two-day design workshop involving 93 faculty members of

the University of Leicester. Specifically, they found that faculty move through three stages of e-learning design: 1) transmissive design, 2) interactive design, and 3) design for knowledge construction. Transmissive design is characterised by a focus on providing resources for students, using the learning platform as a repository of materials, and student interaction with tutors being limited to submitting assignments for marking. Interactive design, also referred to as *interactive, single loop design*, fosters limited participation typically by asking participants to post in discussion forums their experiences with the course material. Because the discussion tends to be limited to one response to the task posed by the teacher, with little or no further exchanges among students, interactive design is characterised as being closer to teacher-centred rather than learner-centred approaches and as having a strong focus on content. In collaborative designs, which is considered to be learner-centred, multiple-loop interaction and collaboration among learners and tutors is central to learning and the teacher's role is to design 'e-tivities', encourage collaboration, and ensure meaningful student engagement through 'e-moderation'. According to Armellini and Jones, although course teams did not all change "in the same way or at the same speed,... all showed signs of change towards the collaborative category" (p. 25) after going through the design workshop, and course teams that opted to maintain a transmissive approach to e-learning developed an awareness of alternative approaches as well as key pedagogical issues in technology-supported learning.

Pedagogic change in online learning might also be understood in terms of the development of the teacher's knowledge of how to teach effectively with technology. Mishra and Koehler (2006) have proposed the technological pedagogical content knowledge framework (TPCK or, more recently, TPACK; see Figure 1) for understanding the nature of this knowledge as one that goes beyond technology-related competencies to include knowledge of subject matter or content and pedagogical knowledge as well as the integrated forms of knowledge that develop in the interplay among these three main forms, namely, technological pedagogical knowledge (TPK), technological content knowledge (TCK), and pedagogical content knowledge (PCK, first proposed by Shulman in 1986). Mishra and Koehler (2006) have noted that TPACK is developed by engaging continuously in the design of technology-supported learning. According to Angeli and Valanides (2009), this continuous practice should lead to the transformation of the forms of knowledge that comprise TPACK and not just the increase or accumulation of each component. Moreover, "teachers need to be explicitly taught about the interactions among technology, content, pedagogy, and learners" in order to effectively use technology to improve learning (Angeli & Valanides, p. 158).
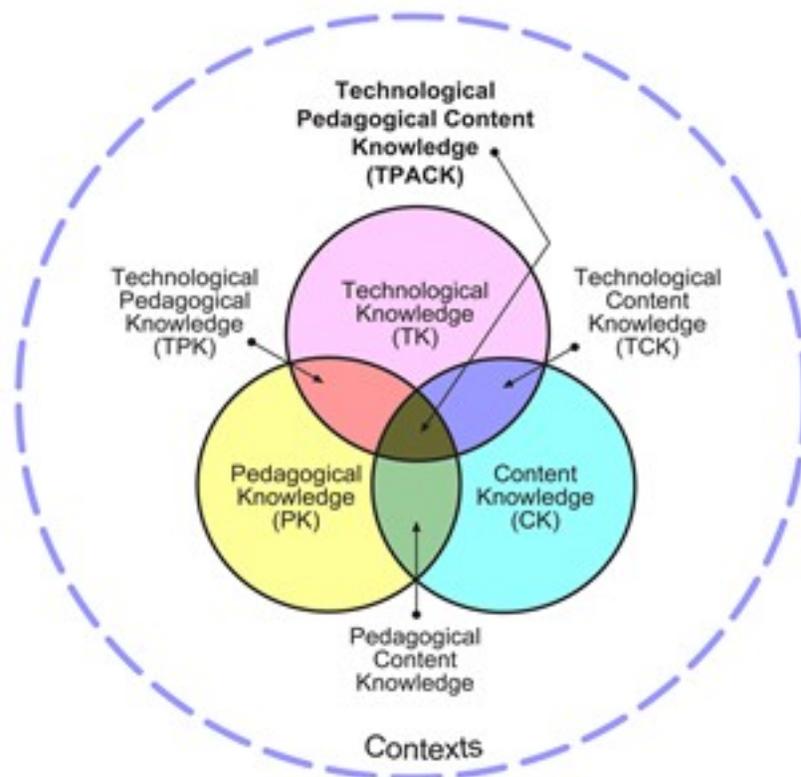
Figure 1. The TPACK framework (http://tpack.org).

Fndings and Discussion: Changes in Course Design Practice at UPOU

In the current study, the faculty described changes in four aspects of course design: content development, teaching strategies, learning activities, and assessment of learning (Table 1).

Table 1

Summary of Changes in Participants' Course Design Practice

Changes in content development	Changes in teaching strategies	Changes in learning activities	Changes in assessment
including learning resources in various formats (P1, P2, P9)

frequent updating of the course package (P2, P6)

inclusion of learning resources that learners can also use in their own professional context (P2)

being able to customise a course through the inclusion of sample texts from the students' field of study (P5) | using web tools to implement a process-oriented, synchronous discussion-based course model (P5)

exploiting LMS functionalities to structure/organise the course better (P5)

use of web tools in a "lab" course requiring demonstrations and hands-on exercises (P8)

being able to include synchronous discussion (P9) | using a variety of learning activities to motivate students (P3)

scaffolding learning (P3)

involving students more in the teaching and learning process; enabling greater student participation (P2, P9)

enabling collaborative learning (P4, P8, P9)

fostering dialogue and community-building (P5, P7) | more holistic assessment through use of formative and summative assessment, and different types of assessment (not just tests) (P1)

adoption of different formats for student work (i.e. aside from print or text) (P1, P3, P7)

specification of assessment criteria to guide students better (P4) |

(Note: The participant/s who mentioned a particular change is/are identified in parentheses after each item. The participant reference is P plus a number from 1 to 10.)

The changes mentioned under content development and learning activities are consistent with those noted in DE research (for example by Haughey et al., 2008; Mason, 1998; Naidu, 2007; Tait, 2010), in particular the shift from pre-packaged to resource-based content development and from materials development to the design of learning environments and activities. These are said to be evidence of a shift from teacher-focused knowledge transmission pedagogies to learner-focused social constructivist knowledge generation pedagogies (Goodyear, 2009; Swan, 2010). In contrast, changes in teaching strategies and assessment were described in more teacher-focused terms. More specifically, the increasing use of web technologies for synchronous communication appears to be enabling teaching strategies which might foster greater teacher-learner interaction but which might also constrain learner access and participation (Murphy et al., 2011). Assessment practice also appears to still be teacher-directed, with little use of student self- and peer-assessment, which confirms Mason's

(2008) comment regarding the paucity of innovative assessment design in online courses.

This analysis finds further support in the faculty's description of aspects of their course design practice that have been weakened or reduced by using web technologies and their perception of gaps between what they design for and what takes place in practice. Paradoxically, these gaps and weaknesses were in the same areas of course design that they referred to as having been strengthened (Table 2).

Table 2

Issues and Challenges in Personal ODeL Course Design Practice

Aspect	Weakness/issue/challenge
Content development	Time needed for selecting resources (P1, P2, P8)
	Development of study guides (P2, P4, P6)
Teaching strategies	Reduction of opportunities to lecture (P6, P10)
Learning activities	Over-reliance on tool and failure to consider effects on learners/learning (P3, P4)
	Fostering learner engagement and participation (P1, P3, P6, P8, P9)
	Spontaneity and immediacy (P2, P7)
	Control of learner behaviour (P5)
Assessment	Fairness in assessment of learning (P7)
	Providing learner support (P7)
	Giving timely feedback (P4)

While many of the faculty mentioned access to numerous learning resources as one of the benefits of teaching with the Web, they also noted that this has made the resource

selection task of teachers more complicated. Aside from more time being spent on evaluating materials, the sheer volume of resources to choose from can prove confusing and overwhelming, resulting in poor choices of resources to recommend to learners (a problem noted by P8). P2 referred to this as the challenge of curatorship: "Actually, the problem is how to choose, the time that you have to spend for curating." In addition, since web resources have been created for other contexts, teachers need to spend time on developing study guides to help learners make productive use of these resources (as P4 pointed out). However, faculty members (like P6 in this study) tend to neglect the development of study guides. This might be because in face-to-face teaching, texts are usually discussed in class, which reduces the need for a written study guide. Another reason is that writing study guides is associated with the older DE course development model of writing stand-alone or self-contained course materials, and this model is being supplanted by the newer resource-based approach to course development. As P4's comments on this point suggest, in the resource-based model how much guidance to give to students in the form of written materials can pose a dilemma for faculty. There can be too little guidance or too much, both of which would be detrimental to learning.

Providing relevant guidance in a timely manner is also an issue. Being able to provide just-in-time instruction is one of the affordances of web technologies for distance teaching. Access to web-based resources that can be easily re-purposed for instruction and the availability of tools for faculty to assemble course packages on their own (Muirhead, 2005) mean that course development is now more open-ended and flexible (Mason, 1999). Faculty members (like P7 in this study) generally consider this to be an advantage. However, the increased flexibility for teachers, for example with regard to when to post course materials, does not necessarily mean greater flexibility for all learners (cf. Thorpe & Godwin, 2007), as suggested by the student comments reported by P4 about how the unavailability of all course materials at the beginning of the term limits their ability to pace their own learning.

In the area of teaching strategies, some of the faculty expressed concern over the reduced opportunity in online teaching contexts for providing direct instruction via lectures. It appears that lecturing is still considered by some DE faculty to be synonymous with teaching. In some cases there seems to be the assumption that classroom-based face-to-face teaching is the standard practice not only in the sense of being the benchmark against which all modes of teaching are measured, but also in the sense of being the best practice that should be emulated. In this study, this is evident in some of the faculty's statements about being able to do online what is done face-to-face. The problem with this is that it can lead to failure to recognise the opportunities for innovation that online teaching opens up (Haythornthwaite & Andrews, 2011).

Fostering learner participation through diverse learning activities is cited (by P3, P5, and P9) as one of the areas of teaching that is strengthened by web technologies. However, there is also the possibility of teachers becoming technology-centric in their design of online learning activities, such that "you don't foresee... the effect on the learning itself and how the students are using [the technology]" (P3). Online learning

activities can be challenging even for students who are competent distance learners. P4 and P8 have noted that collaborative activities in particular can alienate (P8) some learners as they are constrained to follow group schedules instead of their own pace (Garrison, 2009).

For those like P7 who consider dialogue to be central to learning, there is dissatisfaction with the lack of spontaneity and immediacy in asynchronous computer-mediated interaction. Immediacy refers to the sense of physical or psychological closeness arising from particular communication behaviours (Woods & Baker, 2004). In online courses, instructors can achieve immediacy by "ensuring a high degree of interactivity and participation" (Kearsley, cited in Woods & Baker, 2004, p. 5) through class discussion, dialogue about complex issues, group projects, and authentic learning activities. However, although teachers can build in these types of activities (as P7 and others do), how the design will unfold is unpredictable. P5 cited the example of students engaging in heated argument in discussion forums as an example of this gap between the design for interaction and how interaction might take place. P5's example suggests the need to orient faculty not only to the technology-related and pedagogical aspects of online teaching but also the social and managerial aspects, including "how to prevent and/or deal with inappropriate student behaviours when using the Internet and/or Web communication tools" (Kanuka, Heller, & Jugdev, 2008, p. 137).

The assessment-related challenges mentioned by the faculty were difficulty in giving individualised feedback in a timely manner (P4) and difficulty in ensuring equity and fairness in assessment (P7). The need to provide individualised feedback to students is felt more in online learning where each student makes a written contribution. However, keeping track of student contributions and providing individualised feedback requires a lot of time (Coppola, Hiltz, & Rotter, 2001). With regard to fairness and equity in assessment, P7 expressed concern about how to ensure that the different assessment options that she gives to her students meet the same standards of quality and enable learning to the same degree. According to Beetham (2007), flexible learning, where learners have a choice of what learning tasks to undertake, what technologies to use, and what evidence of learning to present for assessment, requires that "learners be supported in all the different choices they make". This is challenging "despite the capacity of technology to present a wider range of options" because "the limiting factor is the availability of skilled practitioners to provide relevant feedback and support" (p. 33).

A Proposed Framework for Faculty Development in ODeL

The findings presented in the preceding section suggest that faculty training programmes in ODeL should aim to develop a comprehensive range of ODeL competencies in a systematic and coherent way. It is not just technology-related skills (e.g., how to use a VLE) that faculty members need to develop in order to be able to teach effectively online. Based on the four areas of change in course design practice identified in the study (i.e., content development, learning activities, teaching strategies, and assessment) and related research, the following framework of ODeL skills is proposed (see Table 3).

Table 3

Proposed Framework of Developing ODeL Skills

Areas	Basic	Intermediate	Advanced
Content development	updating course content using web resources selecting web resources with learning outcomes in mind writing study guides complying with copyright and exemptions from copyright	selecting web resources in all media types including resources for supplementary study (aside from core resources) using OER repositories	selecting web resources to cater to different sets of learners producing OER
Design of learning activities	designing online learning activities to engage learners and facilitate understanding of content writing activity guides providing resources and tools	designing online learning activities to foster dialogue and a community of inquiry	designing online collaborative knowledge generation learning activities
Teaching strategies	differentiating the roles of the online teacher from those of the f2f teacher providing direct instruction online	establishing teaching presence performing "new" teaching roles online organising and conducting	adopting participatory pedagogies (students as co-creators) teaching with others ("teaching with

	organising the course site	online discussions	networks")
	managing workload		
Assessment	designing summative assessment	designing formative assessment	designing flexible assessment
	writing assignment guides (including criteria for marking)	ensuring a balance and coherence between summative and formative assessment	
	providing timely and constructive feedback	using alternative assessment, including student self- and peer-assessment	

Following the principle that effective teaching with technology requires the integration of knowledge of content, pedagogy, and technologies for learning, or TPACK (Koehler & Mishra, 2006; Angeli & Valanides, 2010), the framework does not list technology skills separately from pedagogical skills and content-related skills. Instead, the competencies indicated for each of the four areas at a particular level of expertise are TPACK competencies. For example, *selecting web resources with learning outcomes in mind* (under basic level content development) requires a course designer to integrate knowledge of a particular course and its target learning outcomes in a programme of study (i.e., subject matter knowledge, curricular knowledge), knowledge of how the course is best taught and/or how particular learning outcomes are best achieved (pedagogical knowledge), and knowledge of how to locate web resources (technological knowledge, in particular internet skills) and evaluate their relevance to the subject matter and their usefulness for helping learners achieve the target learning outcomes (subject and pedagogical knowledge as well as media literacy).

The proposed framework also specifies levels of expertise (basic, intermediate, and advanced), indicating degrees of complexity of the knowledge and skills required for each area at each level. All of the competencies listed for all four areas at the basic level comprise the minimum competencies for teaching an online distance education course. Anyone who is assigned to teach an online course at UPOU should have, or should be helped to develop, these minimum competencies. It should be noted that the framework as presented lists only the key skills derived from the findings of the current study. The list of key skills may be expanded as needed.

In conclusion, it is important to note that training programmes by themselves are not sufficient for the professional development of ODeL practitioners. Based on the research

participants' descriptions of the evolution of their course design practice, it is clear that professional development in ODeL is a complex process that requires continuous engagement in design work, critical reflection, and membership in a community of practice. Thus, training in course design should be part of a holistic and integrated faculty development programme in ODeL which would include not only workshops but also opportunities to undertake experiments, to learn alone or with a partner or with a small group, and to share experiences and critical reflections as well as 'products' of innovation, using a whole range of tools and resources (toolkits) and with appropriate and effective administrative and research support. The research participants' perspectives on the issues and challenges in ODeL course design at the personal and institutional levels underscore the value of these "mechanisms for innovation in teaching and learning" (Laurillard, 2008, p. 529).

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Peer Portal : Quality Enhancement in Thesis Writing Using Self-Managed Peer Review on a Mass Scale

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Abstract

This paper describes a specially developed online peer-review system, the Peer Portal, and the first results of its use for quality enhancement of bachelor's and master's thesis manuscripts. The peer-review system is completely student driven and therefore saves time for supervisors and creates a direct interaction between students without interference from supervisors. The purpose is to improve thesis manuscript quality, and thereby use supervisor time more efficiently, since peers review basic aspects of the manuscripts and give constructive suggestions for improvements. The process was initiated in 2012, and, in total, 260 peer reviews were completed between 1st January and 15th May, 2012. All peer reviews for this period have been analyzed with the help of content analysis. The purpose of analysis is to assess the quality of the students work. The results are categorized in four groups: 1) excellent (18.1%), 2) good (22.7%), 3) fragmented (18.5%), and 4) poor (40.7%). The overall result shows that almost 40% of the students produced excellent or good peer reviews and almost as many produced poor peer reviews. The result shows that the quality varies considerably. Explanations of these quality variations need further study. However, alternative hypotheses followed by some strategic suggestions are discussed in this study. Finally, a way forward in terms of improving peer reviews is outlined: 1) development of a peer wizard system and 2) rating of received peer reviews based on the quality categories created in this study. A Peer Portal version 2.0 is suggested, which will eliminate the fragmented and poor quality peer reviews, but still keep this review system student driven and ensure autonomous learning.

Keywords: Autonomous learning; online collaboration; computer-mediated communication; SciPro; peer review; peer portal; thesis process

Introduction and Aim

Online collaboration through computer-mediated communication (CMC) is fostered in current educational practices, which reflect the growing adoption of tools in different computer-supported collaborative learning (CSCL) environments (De Wever, Schellens, Valcke, & Van Keer, 2006). In spite of the conceptual variety of online communication tools in educational practices, most environments aim to support students to exchange messages with one another.

Peer reviews are used in many contexts in order to improve the quality of research papers and reports, which is an important and fundamental part of scientific discourse. The purpose of peer reviews could be different; in some cases, the purpose is to validate the authenticity and novelty of a scientific contribution worthy of publication in a research journal. In fact an important quality "label" of a journal is that it is peer reviewed. The higher the status of the reviewers, the higher the status the journal is accredited with. Several ranking systems of journals are used; see for instance the "Norwegian model" (Norwegian Social Science Data Services (NSD), 2012), which is used by Swedish universities. This is an example of peer review of scientific end products (final articles) and by experienced reviewers. However, the peer-review process can also be utilized in other contexts. To read and evaluate someone else's work is a valuable experience for the reviewer as well as for the author, who receives the review. Therefore, peer review is even useful for educational purposes.

This paper focuses on peer review as part of the quality enhancement process in thesis production (bachelor's and master's). Student peer reviews can be conducted face to face and/or by using online technology. As part of a larger support system for thesis writing, SciPro (Hansson, 2012; Hansson & Moberg, 2011; Hallberg, Hansson, Moberg, & Hewagamage, 2011; Larsson & Hansson, 2011; Hansson, Collin, Larsson, & Wettergren, 2010; Hansson, Larsson, & Wettergren, 2009), an online peer review module, was developed as a bachelor's thesis (Kjellman & Peters, 2011). The purpose of this module (Peer Portal) is to facilitate interaction between student peers during the thesis process, from project proposal to the discussion section, in order to increase the quality of theses. The aim of this paper is to describe the design of the online peer review module, the Peer Portal, and to evaluate students' performances when using this module to do the peer reviews.

Related Work

According to some studies (including Woolley & Hatcher, 1986; Gay, 1994; Lightfoot, 1998; Sharp, Olds, Miller, & Dyrud, 1999; Guilford, 2001), students need additional support to understand the scientific writing and peer-review process. They need to learn about the steps of the scientific writing process or at least parts of the strategies for publishing and peer reviewing. Different practitioners have discussed peer reviews previously (including Simkin & Ramarapu, 1997; Iyengar et al., 2008; Brammer & Rees, 2007) as a significant component and critical element of writing, which is one of the

major cornerstones of a scholarly and educational publication. The peer review process is an important step, which is usually considered as a "gold standard" (Hjørland, 2012). The peer review process is a progressive method, which is now more accepted and commonly used in educational learning and academic writing in higher education. Some studies (Sharp et. al., 1999; Guilford, 2001; Venables & Summit, 2003) discuss peer review at the undergraduate and graduate level as a useful tool to both support students to improve the quality of their scientific writings and to reduce supervisors' workloads.

The peer review process is deeply discussed in some studies (including Cicchetti, 1991; Starbuck, 2005; Chubin & Hackett, 1990) and criticized for its reliability and how well it really works. As mentioned by Brammer and Rees (2007), there are still frequent bitter complaints from students that peer reviews are a waste of time, or some blame their peers for not finding significant mistakes. There are also staff members who grumble about the poor quality of students' papers and that students do not stay on task during the peer-review process (Brammer & Rees, 2007). Although these issues or observations may not be supported by the theories, they are still challenges in educational systems.

Research Method

This paper investigates an emerging topic; hence, an explanatory and exploratory study is conducted. Exploratory research initially employs a broad perspective regarding a specific issue and the results crystallize as it progresses (Adams & Schvaneveldt, 1991). In the next section, general information about how to use the peer portal is explained. Then the quality of peer reviews in a sample is explored by using content analysis tools. Content analysis, with the help of computer-mediated and analysis tools, has been a fast-growing, systematic, and objective analysis technique for message characteristics and manifest content of communication (Berelson, 1952; Riffe & Freitag, 1997; Yale & Gilly, 1988; Neuendorf, 2002). This analysis includes the examination of human interactions (Neuendorf 2002) mostly for quantitative, but also qualitative, data analysis (Elo & Kyngäs, 2008). Content analysis is often used to analyze information from asynchronous computer-mediated communications and discussions in formal educational settings, which is not situated at the surface of the transcripts (De Wever et al., 2006). Content analysis is an appropriate method for analysis of messages in mass communication studies (Lombard, Snyder-Duch, & Bracken, 2002).

In this study, content analysis has been chosen as an analysis tool since this study is related to the examination of human interactions and educational settings. This requires profound analysis of the characteristics of peer reviews to provide a clear explanation about the need for a peer portal in higher education. The focus of this article is on the analysis of the quality of the peer reviews in order to investigate how many students understand the peer review process and follow the instructions to fulfill the requirements. The analysis procedure involves three phases: 1) assessing part of the peer reviews in order to establish the categories, 2) assessing the quality of all peer reviews in the assigned time period, and 3) developing hypotheses and suggestions.

In the first phase, based on 150 peer reviews completed during the period of January 1st and May 15th, 2012, four qualitative and mutually exclusive categories were established: 1) *excellent*, 2) *good*, 3) *fragmented*, and 4) *poor*. The category concepts and criteria were modified in this phase as part of the qualitative process until a useful grounded theory was created. The criteria for each category and category label were validated by external reviewers and tested empirically with the content of the additional peer reviews in the second phase. These categories and the categorizing criteria of peer reviews are described in detail in the "Peer review quality criteria and analysis" section.

In the second phase, the quality of the remaining peer reviews (110) during the same period of time was assessed and the percentage of reviews belonging to each category was determined based on the total number of analyzed peer reviews (260). This proved the validity of categories developed, and no further modifications were required when adding the additional 110 analyzed peer reviews. In this phase, more details are taken into account for each peer review to investigate how many of the peer reviewers understand the review process or follow the criteria (defined in Table 1) and cover the discussed issues in each category (explained in the "Peer review quality criteria and analysis" section). Moreover, how the peer portal helps users to achieve better results and produce higher quality reviews is explored. Finally, in the last phase, a set of hypotheses was formulated in order to tentatively explain the reasons for quality variations found in the online peer reviews. Based on the findings strategic suggestions for improvements are listed and general conclusions are drawn.

Some reviews were in English and the rest were in Swedish. The language of the reviews mainly depends on the language of the thesis drafts, which in most of the cases reflects whether the thesis belongs to the bachelor's or master's level. However, the system does not register the completed peer reviews according to educational levels (bachelor's or master's). Female students performed approximately 98 of 260 (38%) of the reviews. This number is only based on the names of the reviewers, and in some cases there is a risk that it is mistaken. This number also disregards the duplication of individuals, who might have done several peer reviews on different theses. The quality of the reviews was not correlated to gender.

Online Peer Review Module: Peer Portal

Design of the Online Peer Review Module

This section describes the design of the online peer review module in SciPro followed by the next section, which evaluates students' peer review performances when using this module. The aim of developing this module is to support the peer-review process and improve the quality of scientific writings. Specifically, the purpose is to enhance autonomous learning and working independently and to support asynchronous communication among students to learn from each other, so that both thesis peer

reviewers and authors (students, who write the thesis) benefit. Moreover, this strategy helps reduce supervisors' workload because they are not assigned as reviewers and do not have to teach each student about the peer-review process. A description of how the peer-review system works and the purpose of peer reviews in this context is available in SciPro. Students are instructed in the SciPro system for the purpose of the peer review in the following way:

> Regard yourself as an advisor rather than an almighty judge. Provide useful critique and constructive feedback, so that the author can improve his/her thesis. Remember, it is not a finished manuscript, but a work in progress. You can help improve the quality and in the process you will learn something as well. Do not waste your time, the author's time or the supervisor's time by doing it superficially. Make a deep analysis, and analyze according to the checklist, your methodological skills and creativity. Go beyond the text, what alternatives are there? Can you provide some interesting ideas, URLs or reading material to the author? The peer review process is between peers. However, supervisors will be able to check out the quality of your reviews. By providing good reviews you demonstrate that you understand research concepts, theories, and the subject matter.

Moreover, students are informed about the required amount of work in the following way:

> The supervisor decides how many peer reviews you need to do. However, it is mandatory to do at least two peer reviews during the course period. It is recommended to do an initial peer review on the "Project plan" and one on "Background, aim, methods and ethics". The number of reviews you want to receive equals the number of reviews you need to do. In summary, the more feedback you want on your own work, the more feedback you need to provide.

Request peer review.

When a student would like to request a peer review, the section "Request peer review" allows her/him as an author to express the need or desire for a review on a specific part of the report. The following steps need to be followed by authors of the thesis in order to fulfill the requirements and understand the process.

Step 1: Read the instructions to get valuable information about how the system works.

Step 2: Attach the file(s) that are supposed to be read by peer reviewers. If there is more than one file, it is recommended to zip them together before uploading.

Step 3: Write review guideline/comment. Here you can add a note to specify any part in your report you want to have reviewed (e.g., the language).

Step 4: Select a suitable review template (optional but recommended). The students can pick one of the available "Questions checklists" as a guide for assessment for the peer review. The checklists are based on a large number of established scientific methods in course literature and on senior supervisors' experience. The questions in the available checklists focus on methodological and process aspects of the thesis work. System designers determine the selection and structure of the questions once researchers and senior supervisors at the department consult and validate the selection.

Step 5: Submit the request for review by clicking on the button at the bottom of the page.

Write a peer review.

There are also steps to write a peer review. The more the following steps are taken into consideration by the peer reviewers, the higher the quality of the peer reviews. This is not an anonymous review process. The names of both authors and reviewers are visible in the system. Students are able to choose any thesis within any research area, but only on the same level (i.e., bachelor's or master's level). However, once a manuscript is chosen by the first reviewer, it will no longer be available for other students, unless the author uploads the same manuscript several times. The procedure consists of the following steps.

Step 1: To start the peer review process, select the "Perform peer review" tab.

Step 2: Click on the arrow to the right of the thesis report that is to be reviewed.

Step 3: Click on "Review this request" to start the review process.

Step 4: Start by downloading the file available in the "Attachment".

Step 5: If a checklist is chosen by authors to be followed by peer reviewers, the colored circles in the traffic light signals need to be selected for the respective question. Each traffic light signal (see Figure 1) is related to a comment box for additional explanations and motivation for the chosen color. Traffic light signals are used as an overall assessment (green = well-done [OK], yellow = minor corrections required, and red = the requirement is not fulfilled/not OK). If no checklist is available then the authors' instructions should be followed by the peer reviewer.

Step 6: If a checklist is chosen by authors, peer reviewers need to provide analytic responses related to each pre-defined question in the selected checklist. Otherwise, if no

checklist is chosen by authors, the peer reviewers are required to provide their analysis in a free but structured way relating to specific sections in the manuscript.

Step 7 (optional but recommended)*:* Add detailed comments in the original thesis file or a separate file to connect the expressed statements to the related parts. Guide the author by defining what is missing and where in the thesis changes should be made. Then attach the file at the bottom of the page.

Step 8: When the review is completed and the file is uploaded, click on "submit peer review". Then, the peer review process has to be completed within three days after selecting the thesis report.

Manage requests and reviews.

Under the tab "My requests & reviews", users have an overview of their request(s), the response(s) to them, and their own reviews. Here users have the possibility of commenting on the reviews they receive from others or of engaging in discussion with the author of the thesis that they have reviewed.

Categories of Peer Reviews

Expected issues from peer reviews.

In the peer-review process, there are some significant issues that should be taken into consideration. It is required that reviewers understand the significance of providing clear insight into any deficiencies and explain their judgment process, so that the authors will be able to understand the reasoning behind the given comments. It is also important to consider the thesis grading criteria and hence give comments based on the explanations about the required items needed to be covered by each thesis work. Commentaries should be courteous and constructive, without including any personal remarks or problems regarding the issues discussed in the paper. Reviewers need to indicate whether the given comments are their own opinion or reflect scientific references. If the comments reflect references, the original reference needs to be provided clearly.

Reviewers should regard themselves as advisors rather than almighty professional judges. They need to try to provide useful critique and constructive feedback, plus point out the missing required information, so that based on those comments the authors can improve the quality of their works. Moreover, based on how the system works, it is expected that reviewers provide sufficient feedback, both in respect to positive and negative issues, to motivate authors to enhance the quality of the thesis.

Based on the issues above, the reviewers are expected to 1) provide their general views by going through the optional checklist, traffic light signals (green = well-done, yellow = needs slight revision, red = requires more effort to fulfill the requirements); 2) briefly

explain the issues in each comment box; 3) produce a report or comment on the original document to cover key elements of their views on each particular issue to address the point and what is required to be considered or modified. It is important for reviewers to be neutral and to use a professional and scientific manner without involving their personal emotions.

Peer review quality criteria and analysis.

As mentioned above, 260 completed peer reviews were categorized as follows: 1) excellent, 2) good, 3) fragmented, and 4) poor. Table 1 provides a general picture of the categorizing criteria. Further, the criteria and reasons for grouping peer reviews into these four categories are explained in detail for each category.

Table 1

Peer Review Quality Categories and the Defining Criteria

Criteria \ Category	Excellent	Good	Fragmented	Poor
Following the steps[1]	✓	✓	✓	✓
Checklist: use the screening signals appropriately [2]	✓	✓	❖	☒
Checklist: responses to questions/ comments [3]	✓	✓	❖	❖
Additional detailed comments in separate files [4]	✓	☒	☒	☒
Registered in the system as a completed review [5]	✓	✓	✓	✓

¹ Defined above in section "Write a peer review", Step 1-4

² Defined in section "Write a peer review", Step 5

³ Defined in section "Write a peer review", Step 6

⁴ Defined in section "Write a peer review", Step 7

⁵ Defined in section "Write a peer review", Step 8

✓ Criteria fulfilled

❖ Criteria partly fulfilled

☒ Criteria missing

1 - Excellent peer reviews (18.1%)

In this category, peer reviewers followed the checklist selected by the thesis' authors. The peer reviewers gave enough effort to identify and analyze the strengths and weaknesses of the thesis manuscript, and, accordingly, they provided support for the author to develop the thesis. The peer reviewers used the traffic light signals correctly and explained general problems. They provided relevant comments based on the grading criteria to answer all or almost all the checklist questions. In most of the reviews in this category, reviewers followed the questions from the optional checklist one by one. Those who did not use the checklist directly made comments based on the questions and covered almost all the required issues. In some cases, reviewers encouraged authors to communicate with them or discuss further the highlighted issues if needed. Moreover, reviewers provided additional details in a separate file to point out specific issues that judgments were based on. With respect to all the issues discussed above, approximately 18% of the reviews in the selected sample belong to this category. Figure 1 is an example of an excellent review, done by a master's student, to illustrate how the system is supposed to be used.

Figure 1. Part of an excellent peer review with additional comments in the attached file at the bottom of the page.

2 - Good quality peer reviews (22.7%)

In this category, reviewers follow most of the instructions and questions in the checklists. They use the traffic light signals correctly and provide constructive comments in each comment box. However, in this group, reviewers do not point out the details or add any specific comments in the original text to clarify their judgment. In some cases, reviewers use examples or illustrations to point out the issues they bring up. However, further specification about the required modifications, where the subject is mentioned in the original text or what the author should specifically consider, is missing. In this category, most of the reviewers, who provide quite good general comments, do not provide an additional document for the author to specifically show where the required modifications should be applied. In respect to these criteria, approximately 23% of the reviews belong to this category.

3 - Fragmented peer reviews (18.5%)

In this category, approximately 18% of the peer reviews, peer reviewers fulfill only a few criteria according to the instructions. The peer reviewers briefly discuss only a few issues that need reconsideration. However, there is a need for further explanation about why those changes are required and what should be added. The reviewers do not go through all the checklist questions and skip answering most of them. They do not appear to know about all parts of the thesis and do not touch upon necessary issues.

Comments in this category include general remarks from some references, which in most cases are not connected to the original reference. Moreover, no detailed comments or constructive feedback are provided or attached.

4 - Poor peer reviews (40.7%)

In the last category, peer reviewers do not follow the instructions, checklist questions or criteria, and do not properly use the traffic light signs. Reviewers only fill in a few words to answer less than 20% of the checklist questions, without any follow-up discussion or clarification. In this category, the comments are very general (e.g., "the thesis is very poor" or "this point is not discussed"). In most of the cases in this group, the impression is that reviewers do not read the instructions properly and do not spend enough time to read the entire thesis before commenting on it. Some reviewers use the wrong traffic light signal; for instance, they choose the green sign (which means the checklist item is entirely fulfilled) and they comment in the comment box, "the issue is not discussed at all", or vice versa, choose the red sign and say, "it is perfectly done". This shows that most of the reviewers in this category, which has the highest percentage of reviews (approximately 41%), do not read the reviewing instructions and apparently only want to finish the task, without concern for the quality of their reviews.

Summary of Results

Based on the categories above, the result of the chosen sample (260 peer reviews) is shown in Table 2. This table illustrates the quality of the completed peer reviews of the uncompleted thesis manuscripts done by bachelor's and master's students. The four categories, discussed above, are presented in this table with the number and percentage of peer reviews belonging to each category.

Table 2

Categories of the Peer Reviews

Category	No. of reviews in each category (of total 260)	Percentage (%)
1-Excellent	47/ 260	18.1%
2-Good	59/ 260	22.7%
3-Fragmented	48/ 260	18.5%
4-Poor	106/ 260	40.7%

The categories are merged further based on Table 2 into three major parts, "Excellent or Good", "Fragmented", and "Poor" to provide a general overview (Figure 2).
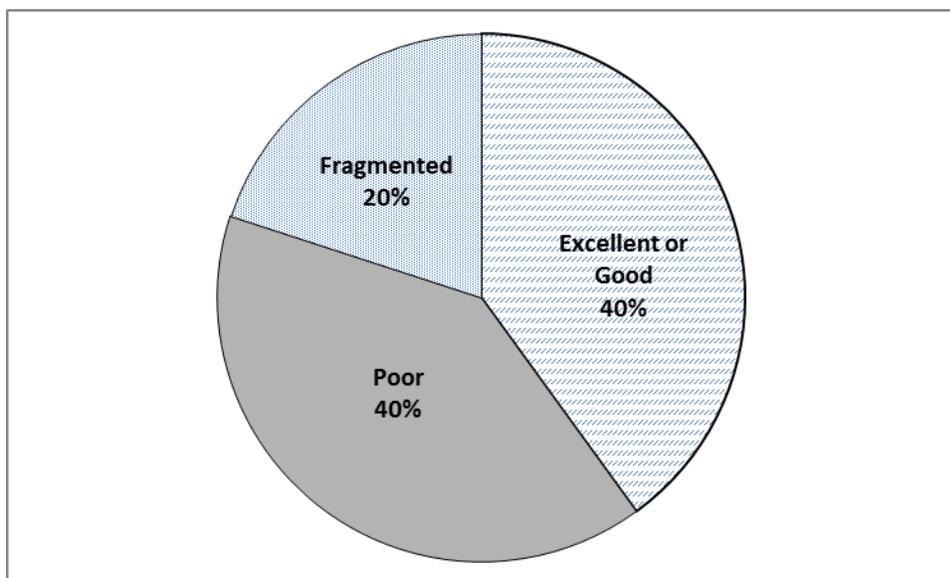
Figure 2. Overall picture showing the major quality differences among the peer reviews ($N = 260$).

Discussion

The online peer review module, the Peer Portal, provides opportunities for asynchronous communications, dialogs, and discussions for students during the thesis process. By following the required steps, both the thesis author and the peer reviewer take advantage of the peer review. The reviewer learns about new issues discussed in the thesis and the author receives some feedback to enhance the quality of the thesis. The constructive and relevant feedback that students get from their peer reviewers provides opportunities to enhance the unfinished thesis manuscripts before sending them to their supervisors. Moreover, using the online Peer Portal makes the process more efficient and effective for both students and supervisors. Without this system, supervisors must assign each peer reviewer manually, control the relevance of the topic, check with the students whether or not they would like to review the specific thesis, and consider the language issues (non-Swedish speaking students cannot review Swedish theses). The peer portal supports students to select topics relevant to their own subject area and develop their knowledge, provide opportunities to have open discussions, ask relevant questions, or get help from their reviewers to enhance the quality of their work.

This study explored how the peer review portal is used and what might be the limitations that require further development. Based on the findings from the analysis of 260 peer reviews, approximately 40% of students follow the instructions and take advantage of the peer-review process. Finding some good peer reviews proves that there are students who are interested in learning from others' experiences and in supporting

their fellows to enhance thesis quality. In some cases, the authors ask for further comments or explanations from the reviewers. For instance, a student as an author asks the reviewer: "Could you please dedicate more time in reviewing my paper and send it to me as soon as you can. Hence, the quality of my paper relies on the quality of the review." Or in another case, the author asks for further references from the reviewer to develop his knowledge about the discussed issue. This means that some students are interested in getting constructive feedback or detailed comments from their peers to enhance the quality of their theses.

As shown in Figure 2, approximately 60% of students deliver fragmented or poor peer reviews. The result shows that a large number of the reviewers in this group do not spend sufficient time to understand the review process and how the system works. They write very short comments (i.e., only a few words or sentences to get the task done, regardless of the quality of the review). Despite varying results the Peer Portal system has so far created more than 6,100 structured question-and-answer interactions (checklists used contained on average 15 questions). These interactions between students about their thesis manuscripts and positive learning effects, which are not visible in reviews, are taking place through this process. In order to understand the underlying reasons for the different results from different groups, further studies are required. Yet, some hypotheses have been developed here.

- The quality of the thesis drafts submitted for review is quite low, which leads to low quality review results.

- When the quality of the reviews does not affect students' final grades (i.e., the task is only required to be done), some students do not feel motivated to spend time and produce a higher quality review report.

- Some students do not spend enough time to learn and follow the instructions to fulfill the criteria. They do not care about the learning process and how constructive and helpful the comments could be for their fellow students.

- Some students would prefer the old-fashioned way of getting all information from their supervisors. They are dependent on getting feedback from the supervisors and involve them in all steps of their thesis process to develop their thesis manuscripts.

- There is a lack of knowledge or competence among less experienced, especially first cycle (bachelor's) students. An expected, but not studied, result is that the quality of both the theses manuscripts and reviews among master's theses is generally better than bachelor's theses.

- Students might read the entire process and do their best. However, not all students may have enough competence to achieve better results and do higher quality reviews, even if they would like to.

Conclusions and Recommendations

The developed peer review system, the Peer Portal, facilitated more than 400 autonomous peer review interactions between students during 2012. The purpose was to make a structured, self-managed, student-driven system for quality enhancement of thesis manuscripts. This objective has been fulfilled. About 40% of the students produced excellent or good reviews; however, the rest produced low quality (fragmented or poor) peer reviews (see Figure 2). The underlying philosophy with this peer review approach is that students should manage their involvement without supervisors' intervention firstly because supervisors might change the nature of dialogues (create a power asymmetry) and secondly because the Peer Portal is meant to reduce the work load for supervisors, not create another task to take care of. This is why, as this study clearly shows, leaving the interactions open and unmonitored is not enough. It might be satisfactory when 40% of the students do reasonably acceptable peer reviews. However, since the interaction is asymmetric because more than 40% of the students do not deliver peer reviews up to the standards, further support mechanisms are required to improve the overall quality and make the interactions fair among students.

In line with the results and philosophy, further development might include introducing a rating system with four quality levels representing the categories that have been developed in this study (excellent, good, fragmented, poor). By using such a rating system (e.g., indicated by 1-4 stars), students would be able to rate their received peer reviews, and thereby the poor peer reviews would be filtered out by the system. This development would empower students who want to do good peer reviews and produce the right incentives. This would clearly make best-practice students visible to all, including supervisors, and likewise the bad-quality reviewers would be easily spotted. It is believed that the social pressure introduced would contribute to better results. Moreover, a more structured peer-review process with mandatory steps built in would make students use the available checklists and fill in all required fields. A peer review surveyor might be introduced to follow up, analyze, and give feedback to students about their peer reviews. Furthermore, support from supervisors or the SciPro support-group to introduce face-to-face peer-review workshops for students would also encourage reviewers to learn more and hence improve the quality of their works. Yet, essentially the vision is, the more student driven the Peer Portal activities are, the better it is for students, supervisors, and the department.

In some cases the feedback between students using the Peer Portal is of higher quality than feedback provided by supervisors. Since the Peer Portal is completely student driven, it could be scaled up and become an international crowd sourcing system that benefits a large number of students and supervisors in their common goal of intensifying feedback in the supervision process leading to high quality theses. The whole ethos and understanding when using the Peer Portal should be that of encouragement and exchange of innovative, creative, and critical ideas with the overall goal of creating quality theses and scientific minds.

Further Studies

Based on our findings in this study the following studies would be of interest to pursue:

- Interview students about the reasons for excellent and poor quality reviews and whether or not the suggestions in this study would help to improve the quality.

- Compare and analyse thesis opposition reports (also presented face to face at the final seminar) with this study of draft thesis peer reviews to investigate quality differences and find out the reasons for these differences.

- Undertake a follow-up study in order to investigate if subsequent student groups are improving on peer review quality or if the achievements are similar to this first student group. Will students who are more familiar with our academic requirements, the Peer Portal system, and previous students' results improve their work?

- Determine whether final thesis quality and completion can be predicted early by assessment of peer review quality. The better the peer review quality, the better the thesis quality and the greater the probability that the student will complete within the time frame is the hypothesis. Or can final thesis quality and completion be predicted early by the timing of peer reviews? The hypothesis is that the earlier students engage in peer reviews the more likely they are to finish their theses on time and with higher quality than the students doing peer reviews later in the process.

- Test the online peer-review system across universities and across departments. What benefits would such large-scale peer review interaction have for thesis quality, reduced supervision burden, student motivation, and completion time and costs?

Acknowledgments

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Learning in Multiple Communities from the Perspective of Knowledge Capital

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Abstract

In a learning system, multiple communities represent a networked structure of learning experiences. Individuals belong to multiple communities connected though complex relationships consisting of people, resources, rituals, and ties. Learning occurs as individuals traverse this network from one community to the next. This paper explores the question of how learning occurs in compound communities from the perspective of *knowledge capital*, that is, the communities' collective knowledge, skill, and perspective, as well as relationships and connections among members. Through interviews conducted with postgraduate students belonging to multiple communities, we identified issues related to conflict between communities, closed-congregation communities, privacy, and reputation. The results have implications concerning social and structural aspects of learning and instructional design in multiple communities.

Keywords: Online and face-to-face communities; multiple communities; knowledge capital; social capital; networked learning

Introduction

Multiple communities consist of a variety of communities and/or sub-communities within a community in a networked structure. In its basic form, a community includes people, resources, rituals, and ties, as well as nodes and holes between different communities. Hodgson and Reynolds (2005, p.20) regard multiple communities as "legitimate and constructive means of working with and across differences" in networked learning. Multiple communities have the potential to accommodate, enable, and encourage individual differences through a variety of communities. In particular, improvements in technological tools make multiple communities accessible and connectible for individuals who seek knowledge from different networked sources. In this article, inspired by Hodgson and Reynolds (2005), we use the concept of multiple communities as each of us is a member of many communities (Smith, 1988) and engages in social practices which consist of "diverse, located contextual practices which are linked in a social structure" (Dreier, 1999, p. 7). From this point of view, using the concept of multiple communities allows us to examine multiple social practices and identities, shifting "structure of personal relevance" (Dreier, 1999) as individuals move from one community to another and pursue their individual interests through a variety of multiple communities.

In the literature, one aspect of individuals' experiences in multiple communities has been dealt with from the network structure point of view. In the process of joining and becoming members of a new community, individuals bridge the structural holes between the communities of which they are currently members and the newly joined community. In this context, learners could be considered as boundary crossers (Engstrom & Cole, 1997). In technical terms, Ganley and Lampe (2009, p. 267) write,

> Structural holes are defined as a lightly connected bridge between denser sub-network elements. If, in their collection of networks, an individual has bridged one or more structural holes they are 'brokers' between the sub-networks; at the other extreme they are participating in 'closed' networks.

In reviewing multiple communities from the perspective of holes and brokers, it is also noteworthy that a closed or opened structure of a community may be important in explaining "bridge" or "brokerage" (Burt, 2000; Burt, 2005). "If the structural hole is large with very few actors crossing it, brokerage allows the entry of new ideas across a "bridge" or "brokerage" across sub-communities in a way that can facilitate information flow in the larger network" (Ganley & Lampe, 2009, p.267). Bridging also refers to *interconnecting* the communities through brokers.

Given the discussion above, from the network structure point of view, it could be asserted that learning in multiple communities requires a fuller understanding of the complexity of learning from diverse multiple communities which are connected in a

social structure. Due to the fragmented nature of multiple communities which are connected to each other with a variety of nodes through brokers, as the connectivity among these networks increases, the level of unintended engagement and knowledge acquisition also increases; therefore, this requires "a sense of direction for individuals" (Wenger et al., 2011).

Assuming that individuals learn as they travel within a complex structure of learning systems consisting of multiple communities, the very construct of communities is problematically deterministic. Learning in connected communities signifies a process of co-operation between co-participants in the communities; that is to say, they are dealing with different identities, experiencing conflict across the communities, integrating fragmented knowledge, and so on. Little seems to have been written about the experiences of learners whose learning practices are embodied in their multiple community participation, in particular in higher education settings (Veletsianos & Navarrete, 2012).

While examining the experiences of individuals learning in multiple communities, taking a perspective of knowledge capital as a framework is helpful since that concept inheres in the interactions and connections of structures, relations, and resources, and this offers an insight into the complex nature of learning in a network of communities. The connectedness emerges as a result of social relationships and social involvement and this generates social capital (Coleman, 1988), which is a form of knowledge capital. In that sense, we will use the concept of knowledge capital as a lens through which to examine learning experiences of multiple community members. Knowledge capital is important in multiple communities in the sense that it signifies the fragmented but collective knowledge, skill, and perspective of members, as well as the relationships and connections among them. Briefly, according to Wenger, et al. (2011, p.20) knowledge capital can take different forms, described as follows:

- *Human capital* refers to a skill, information, or perspective;

- *Social capital* refers to relationships and connections among members of a community;

- *Tangible capital* refers to shared resources;

- *Reputational capital* refers to the reputation of the community/network;

- *Learning capital* refers to a transformed ability to learn.

Although much has been written on knowledge capital especially in management literature, very few empirical educational research studies in the context of multiple communities have been conducted. Therefore, this research study aims to empirically examine knowledge capital in the learning experience of multiple community learners.

In light of the discussions above, two main research questions have been formulated:

1. How does knowledge capital inform the practices of multiple community members?

2. In general, how do the individuals describe their learning experiences with multiple communities?

Methology

Research Design and Participants

When investigating the communities in a network, researchers tend to utilise deterministic quantitative approaches based on a set of algorithms and social network metrics, especially for large networks. In this research, as our primary goal is to examine learners' experience from the perspective of knowledge capital, instead of using deterministic quantitative approaches, we adopted interpretive qualitative approaches, which enable us to analyse the experiences in depth and also to analyse an abstract phenomenon like knowledge capital or some aspects such as conflict among multiple communities. We put the focus on the individual because as Wenger et al. (2011, p. 9) put it, "through a personal network multiple networks are connected". Furthermore, very few formal research studies which sought to understand the individuals' feelings and trajectories of their learning stand out in the large body of literature relevant to networks of communities. In this research, as a starting point, we focused on individuals and through their personal trajectories of participation we aimed to examine learning experiences. Therefore, instead of examining stable and certain communities, we aimed to discover the individuals' learning experience with their ties to different communities.

We also intended to examine the individuals with their formal and informal (learning community) connections to find out their biographical learning experience, which is not limited to purely formal education. Although Colley et al. (2003) suggest that formal and informal learning are not discrete categories to differentiate an individual's type of connection to a community (formal or informal), in this research, these concepts are referred to separately when necessary.

Finally, this research deals with individuals' participation in multiple communities, which consist of networks of *online* and/or *face-to-face* communities. Given that individuals who learn from online communities may also belong to face-to-face communities and that some face-to-face communities also exist online, including both of the community settings helps us holistically understand the multiple communities. Also, in terms of biographical continuity, individuals learn without differentiating the communities of which they are members. Learning does not stop in a community while starting up in another community. "Different learning trajectories intersect and become relevant" (Silseth, 2012, p. 82) in an individual's life by participating in multiple

communities. In that sense, individuals acquire knowledge which can be described as a set of connections occurring from actions and experiences (Downes, 2007). In order to capture these connections, this research involves the   communities without excluding either of the types.

With this in mind, 10 interviews were conducted with postgraduate (PgR) students studying at two universities at the School of Education in Turkey. All participants were involved in face-to-face and/or online multiple communities. The participants in this research were asked about the type of group/community in which they were involved in relation to their knowledge domain (PhD thesis). For ethical considerations, participants were coded as Participant 1, 2, 3, and so on.

Method

In carrying out this research, we aimed to seek and construct an image of reality rather than the reality itself (Charmaz, 2010). Realities are multiple, intangible mental constructions and also situational (Guba and Lincoln, 1994). Knowledge of reality is mediated and constructed with social negotiations and individual perceptions. In the light of this epistemological and ontological stance, this research is informed by grounded theory.

There are different approaches in grounded theory. In this research, Strauss and Corbin's (1998) approach was utilised. Accordingly, several choices have been made with regard to "conceptualizing or defining boundaries of the [research] area" and "making use of the literature" (Green et al., 2007, p. 476). At the beginning of the study, temporary research questions were formed in order to guide the data collection.

Coding Analysis

As knowledge capital is an abstract concept and difficult to measure, information from Wenger et al.'s (2003, pp.27-28) study, which demonstrates indicators for knowledge capital, was employed in this research. Thus, we benefited from a predefined coding paradigm (Kelle, 2007). These indicators were used to guide the analysis of knowledge capital. Utilising literature was helpful for us in terms of providing consistency between the concepts we used while interpreting the data. Some new themes emerged from the data and were added to the coding schema during the coding process.

Limitation of the Methodology

With the small numbers interviewed (10 participants), it was not possible to examine all aspects of the nature and dynamics of knowledge capital across multiple communities. There might be alternative supporting evidence such as utilising the communities to which the participants in this research belong. However, a majority of the communities which the participants refer to require membership and/or log in details, and gaining unrestricted access was not possible for privacy and ethical reasons. Also, although this research investigated the historical connection of the participants to their previous

communities, it was not possible to examine these communities retrospectively. Furthermore, as we primarily intended to focus on an individual's experiences and feelings and how knowledge capital informs learning in multiple communities, the individual interviews were helpful at our current level of investigation. In regard to focusing on individuals in networks of communities, as Backstrom and Leskovec (2011, p. 635) put it, "studying the networks at a level of individual edge creations is also interesting and in some respects more difficult than global network modelling". However, on this point, utilising the grounded theory approach was helpful in heuristically exploring the individuals' expeditions.

Finally, we chose postgraduate students in our research as they could be considered active knowledge seekers and by the nature of their work are involved in multiple communities. By choosing them, we intended to see the practices of multiple communities in higher education. However, this particular collection of subjects may limit the applicability of the research at different levels of education and student groups. Also, as Hofsteder (2001) states there are culture-specific dimensions, such as the culture of individualism/collectivism, power distance, and so on, which characterise and form the attitude and behaviour of the individuals. This research involves participants from Turkey and therefore the discussions we present could be culture specific. However, as we adopted a qualitative approach, we did not aim to generalise our findings to a wider population, but rather to examine the research questions in depth, or in other words, to generalise analytically (Yin, 2003).

Discussion: Knowledge Capital in Multiple Communities

As discussed earlier, Wenger et al. (2011) refer to different forms of knowledge capital as human, social, tangible, reputational, and learning capital. In the sections below, these concepts will be discussed in the context of multiple communities based on the participants' learning experiences. However, among these forms of capital, we will deal with learning capital within the scope of each form of knowledge capital because we aim to put the focus of this article on the concept of learning, and, therefore, instead of separating out learning from different forms of capital, we will attempt to show how learning capital within and across communities is achieved and comes out of different learning trajectories converging in compound communities in the context of each form of capital.

Before discussing the forms of knowledge capital in relation to multiple communities, it may be helpful to get a sense of multiple community participation and to visualize the communities with a view to revealing the relations between them. For this purpose, the participants in this study were asked to draw the communities in which they were involved, using circles and rectangles. Accordingly, they were asked to draw a big circle (for face-to-face communities) or rectangle (for online communities) to represent a community that has the biggest place in their lives and vice versa. They were also asked

to draw overlapping sets if there were any commonalities between the communities; for instance, if two communities shared the same aim, then they were asked to draw these communities with an intersection. An example of this can be seen in the figure below.
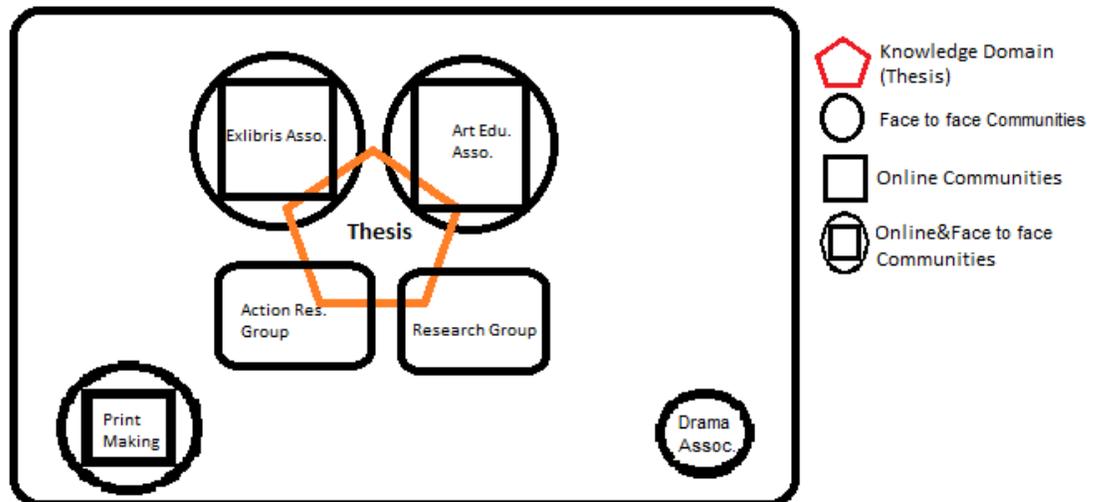

Figure 1. Multiple communities in which Participant 1 is involved.

While drawing the communities, a majority of the participants remarked that the shape of the communities should be changed in such a way as to show them shrinking or enlarging over time, based on their personal changing interests and needs. Therefore, in terms of representing their current community involvement, they drew a snapshot of the communities.

These changing shapes give us a sense of the organic structure of the multiple communities which appear in an individual's life in different time periods and which have different levels of importance. As happens in most social networks, the multiple communities which Participant 1 describes grow and dissolve, and via additions of new edges, the communities merge, which signifies their dynamic nature (Backstrom & Leskovec, 2011). The fluidity in an individual's transition among multiple communities points to the mobility that is seen in online communities.

Furthermore, as can be seen from the picture drawn by Participant 1, the multiple communities overlap. Here, it is interesting to observe how knowledge is transmitted through overlaps of personal influence as we will elaborate in the next sections.

Overall, in particular given the structures of the communities as presented above, learning in multiple communities requires a different perspective for understanding of learning with communities. Through the data extracts, below, we aimed to discuss how

knowledge capital informs the learning experience of the learners within the framework of the structure and functionality of compound communities.

Human Capital

Participants' communities consisted of a group of individuals who specialize in certain skills and knowledge. Through rituals, the members practice their expertise. In the context of multiple communities, through the ties by which individuals are connected to different communities, knowledge transition is likely to occur, and these rituals may give the members new inspiration and new perspectives.

So, what type of knowledge do the multiple community members acquire, produce, and share? It was revealed in the interviews that the overlapping structure of the communities, as shown in Figure 1, leads to integration of formal and informal education. For instance, Participant 1 examined the print-making techniques in art education in her thesis. With regard to her knowledge domain, she is involved in the Association of Art Education, Exlibris Association, Green Door Printmaking, Action Research (email) group, and a research group in her department. She is also involved in the Contemporary Drama Association, but according to her, this group is not related to her knowledge domain and she is now an inactive member. As can be seen in Figure 1, from the circles which Participant 1 drew, there is a considerable relationship between her knowledge domain and the informal communities in which she is involved. In her case, informal multiple communities and her formal education feed each other.

As a concrete example, during the interview, she mentioned how her informal international community involvement changed her ideas in her thesis:

> When I found new print-making techniques, I asked myself 'why should not I use these techniques in my thesis?'. Because when I reviewed the theses done here, they are all about traditional techniques. I said to myself 'this (new technique) would contribute to my thesis.' However, in terms of this community's contribution to the education domain of my thesis, I should say that it did not help too much.

Although the community to which she referred did not meet her expectations about the educational domain of her thesis, she was involved in another community, the Association of Art Education. Therefore, the formal education she received did not provide her with a new perspective and neither did the international community she referred to; however, through her multiple community membership, she could acquire the knowledge she needed. This overlapping structure of multiple communities helped her produce alternative knowledge to her formal education.

A further knowledge type could be summarised as *interdisciplinary* knowledge. Although not in every case, each community represents a discipline. The participants in this research pointed out that one single community does not do enough for them to acquire the necessary knowledge for their knowledge domain. In a similar way, individuals may not acquire in-depth knowledge about a discipline by becoming a member of a discipline-specific community. As a result, they are involved in multiple communities, or in other words, sub-communities or different communities. However, knowledge construction through these multiple communities is problematic for some participants in terms of experiencing conflict across the communities and integrating fragmented knowledge, as discussed in the remainder of the section.

In terms of knowledge transition, the mobility seen in multiple communities is an important aspect. As individuals move from one community to another or within the sub-communities of a community, they represent a node between the communities and thus have the potential to facilitate knowledge transition among different communities. To make it more concrete, Participant 4 was working on children's literature by becoming involved in multiple communities such as the Language Association, a research group in the department, and the Children's Literature Association. In the interview, she referred to her multiple community involvement as a way of bridging the communities through the knowledge domain. For instance, at an annual conference organised by the research group in her department, she worked together with the members of the Language Association and made a presentation at the conference drawing on the knowledge she gained from the Association. The interesting point here is that once knowledge is transited into a community, it does not disappear in that network. A close look at the trajectory of the knowledge in multiple communities reveals that when brokers obtain new knowledge from a community and when they transmit the knowledge into a different community, they either adapt the knowledge to the community members' interests or transmit the knowledge in its original form. In regards to this, Participant 9 said that as a way of assuring the credibility of the knowledge she was disseminating, she passed on knowledge as it was in its original source without any changes. On the contrary, Participant 3 reported that he adapted the knowledge based on the community members' needs and interests.

However, knowledge transition between communities might not be smooth. For instance, conflict of identity can be seen, which in turn tends to influence knowledge transition across communities. With regard to this, Participant 4 refers to her friend who needed to hide her academic background because the community excludes individuals from different academic backgrounds. Therefore, she disguised her background, which created an obstacle to knowledge transition between the communities she was previously involved in and the one in which she is now involved.

A further point with regard to knowledge transition as a crucial process of learning concerns the nature of knowledge in multiple communities. Each community of which an individual is a member produces knowledge which pertains to that community. Here, multiple communities represent a variety of knowledge production, or in other words,

fragmented knowledge. It came out from the interviews that sometimes this fragmented knowledge was contradictory. So, how does an individual decide upon the truth when faced with contradictory knowledge produced by the multiple communities in which he or she is involved?

Participant 4 stated that while deciding on what was true knowledge among a wide variety of views, she needed to verify this with the people she valued in the communities. She said that "until these people confirm, I keep changing (my work), I can sense when all these people would say 'OK'". So, here, her connection with the key community members is a reference point for deciding what true knowledge is. The issue of *true knowledge* will be further discussed in the following sections.

In regard to seeking true knowledge among competitive communities, cohesive ties among members might be an important aspect. Participant 1 remarked that the communities in which she was involved could be regarded as local, perhaps therefore closed, and these local closed communities tended to reaffirm the knowledge they produced. These sorts of communities tended to lack cooperation with their counterparts. Possibly for this reason, Participant 1 wanted to get involved in international communities through which she could get a different perspective.

A further point concerns the instant-momentary appearance of the communities in an individual's life. Participants 3, 5, and 10 stated that whenever they needed information, they would seek forum-like communities, then get temporary user names to join these communities, and once they got the required information, they would leave the group or remain inactive until they needed information again. This momentary participation points to a temporary existence of multiple communities in an individual's learning, and in terms of human capital, momentary participation may constrain collective knowledge deriving from an absence of attendant social relations.

Social Capital

Social ties in a community are considered as a social resource and this social resource signifies social capital (Daniel, et al., 2003). In the context of multiple communities, individuals are connected to a variety of communities with different levels of social connectedness. In particular, given the dynamic involvement in communities, the concept of social capital is worth examining.

In the interviews, participants frequently referred to the people in the communities of which they were members, explaining the reasons for their involvement in communities or for leaving communities. Some factors such as trust, confidence, and reputation were mentioned when referring to "people" in the community. This is important, especially for online communities because, as Bolliger and Inan (2012) remark, social isolation and connectedness in online learning have been research concerns, and student isolation has been shown to be an important problem for online learners. Participants 3, 5, and 10 stated that in the online communities they were not aware of the other people,

they did not trust others, and this influenced their level of participation in the collective outcome. This is important because as Daniel et al. (2003, p. 115) state, social capital is "a common social resource that facilitates information exchange, knowledge sharing, and knowledge construction through continuous interaction, built on trust and maintained through shared understanding"; therefore, members' sense of trust and shared understanding have an important place in knowledge capital. Furthermore, with regard to trust, almost all of the participants remarked upon their intellectual property rights and possible ways that the "others" in these environments could (mis)use it. For instance, Participant 4 stated:

> There are things which can be used for good or bad purposes. Trust is established based on this. In fact, nothing written by me is deleted [in online settings]. They are all saved somewhere. Sometimes, I find this quite frustrating but I am always thinking about this. Perhaps, this leads to self-control in individuals.

What the participants in general refer to can also be explained in terms of privacy or security, but in the context of trust, the perception of the *others* raises a question about whether the lurkers, members who usually take passive roles in a community, tend to influence people's sense of trust, especially in large groups. Participant 2 says, "Generally, I do not trust the people I do not see face to face. I cannot say that I quite trust the people in the forums or administrators in the forums". He points out the unknown people in the online environments and says, "I do not hang around in those environments, because I do not know with whom, when and for what purposes to share (knowledge)".

In the context of social capital in multiple communities, the statement above leads us to think that the unknown people to which Participant 2 refers could be considered as individuals who benefit relatively less from high social capital because they tend to obtain knowledge from different communities, rather than actively participating in one single community. This in turn might lead the individuals to gain superficial knowledge as Participant 7 stated:

> I search for knowledge on Google. I do not become a member of a forum, nor do I ask questions in a community in order to acquire knowledge. However, based on my experience, I should say that I cannot obtain in-depth knowledge about my field without becoming involved in a group.

A final point concerns a variety of relationships and the rituals experienced in multiple communities, which may mean self-actualization for individuals. In an interview, Participant 8 referred to pursuing her wishes through multiple communities that existed

for different purposes. Thus, she could be a part of events and relationships based on what different communities offered.

Reputational Capital

In this research study, reputational capital is seen in the form of status of a profession (Wenger, et al., 2011) and fear of isolation.

In the interviews, Participant 1 gave her reason for joining a community: It was the *only* community working on Exlibris, in which she was interested. Based on her statement, it can be said that the community's reputation is derived from its monopoly; and thus the community members can establish a profession. From this angle, its reputation can be regarded as appealing for the individuals in this field, and it has the potential to provide a base for members to get to know each other and consolidate social capital. In relation to this, its members tend to bring their existence into the community, as Participant 1 stated: "I can send my Exlibris to this society in order for them to exhibit my Exlibris as a member. Thus, my picture represents myself and I somehow can bring my existence into the community through them".

Her statement raises the questions of whether the monopoly of a community in a specific discipline increases the social capital of a community and what the situation would be like if there were multiple communities.

When there are multiple communities for a specific discipline, fear of isolation may be felt by the individuals working in that field. In other words, the tendency to be a part of massive communities may create a sense of isolation for the individuals who are not involved. For instance, Participant 2 referred to his reason for becoming a member of a large-size social network (academia.edu) as his intention to bring his academic identity into existence through these communities. He explained his intention when joining this network with the words, "being followed and also follow important people in his field". With regard to this, Barabasi (2002, p. 106) remarks that "nodes always compete for connections because links represent survival in an interconnected world". However, it is important to note that fear of isolation may not be felt by all individuals. Unlike Participant 2, Participants 4, 5, and 10 stated that they actually enjoyed working individually or joining these groups as lurkers.

With regard to the credibility of the knowledge produced in a community, it is interesting to note that reputational capital has the power to establish true knowledge. To make it more concrete, reputation confers authority in a community, and the standards of *knowledge* and *truth* are established by those with authority. This proficiency, obtained by becoming a member of this kind of community of practice (CoP), leads them to gain a reputation among knowledge seekers. Consequently, individuals tend to accept the knowledge produced by these CoPs. The following notes from the interviews with the Participant 5 are examples of this:

Participant 5: [in seeking for knowledge] Actually, I do not prefer the sites such as forums, because there is no authority in these places and everybody can say anything. Then, it becomes difficult to decide whether the presented knowledge is true or not.

(...)

Researcher: There are doctors on the internet. Do you rely on what the doctors say?

Participant 5: To me, the credibility of the website is important. For instance, there is a website like doctorlarsitesi.com (English translation can be thedoctors.com). These sites are more serious and more credible. I also question these sites but this questioning is more about whether my illness is rightly diagnosed rather than whether what they say is true or not.

The example shows that a community's proven professional status makes it credible for the individuals.

In the context of multiple communities, reputational capital may also point out negative learning experiences. For instance, Participant 4 referred to her multiple community experience while writing her thesis. She was a member of both the Language Association and the Literature Association, and she stated that the communities have conflicting, competitive views. Her field, children's literature (teaching literature to children), required her to engage in both communities from the transdisciplinary perspective. However, these communities refuted each others' ideas, creating a bad reputation for both, and as a multiple community member, Participant 4 feels the need to hide her identity when she engages in discussions in both communities.

Resource/Tangible Capital

For almost all of the participants in this research, sharing resources is a common reason for becoming a member of a community, even for the participants who usually prefer to work individually.

Resource capital has the potential to influence the intellectual development of community members. In particular, being a member of multiple communities helps individuals utilise a variety of resources, improves their knowledge, and strengthens cooperation through resource sharing. With regard to this, Participant 3 referred to his community participation in which the other members were also members of different communities. He said that he had the privilege of accessing articles through his friends, which contributed to his research by enhancing the bibliography of his thesis.

Furthermore, while dealing with resource capital, the aspect of *privacy* stands out in the multiple community members' lives. Privacy is important because it may mean intimacy and security for some people. However, in online settings, it is not easy to control privacy when sharing resources such as a private picture and a personal message. Therefore, when it comes to sharing resources online, individuals need to make strategic decisions. During the interviews, participants stated that when they intended to share resources online, they sometimes needed to create sub-groups, decide who to assign to these sub-groups, and then share with these assigned groups. Here, there is a significant relation between privacy and knowledge management.

In the context of multiple communities, Participant 8 stated that a reason why she shares resources, such as an image, which she obtains from a community with the other communities of which she is a member is that she wishes to disseminate her ideas, as embedded in the resource. Here, particular to resource sharing in multiple communities, sharing a resource might signify disclosing and disseminating the position and ideas of an individual via a tangible resource in which a message is coded.

Conclusion: Learning Experience in Multiple Communities

This research has addressed the experiences of learners in multiple communities from the perspective of knowledge capital in the context of a network structure of multiple communities. The highlighted points of knowledge capital can be summarised as follows.

By examining human capital, we mainly focused on the knowledge and skills gained through the involvement in multiple communities. In investigating the knowledge aspect of human capital, the context of multiple communities required us to take a different epistemological approach. Myers, Zhu, and Leskovec (2012, p. 33) depict information in networks as follows: "...information can reach a node via the links of the social network or through the influence of external sources". Community boundaries, ties, and nodes bring a different perspective into constructing an individual's learning. The type of knowledge is both formal and informal, which reflects real life, and remains alive in the network even after an individual leaves the group. Accordingly, through brokers, knowledge tends to be disseminated in the multiple communities and is either adapted or directly used by other community members. Knowledge transition is complex in multiple communities as discussed earlier, drawing on the interviews. For instance, while learning with competitive communities, individuals may experience conflict in the search for true knowledge. As a result, they may need to hide their identities as they enter each new community. Although they learn from each discipline- and/or purpose-driven community, in the big picture consisting of multiple communities, learners may experience conflict and this may bring about a chaotic learning experience. Furthermore, knowledge is distributed in the cooperative outcomes

of a variety of communities, and individuals may experience difficulties in acquiring and integrating this fragmented knowledge.

In terms of social capital, it was revealed in the interviews that cohesive ties among community members may lead them to behave as kinds of closed-congregation communities and to produce the same type of knowledge from the same perspective. On the other hand, cohesive ties means trust to the individuals and this is important for connectedness, which is one of the central issues in online learning and credibility of knowledge (e.g., some interviewees referred to the people whom they trust and therefore perceive them as a source of credible knowledge). In the context of multiple communities, social capital may also refer to self-actualization, which is a result of engaging in a variety of overlapping communities in the pursuit of self-interest and wishes through relationships.

In terms of tangible/resource capital, the issue of privacy stands out in the individuals' learning experiences as they need to make strategic decisions in disseminating resources, knowledge, or any materials in order to avoid unwanted results of sharing. In general, for privacy purposes individuals tend to form sub-communities and deliver or share the resources according to the characteristics of each sub-group, which in turn makes large communities 'manageable' for individuals.

A final point of knowledge capital concerns reputational capital. In this research study, for some of the interviewees, through involvment in a community, they intended to connect to a network of experts (knowledge authorities in a field) and thus bring their professional identity into the network. Reputation also meant validation of knowledge for the interviewees. Rather than a published source, the participantss tend to rely on the knowledge delivered by professionals reputed in certain communities.

Overall, we aimed to summarise the learning in multiple communities from the perspective of knowledge capital. In terms of implications of the findings, each of us is a member of multiple communities, and it is inevitable for individuals to learn from relationships with other members as they become a part of the communities' rituals. The knowledge produced in these communities may mean self-actualization, trust, conflict, privacy, and chaos for an individual. In that sense, it requires the instructional designers to take a different perspective and epistemological position in designing face-to-face and online (blended) courses given all the complex dynamics. Finally, we will conclude our article in the words of Hodgson and Reynolds (2005, p. 22): "...online work offers higher education the prospect of structures that can facilitate multiple communities as a way of recognising and supporting difference and learning from difference."

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A Multimedia Approach to ODL for Agricultural Training in Cambodia

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Abstract

Open distance learning (ODL) has long been an important option for formal and non-formal education (NFE) in most developed and developing countries, but less so in post-conflict countries, including Cambodia. However, in Cambodia there is now greater awareness that ODL can complement traditional face-to-face educational approaches, particularly as there is a shortage of teachers in the country. Thus, understanding how ODL can achieve learning and other objectives has important implications for both formal education and NFE. If it can be found to be effective, ODL has the potential of reaching a large number of people at comparatively lower average costs. This paper reports on a project where the same content was taught to farmers in Cambodia via traditional face-to-face and via ODL and compares outcomes between the different training methods. Exploring the extent to which farmers had adopted new farm practices taught in the course, our results indicate that the outcomes did not vary considerably between those trained using the different approaches.

Keywords: Distance education; open learning; Cambodia; farming; multimedia; mobile learning

Introduction

This paper summarises an evaluation of a pilot non-formal ODL project for farmer education in Cambodia, in which one face-to-face and two ODL approaches were compared for self-reported adoption of new agriculture practices by the participants on their farms. Since the 1960s, ODL has been an important option for formal and NFE in developed countries, sometimes providing a cheaper option for meeting the needs of learners who are not able or prefer not to attend regular face-to-face classes. The use of ODL has escalated with the availability of information and communication technologies (ICTs). Jung, et al. (2011) pointed to evidence of progress made in distance education in Asia with respect to access, equity, and cost-benefits, but Perraton (2004) cautioned that ODL does not always reduce unit costs of education. Understanding whether and how ODL can contribute to learning and change behaviour in on-farm practices is important for rural development. This is especially so where there is a shortage of qualified teachers, often the case in rural areas in the developing world. These areas also tend to have a large and growing proportion of youth, who might be more likely to migrate to urban areas in the absence of local learning opportunities. Teacher shortages are particularly felt in Cambodia, which is still recovering from thirty years of civil war, including the devastation of the Khmer Rouge rule. During this time, the skill base of the country was eroded and is only gradually being reconstructed. It was not until the establishment of the United Nations Transitional Authority in Cambodia in 1992 that the long path to normalisation commenced (UN, 2003).

Farmer training in developing nations has benefitted from the use of radio and video for many decades (Sulaiman, et al., 2012), but ODL based on multimedia accessed from computers is less common. ODL in developing countries faces different issues and problems from those encountered in the developed world (Wright, Dhanarajan, & Reju, 2009). For example, there may be inadequate telecommunications infrastructure, ICT hardware and software, quality assurance, qualified staff to design and develop instructional material, and trained staff to support students. In addition, the learners may not have the skills needed to use self-study material effectively. This is a particular challenge, even in developed countries, for vocational training (Mikalsen, et al., 2008). Serious problems exist in relation to the building of instructional design capacity in Asia as there are relatively few well-trained instructional designers (Librero, 2010). However, ODL designed with proper student support systems has the potential of reaching a large number of people in a cost effective manner and inspiring learning. As noted by Gulati (2008), when addressing the above and other challenges of ODL in developing countries, it is also necessary to consider the distributional impacts of this mode of learning to ensure it does not only benefit those who are better off. This is particularly the case as it appears, from the literature on ODL in developing countries, that this form of learning is more prevalent in the higher education than in other sectors.

After describing the project and course participants, we discuss methodological options considered for assessing the effectiveness of the course and describe the research

method of the evaluation. This is followed by a report on the outcomes of the evaluation and a discussion on possible implications.

ODL in a Non-Formal Course on Farming Methods at Chea Sim University of Kamchaymear

The project discussed in this paper involved the development, delivery, and assessment of a non-formal ODL course for farmers by the Chea Sim University of Kamchaymear (CSUK), a small rural university located approximately 120 km east of the Cambodian capital, Phnom Penh. The duration of the project, from training in the preparation of ODL course material until completion of course delivery, was 24 months. The project was managed by the Pan Asian Distance and Open Resources Access (PANdora) network and was supported by the International Development Research Centre (IDRC) of Canada. Its purpose was to test the efficacy of ODL compared to traditional face-to-face learning.

Cambodia has had limited exposure to ODL. At the time of the course delivery and evaluation reported in this paper, there was no policy framework for ODL in the country. The outcome of this CSUK ODL course was one of the inputs into a policy dialogue[1] with the Ministry of Education, Youth and Sport and IDRC in March 2012. This dialogue covered a range of issues associated with organising and structuring ODL, including governance structures, curriculum, content development and distribution, supporting and enabling environments, assessment, examination and certification, media and technologies, monitoring and evaluation for quality maintenance, and regulatory and legislative matters.

The project offered non-formal education and training for farmers in nine villages located in three communes in Kamchai Mear District, Prey Veng Province, in which 97% of the villagers rely on subsistence farming as their primary livelihood (NCDD, 2009). The course was conducted from May 2011 – Jan 2012, 12 weeks per learning mode. Three different training methods were used:

- traditional, face-to-face (FF) learning taught by CSUK lecturers;

- multimedia (MM) learning assisted by a facilitator, using self-instruction material on digital video discs (DVDs); and

- multimedia plus mobile phones (MP) for student learning support, using the same learning material as the MM group.

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[1]   The policy conference was held on 27-29 March 2012, arranged by the Ministry of Education, Youth and Sport (MOEYS), with the technical and financial support of the International Development Research Centre of Canada.

One important difference between the FF and the other two approaches from an ODL perspective was that the FF course was taught by a CSUK lecturer, while the other two courses were conducted by a non-expert facilitator.

The DVD multimedia courseware had been developed and designed by staff at the CSUK Faculty of Agriculture. It combines text, audio, and visual content, such as charts, pictures and videos, using the open source eXeLearning authoring application, and incorporates some interactivity. Each course participant in the MP group was provided with a mobile phone with camera, short messaging service (SMS), and multimedia messaging (MMS) capability. Although the devices were not smartphones, they had, unlike most standard mobile phones in Cambodia, localised Khmer script for SMS. Participants were shown how to use the phones, camera, SMS, and MMS. The cost of the phones and usage charges were covered by the project, so participants did not incur any expenses for these.

There is a large volume of literature dealing with the use of mobile phones for various agricultural applications (e.g., market information) (World Bank, 2011), but limited references to the use of mobiles for structured learning by farmers (COL, 2012). M-learning, applied in several domains of learning, using different technologies, has attracted much scholarly attention (Ally, et al., 2009; Otieno, 2012; Rekkedal & Dye, 2007), including its application in developing countries (Iqbal & Qureshi, 2012; Isaacs & Hollow, 2012). While there has been some research into the use of mobile devices for informal learning (Clough et al., 2009) and adult education (Aker, Ksoll & Lybbert, 2011), its application as a supplement to non-formal courses in farming methods does not appear to have been the focus of much study.

The mobile phones were not used for what is traditionally considered m-learning (i.e., having learning material accessible on mobile phones) (Latchem, 2012). The purpose of the MP delivery was to enable participants to use phones in the field by sending SMS text or preferably MMS with pictures of plant or animal diseases to the lecturers to discuss what to do about these diseases, but there were not many interactions of this nature. Instead, participants tended to use the phones more to understand the learning content (e.g., they might contact the lecturer to ask for a definition of pollination, which was already in the learning material). This latter form of interaction could be perceived as forfeiting one of the benefits of ODL (a cost-effective strategy with low variable costs) as it expended much time of the lecturers (variable costs). However, there were positive aspects of this interaction in that participants used the mobile phones to ask questions in a culture normally characterised by rote learning and fear of asking questions (Berkvens, et al., 2012).

There were 90 course participants, 30 in each learning approach, studying in groups of 10. The same learning method was used in each group and there were thus three groups per learning method. The participants were randomly selected from the target villages, but not randomly assigned to groups. With a few exceptions, everyone in the same village participated in the same group. All participants had to be literate in Khmer. The

training sessions for all three learning modes occurred in multi-purpose community telecentres (MCTs) near the participants' homes. An MCT consisted of a small room equipped with at least one computer and Internet access. These were installed as part of the IDRC-funded "Informatics for rural empowerment and community health (iREACH)" project. MCTs have been recognised as having potential to support ODL in the developing world (Latchem & Walker, 2001; Mahmood, 2005). The session times had been established in consultation with participants to, as far as reasonably possible, accommodate their availability.

The course content was the same for the three learning modes, spanning a wide range of subjects, packaged into five modules consisting of 41 sub-topics with focus on practical implementation. The five modules were as follows: introduction to agriculture, rice farming, vegetable farming, forage crop farming, and animal husbandry.

Although the course also included some theoretical aspects, participants understood that the objective was to learn new farming techniques (e.g., how to build a chicken coop). In the MM and MP sessions, participants studied the course content on a DVD (no Internet access was required for this course) around one computer, assisted by a facilitator, who supported the trainees in using the computers and learning material and discussing how they could apply what they had learned. Most course participants lacked experience in handling computers and although some participants acquired basic computer skills, this did not form part of the course objectives. Informal feedback from the facilitator and some of the learners indicated that having only one computer was unsatisfactory and that two or three learners per computer would have been preferred, but neither additional space nor computers were available in the hubs.

There were also opportunities for course participants to share ideas in this learning environment. This instructional method is often referred to as blended learning, an approach that combines distance education delivery mediated by ICTs with supporting study groups and tutorials (Latchem, 2012). Such interaction among the learners, sometimes involving a facilitator and conducted with a high degree of informality, may overcome the challenge of learning practical skills via ODL. In order to learn practical skills, precise instructions must be given to enable learners to follow the processes taught in the material and repeat what is learned (Hampton, 2002). Also, participants may benefit if they can share their practical experiences with others (e.g., a video-based instructional vocational course for distance learners in Ghana, reported by Donkor, 2011, incorporated fortnightly tutorial sessions at a study centre).

Characteristics of Course Participants

All participants had attended at least primary school, 26% primary, 36% secondary, 25% high school, and 13% university, but not everyone had completed their respective level (e.g., one farmer had only two years of formal primary education). The average and mean years of schooling both centred around eight, with a range from 2-16 years. All of the 11 (four males and seven females) university-educated participants were in the MP

group. Participation in the three learning types was evenly distributed between genders. The greatest discrepancy was that there were 17 females and 12 males in the MM group.

There were between 7-14 participants from each village. Except for one village, Kamchaymear Cheng, which had three male and eleven female participants, participation for all villages was relatively evenly spread gender-wise. The university-educated participants resided in three villages only: five in Tropaign Skon, four in Snoul, and two in Kamchaymear Cheng. The least educated participants (none beyond secondary school) were concentrated in two villages, Lo Ark and Lor Eth. With a few exceptions, all participants from a village used the same learning method.

As shown in Table 1, women were somewhat overrepresented in the age group up to 40 years, with 80% in this group, compared to men, at 69%. Different age groups were distributed across the three learning categories, but there was a bias toward younger farmers in the MP group, in which 75% were below 30, but there was also a 61 year old man. A majority of participants (70%) were married, but only 30% in the MP group, most likely due to the high proportion of young farmers.

Table 1

Age Profile of Participants

Age group	Male	Female	Total	%
18-20	4	10	14	16%
21-30	8	16	24	28%
31-40	17	9	26	30%
41-50	3	6	9	10%
51-60	4	2	6	7%
61-68	6	1	7	8%
Total	42	44	86	100%

From discussions with the course organisers it appears that mixing of age groups could have inhibited the learning process, but this did not appear to be the case with mixed gender groups. Interactions were sometimes reserved between people of different age groups, probably related to the deference shown to older people in traditional Khmer culture.

The main household income of the vast majority of respondents was derived from selling rice: more than 85% of participants in the FF and MP groups, but slightly less than half in the MP group, where there was a higher incidence of income from palm produce sale and other sources (not specified).

The farm size cultivated by course participants ranged from 0.24 to 9 hectares (ha), with the average and median sizes both approximately 2 ha. Although not evenly spread across the learning approaches, there was no particular land size bias in any group. For

example, the FF group included six farmers cultivating 0-1 ha, one with 9 ha, and one with 6 ha. None of the university-educated participants had more than 3 ha, while one man, aged over 60 with only primary education, cultivated 6 ha. On average, 80% of all land under cultivation by respondents was devoted to rice.

Approximately half of the participants had access to irrigation. Of the remaining, 32 responded explicitly that they did not have access, but 11 did not respond to this question. There was no apparent relationship between the three learning groups, land size, and/or access to irrigation. Three of the four largest land holders had access, but the farmer with 6 ha did not.

In terms of ICT, there were different combinations of mobile phone, computer, radio, and television access. Eighty-six percent had access to mobiles, with seven participants having these as their only ICT. Three women and four men had computers. This low level of access is important when considering the approaches to be deployed in ODL programmes.

Consideration of Research and Evaluation Approaches in the Study

There were formative assessments throughout the course, mainly in the form of attendance, three assignments, and two examinations (mid-term and final). Neither quality assurance, such as student perceptions of the course material, nor formal assessments of how the participants in the MP group used the mobile phones, were conducted. But as mentioned above, from discussions with lecturers, it emerged that the phones were not used as intended. Rather than using the SMS and MMS functions to contact lecturers for guidance on specific issues encountered in the field, the phones were used to call the lecturers for clarification on the course content.

The assessments reported in this paper can be classified as summative evaluations, usually undertaken at an advanced or final point in the lifecyle of a project to explore the extent to which its objectives were met (Hudson, 2006; Lockee, Moore, & Burton, 2000). Evaluations often centre on predetermined indicators, but it is also important to shift the focus away from these to make room for unintended outcomes or impacts, particularly to understand whether and how certain interventions have impacted on people's lives (Sanderson & Kindon, 2004; Sen, 2001). In this study, we focused on the farmers' own account of how the course encouraged them to apply new farming methods.

Rather than a body of rules, summative evaluation must be tailored to individual situations and crafted to fit the purpose (Guba & Lincoln, 1981). In our case, the research question was given: Is ODL as effective as face-to-face training in enabling farmers to expand their knowledge about scientifically based agricultural techniques, as reflected in the adoption of new practices covered in the course material.

In order to ascertain the success of a particular mode of delivery, different measures could be used (e.g., knowledge acquisition, the extent to which the course fulfilled the participants' expectations, whether new practices were adopted, and/or how the new practices affected yields). As mentioned above, tests based on course content were conducted throughout the project period in order to explore whether there were any differences in knowledge acquisition using the different learning approaches. As the purpose of the agricultural course was not only to teach practical skills, but also to encourage farmers to adopt new practices, adoption rates were also considered an important outcome. The adoption of new practices also indicates agency (i.e., the ability of farmers to have better control over their lives, providing them with new capabilities in the form of freedom to experiment with new techniques). If individuals value what they have learned, they will apply it (Tikly & Barrett, 2011).

Knowledge is implicit in adoption; farmers can only adopt practices they know about. Also, they are likely to consider applying them if they are aware of what benefits to expect compared to previous practices (Rogers, 2003). Furthermore, adoption indicates some form of achievement, while knowledge reflects only the potential to achieve. However, knowledge may not always translate into change of practice even where the farmer desires to adopt an innovation, but is unable to do so due to lack of other resources required for the change.

The quantity and quality of yields are ultimately the most important indicators for farmers as to whether their farming practices are successful. However, for this study, it was not considered possible for the evaluation to be based on these, which are affected by external factors such as weather and soil quality that are beyond the control of farmers and would be difficult and time-consuming to measure. Further, if one focuses on yields, the measurements would need to be conducted over a longer period of time than was available for the completion of the study. For some practices, there could be a trade-off between quality and quantity, adding another layer of complexity to the comparison. For these reasons, any focus on yields would have to cover a longer time-span than is compatible with the expectations of funding agencies. These usually require feedback shortly after the conclusion of a training programme. Furthermore, studying changes in yields is more complex than generally allowed for in budgets available for evaluations.

Due to the limited scope of this study, it is important to note that the data and associated interpretations serve to illustrate tentative outcomes rather than provide conclusive evidence on the success of the different learning approaches in encouraging farmers to adopt new practices.

Research Framework and Methodology to Assess Changes in New Practices Adoption

Following deliberations outlined in the previous section, we decided to focus on changes in practices, searching for signs of whether and how these had changed as a result of the

course. While it would have been desirable to inspect farms for evidence of change, this was not possible due to resource constraints. Instead, we relied on self-reporting of adopted changes.

The research was carried out in two stages: focus groups (FG) and a survey. The purpose of the first step, conducted in late January 2012, shortly after the delivery of the final course module, was to get an indication of the most important new practices that were likely to be adopted. This type of qualitative research approach is appropriate when studying 'how' questions (Yin, 1994). There were three focus groups, each with 10 participants from the same learning approach and with gender balance in each group. The results from the FGs informed the design of the survey questionnaire, which centred on what the FG participants perceived as the most important practices. The course covered too many topics for all to be included in the survey, considering the limited time available for the analysis.

For the survey instrument, all course participants, except three who had migrated from the area, were interviewed in March 2012 by students studying formal degree courses at CSUK. The questionnaire dealt with adoption of new practices and the primary data set consisted of responses to these questions. Most questions were open-ended, which made it quite time-consuming to code and analyse the results, but this approach had the benefit of enabling farmers to express themselves in their own terms. After coding, the data were analysed, mainly through cross-tabulations in the Statistical Package for the Social Sciences (SPSS), to see what similarities and differences emerged across the three learning modes with respect to changing methods and adoption of new practices. While a common questionnaire was used, it is possible that some questions might have been interpreted in different ways by some respondents.

Research Results

In the FG discussions, participants highlighted the importance of new rice cultivation practices and also referred to crop diversification and new ways of approaching animal husbandry. Similar issues were raised among participants from the three learning groups.

All course participants reported that they had adopted new practices: adoption of a new activity such as composting and the refinement of an existing activity. The number of practices changed for any one activity usually ranged from one to four. For the sake of taking into account the total number of new practices adopted in the comparisons, we developed the concept of "aggregate change", which for an activity is the sum of the number of farmers times the number of new practices. So, a farmer adopting four new practices was given a weight of four, compared with a farmer who only adopted one new practice. A farmer who started a new activity, say composting, was given one weight only, even if adopting several of the composting methods. As an indication of the

relative efficacy of ODL in diffusing new practices compared with traditional face-to-face training, we turn to Table 2, which shows the aggregate changes in the three learning groups.

Table 2

Total Number of Changes Adopted by Farmers

Aggregate number of new changes related to:	FF	MM	MP
- water management of rice fields	33	46	44
- rice field levelling by moving earth from high to low lying areas	12	13	13
- rice planting	67	70	63
- applying fertilisers to rice	63	54	52
- rice harvesting	57	71	70
- farmers starting home gardens	3	5	9
- new crops (based on number of new crops)	92	82	77
- starting to use fertilisers for crops other than rice	2	3	3
- new practices in applying fertilisers for crops other than rice	30	33	32
- starting composting	15	13	11
- starting to use chemical inputs	2	4	1
- practices in using chemical inputs	26	53	47
- practices in raising chicken	72	75	76
- practices in raising pigs	36	40	35
- acquiring cattle after the course	4	9	7
- practices in raising cattle by those with cattle before the course	36	26	22
- practices in raising fish	11	10	8
Total number of changes	561	607	570

While the adoption rate in the different groups was not uniform, the results indicate consistent commonalities in that for some practices one learning group might have had a higher adoption rate, whereas for other practices, learners in another group had a higher propensity to adopt methods from the course material. Although we are primarily interested in the aggregate change in this comparison, the rest of the section summarises results for individual activities.

There was a higher rate of adoption of new methods for applying fertilisers in rice fields in the FF than the other two groups. Ten farmers, most of them in the MP group, did not adopt any new practices for fertilising their rice fields. A total of 19 different methods were listed by respondents. The most commonly reported change was to alter the frequency and timing of applying fertilisers during the growing cycle. There was hardly any difference between the groups in the adoption rate of fertilisers for other crops. The number of course participants who reported using composting increased from 15 before the course to 54 after, with the largest proportional increase in the MP group, but this could be explained by the low incidence of composting in that group prior to the course. In addition to the higher incidence of composting following the course, 73% of those who had used composting before changed some of their practices to new methods they had learned. With a lower proportion of farmers in the FF group using chemical inputs before the course, it was not surprising to see a lower incidence of change in that group.

However, the average number of changed practices per farmer who used chemical inputs prior to the course was also lower for the FF group, 1.6 compared with 2.4 and 2.1 for the MM and MP groups, respectively. The most commonly reported change was to start using masks, mentioned by 39% of farmers in the FF group, compared with 58% and 48% in the MM and MP groups, respectively.

Respondents reported a total of 14 different methods they had applied for land levelling on their rice fields, of which we analysed only the most frequently adopted, moving earth from high to low lying areas of the rice fields. Approximately the same number (12 in the FF and 13 in the other groups) from each learning approach adopted this method. In total, respondents listed 14 different new rice planting methods adopted, with a maximum of four changes per farmer. The greatest discrepancy in the number of new rice planting practices between the groups was 10%, with most new methods adopted in the MM group. Prior to the course, there did not appear to be much interest or skill in water management of rice fields, as reflected in responses like "no interest in the amount of water", "not taking care of dikes or water management", "keep water in the field until harvest", "no rice field dikes for water levelling". After the course, 41 participants (18 male and 23 female) claimed they "diked very well". These were distributed evenly across the learning groups (FF:12, MM:15, MP:14). It did not seem that access to irrigation made any difference either and there were in fact more farmers with access to irrigation who did not improve their dikes, compared to those who did. The aggregate number of new water management practices adopted by the MM and MP groups exceeded the number in the FF group by approximately 36%.

The course included several methods for harvesting rice, including harvesting when the colour has changed to yellow, when 80-85% of the crop is ripe and after rice fields have been drained for 1-2 weeks before the harvest. Farmers in the MM and MP groups adopted new rice harvesting methods to a greater extent than those in the FF group.

Almost 75% of respondents had started planting new crops after the course and the total number of new crops mentioned by different respondents amounted to 23, comprising annual vegetables such as eggplant as well as perennials, including mango and pepper trees and water convolvulus (water spinach). The number of new crops grown by a farmer ranged from one to eight and in the aggregate, farmers in the FF group adopted new crops to a larger extent than the other groups, 12% and 19% more than the MM and MP groups, respectively. Some of the new crops were grown in home gardens, which slightly over 60% of respondents cultivated before the course. This increased to almost 83% after the course, with no major gender differences between the groups. The highest increase was in the MP group, but this could be explained by members of this group having had the lowest incidence of home gardens before the course, only 15. The number of home gardens increased by three in the FF and five in the MM groups. After the course, all participants in two villages had home gardens, and in four villages, there was only one participant without a home garden.

All but four course participants (three males and one female) raised chicken before the course. Two participants in the FF group and one in the MP group started chicken raising after the course. Changes in chicken raising practices were reported in all course categories, with an almost normal distribution around the change of 2-3 new practices, and the aggregate change indicated only marginal differences between the groups. The proportion (approximately 50%) of participants raising pigs prior to the course was similar in the different learning approaches and every village had a mix of those who raised and did not raise pigs. Only three participants acquired pigs after the course, one in the FF and two in the MP groups. They used similar practices as those adopted by farmers who had pigs prior to the course. Of the 48 farmers who had pigs before the course, 38 changed at least some of their practices, with a similar rate of change across learning approaches. Approximately 75% of farmers reared cattle prior to the course. The lowest incidence was in the MM group, which also had the highest increase (9), bringing its numbers up to the average (almost all farmers) after the course. The rate of change among farmers who owned cattle before the course was highest in the FF group. Most new practices adopted across the three groups related to feeding, watering, and washing the cattle.

The number of participants with fish ponds almost doubled, from 18 before to 33 after the course, with only marginal differences between the groups. The FF group had slightly more participants with fish ponds before the course, eight compared with five in the other two groups, and a few more participants with fish ponds after the course. Almost 90% adopted at least one new technique and only two farmers in the FF group did not change, resulting in five farmers in each group changing some way in which they raised fish, adopting between one and three new practices each. There were only slight differences between the number of new techniques adopted in the three learning modes.

Summary and Discussion

Summarising farmers' reported adoption of new farming practices taught in a pilot non-formal farmer ODL project in Cambodia, this paper suggests that ODL was as effective as face-to-face lectures.

Advances in ICTs, including software platforms for ODL and instructional ODL designs, have opened new learning strategies for farmers to expand their knowledge about agricultural techniques for improved practices. The research reported in this paper focussed on the learning outcome relationships between participation in three different learning approaches. We explored whether the course type influenced the competency and capacity to assimilate and apply new knowledge and change behaviour, using self-reporting. The almost equal high rate of reported adoption across the learning modes could be interpreted as an indication that the learners had mastered the course content to a similar extent across the three learning types. There could have been some bias in the form of participants reporting exaggerated adoption rates. But as there is nothing to

suggest such potential exaggeration would be higher in any of the groups, we did not take this potential bias into account when reaching this tentative conclusion.

The evaluation thus pointed to the relevance of ODL for farmer training by indicating that it could be as effective as face-to-face training for farmer adoption of new practices and starting new activities. However, before this result can be generalised as a conclusion, it might be necessary to conduct a similar project elsewhere in Cambodia, preferably with a larger number of participants.

The discussion in the rest of this section assumes that ODL can be an efficient mode of learning for rural farmers. There will be future opportunities to test this assumption as several organisations have started using the course material, available under a Creative Commons license for a small fee covering the cost of CD burning and distribution. It will also be available free of charge on PANdora's Web site, but this option will only be suitable for those with broadband access.

More widespread use of the course material developed for this project will reduce the average cost per user. The potential for comparatively lower costs per user of ODL than traditional face-to-face learning could not be demonstrated in this study because of the high costs of training in the production of self-learning material. Now that several staff members have been trained, these costs can be distributed across several courses. As they gain experience in designing open learning course material, it is expected that their productivity will increase as they begin to expand ODL into other subjects.

In addition to knowledge acquisition and the adoption of new practices, there could be wider development benefits and implications from an ODL course of this nature (e.g., the increased interaction between villagers as they exchange information and knowledge gained during the course). Although social interaction and inclusion were not incorporated as evaluation criteria, the literature has referred to them as possible outcomes under appropriate learning conditions, where the learning forum is also a social environment in which learners can expand their relationships and social capital (de Greef, Verte, & Seegers, 2012).

The results are promising in that they show ODL could facilitate the engagement of farmers in more independent learning, focussing on aspects of farming that are most useful for them. While ICTs are powerful tools for aiding the transference of information, the most important aspect of the course was the content. Now that the content has been prepared and made available to other farmers across Cambodia, it should be updated on a regular basis to incorporate the latest agriculture research results. However, as many farmers lack sufficient digital literacy and equipment for this type of training, it would be necessary to establish appropriate infrastructure, including some form of intermediation, to enable them to benefit from ODL. Such infrastructure for non-formal education would be particularly important for women to enable them to engage in self-paced learning at times that fit with their other duties. Public access centres, designed to be conducive for learning, appear to be a suitable option.

In order for non-formal ODL in agriculture to improve food security and livelihoods, it would have to scale to a national level. This would necessitate an efficient institutional framework, covering all aspects of ODL, including course development and delivery as well as appropriate venues. A critical mass of learners would be required to justify the high up-front cost of preparing the course material and providing learner support. These functions require considerable budget allocations, which must be at a level ensuring that ODL becomes affordable for low-income households. Rather than approaching ODL and traditional modes of learning as a dichotomy between two polarities, it may be more beneficial to consider the two learning approaches as complementary, where some subjects may better lend themselves to the former and others to the latter.

By focussing on adoption (albeit self-reported) in the evaluation, it became clear that the knowledge gained from absorbing the learning material was only one benefit ODL could bring to these areas. Other benefits included the adoption of new practices, the introduction of the lifelong learning concept, and the development of a community of learners. Exploring how ODL can achieve broader development objectives, including social inclusion, would be a fruitful avenue for further research as ODL is likely to become more commonly used for training in farming methods. In order to fully assess the effectiveness of ODL in informing farmers about new methods and encouraging them to adopt these, additional studies should be conducted in other parts of Cambodia. Future research could also explore whether and how a course of this nature could promote learning in households and the wider community. Also, one could research the extent to which the propensity to adopt new practices was associated with resources available to individual farmers.

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Automatic Evaluation for E-Learning Using Latent Semantic Analysis : A Use Case

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Abstract

Assessment in education allows for obtaining, organizing, and presenting information about how much and how well the student is learning. The current paper aims at analysing and discussing some of the most state-of-the-art assessment systems in education. Later, this work presents a specific use case developed for the Universitat Oberta de Catalunya, which is an online university. An automatic evaluation tool is proposed that allows the student to evaluate himself anytime and receive instant feedback. This tool is a web-based platform, and it has been designed for engineering subjects (i.e., with math symbols and formulas) in Catalan and Spanish. Particularly, the technique used for automatic assessment is latent semantic analysis. Although the experimental framework from the use case is quite challenging, results are promising.

Keywords: E-learning; automatic test assessment; web platform; latent semantic analysis

Introduction

Assessment in education is the process of obtaining, organizing, and presenting information about what and how the student is learning. Assessment uses several techniques during the teaching-learning process, and it is especially useful when evaluating open-answer questions since they allow teachers to better understand the assimilation of the student in the subject. In some cases, for instance, students with high punctuation in closed-answer tests report subjacent conceptual errors when being interviewed by a teacher (Tyner, 1999).

During the last years, the use of a computer for assessment purposes has substantially increased. The aims of using computer assessment include achieving and consolidating the advantages of a system with the following characteristics (Brown et al., 1999): first, to reduce the professors' workload by automating part of the student evaluation task; second, to provide the students with detailed information on their learning period in a more efficient way than traditional evaluation; and, finally, to integrate the assessment culture into the students' daily work in an e-learning environment. In fact, nowadays one of the most crucial things in assessment is feedback, so assessment of learning is generally intended to measure learning outcomes and report those outcomes to students (and not only to the system or teacher).

The current paper aims at analysing some of the most state-of-the-art assessment systems in education and presents a specific use case developed for the Universitat Oberta de Catalunya. Some examples of existing e-learning platforms are given. Next the use of latent semantic analysis as a semantic analyser algorithm of related documents is briefly described and explained in the context of assessment tasks. Then the authors present the above-mentioned use case, which takes advantage of latent semantic analysis in order to obtain the evaluation results. Finally, conclusions are shown.

E-learning Assessment Platforms

Some papers in the literature are oriented to automated essay-scoring research. The most relevant ones can be found in Miller (2003), Shermis and Burstein (2003), Hidekatsu et al. (2007), and Hussein (2008). However, studies covering automatic essay scoring in engineering subjects are limited (to the best of our knowledge), though not inexistent. In Quah et al. (2009), for instance, the authors use a Support Vector Machine to build a prototype system, which is able to evaluate equations and short answers. The system extracts textual and mathematical data from input files in the form of distinct words for text and for mathematical equations using equation trees based on MathTree format. Then the system learns how to evaluate them, based on grades given at the beginning, learning the evaluation scheme and evaluating the subsequent scripts automatically.

Many portals can be currently found online. To overview some examples, for instance, the Online Learning and Collaboration Services (OLCS, http://www.olcs.lt.vt.edu) from VirginiaTech provides system administration, support, and training for scholars, online course evaluations, and other instructional software. The ViLLE Collaborative Educational Tool (http://ville.cs.utu.fi/) is a full environment capable of doing many kinds of assessment, where people can benefit of developing their own material instead of developing a new Web site. In addition, it becomes easier to get feedback on the material if done in collaboration with other teachers.

Another example of a learning platform is the Khan Academy (http://www.khanacademy.org), which has created a generic framework for building exercises. This framework, together with the exercises themselves, can be used completely independently of the Khan Academy application. The framework exists in two components: an HTML markup for specifying exercises and a plug-in for generating a usable and interactive exercise from the HTML markup.

Furthermore, some systems can be found specifically for math exercises. STACK (http://www.stack.bham.ac.uk), for instance, is an open-source system for computer-aided assessment in mathematics and related disciplines, with emphasis on formative assessment. And some systems such as restructured text (http://docutils.sourceforge.net/rst.html) provide techniques that can be used to develop new materials.

Latent Semantic Analysis in E-Learning

The task of evaluating a document in our education context implies judging the semantic content of such a document. To this end, latent semantic analysis (LSA), also known as latent semantic indexing, a technique that analyses a semantic relationship between a set of documents and the terms they contain (Hofmann, 1999), has been successfully applied in multiple natural language processing areas such as cross-language information retrieval (Dumais et al. 1996), cross-language sentence matching (Banchs & Costa-jussà, 2010), and statistical machine translation (Banchs & Costa-jussà, 2011).

The aim of LSA is to analyse documents in order to find their underlying meaning or concepts. The technique arises from the problem of how to compare *words* to find relevant documents since what we actually want to do is compare concepts and meanings that are behind the words, instead of the words themselves. In LSA, both words and documents are mapped into a *concept space*. It is in this space where the comparison is performed. This space is created by means of the well-known singular value decomposition (SVD) technique, which is a factorization of a real or a complex matrix (Greenacre, 2011).

In the specific area of essay assessment, LSA has shown promising results in content analysis of essays (Landauer et al., 1997), where LSA-based measures were closely related to human judgments in predicting how much the student will learn from the text (Wolfe et al., 2000; Rehder, et al., 2000) and in grading essay answers (Kakkakonen et al., 2005). Other educational applications are intelligent tutoring systems which provide help for students (Wiemer- Hastings et al., 1999, Foltz et al., 1999b) and assessment of summaries (Steinhart, 2000). In this context, LSA has been applied to a variety of languages such as essays written in English (Wiemer-Hastings & Graesser, 2000), in French (Lemaire and Dessus, 2001), and in Finnish (Kakkakonen et al, 2005) since LSA is language independent. All these studies show that, although it does not take into account word ordering, LSA is capable of capturing significant portions of the meaning not only of individual words but also of whole passages such as sentences, paragraphs, and short essays. That is why we have chosen LSA in order to compare the semantic similarity of documents in the concept space (Pérez et al., 2006).

Particularly, in this work and differently from the previous literature, we investigate if LSA can be applied for e-assessment of mathematical essays. Additionally, experiments are performed both in Catalan and Spanish. LSA is integrated as follows. The documents containing the responses of the students are compared with one or more reference documents containing the correct answers created by the teachers. Then such semantic comparison of the students' and reference documents will allow teachers to generate an approximate evaluation of the students. For the document comparison and/or document retrieval, documents are typically transformed into a suitable representation, usually a vector-space model (Salton, 1989). A document is represented as a vector, in which each dimension corresponds to a separate term. If a term occurs in the document, its value in the vector is non-zero. Several ways of computing these values, also known as (term) weights, have been developed. One of the best known schemes is tf-idf (term frequency inverse document frequency) weighting. The tf-idf weight defines statistically how important a word is to a document in a collection. Such a representation is known to be noisy and sparse. That is why in order to obtain more efficient vector-space representations, space reduction techniques are applied (Deerwester et al., 1990; Hofmann, 1999: Sebastiani, 2002), so that the new reduced space is supposed to capture semantic relations among the documents in the collection. Figure 1 shows a schematic representation of the use of latent semantic analysis for automatic essay scoring.
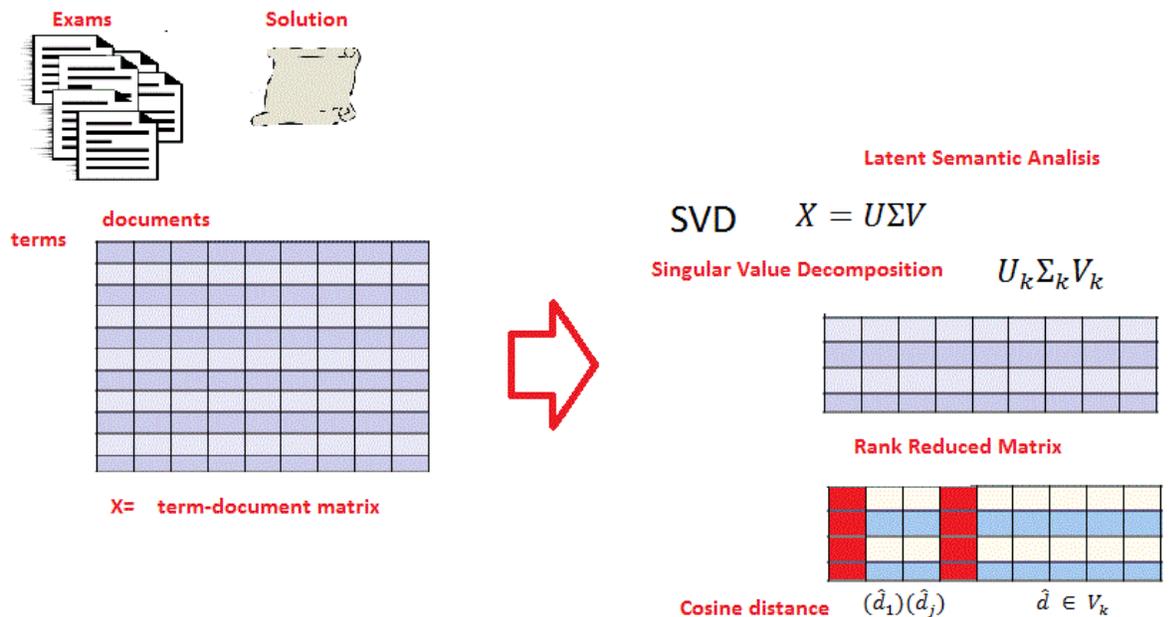
Figure 1. Schematic representation of the use of latent semantic analysis for automatic essay scoring is the term-document matrix and is the singular value decomposition of the matrix, which allows computing a rank reduction matrix over which the cosine distance among documents is computed.

As a final step, a cosine distance similarity measure among each exam and its solution in the reduced space is calculated, obtaining a score that shows how a particular set of exams is similar in semantics with their corresponding solution.

The UOC's Use Case

This section addresses the creation of a free-text assessment tool through the Internet, allowing the automatic student assessment of the Universitat Oberta de Catalunya (Open University of Catalonia, UOC). The main characteristics of the university assessment system and the developed tool are described in the following subsections.

The Universitat Oberta de Catalunya

The UOC is an online university based in Barcelona with more than 54,000 students. Over 2,000 tutors and faculty work together, and administrative staff of around 500 provide services to all these students. The students follow a continuous assessment system, which is carried out online throughout the semester. Although this system is successfully used to complete their studies, one of the main problems is the growing number of students each year, which makes the task of marking their continuous assessment tedious and time-consuming. Likewise, more external tutors are needed to carry out this task, which makes it difficult to come to agreement on criteria.

The Assessment Tool

The tool developed at the UOC aims to provide an automatic assessment of assignments in the engineering subjects by using the latent semantic analysis technique, following the work carried out by Miller (2003), where the application of LSA to automated essay scoring is examined and compared to earlier statistical methods for assessing essay quality. The implementation of LSA is done using JAVA.

The web-based free-text assessment tool allows the professors to design as many evaluation tests as they want, with as many questions as they consider necessary for the evaluation. On the one hand, for each question, the professor associates several correct-answer models in order to generate enough reference answers to guarantee that the automatic evaluation system works correctly. On the other hand, the web-based platform allows students to realise as many evaluation tests as they want, generating, after each test realization, a report including the evaluation results of every individual question as well as the overall results. Moreover, the tool provides the students with the possibility of comparing the reference answers generated by the professor with their own answers in order to give detailed feedback and improve their learning process. The platform also includes a text editor that allows inserting formulas both in the statements and in the answers with the JavaScript plug-in MathML (Su et al., 2006).

Evaluation Experiments

In this section we describe the experimental framework in our case study. We include subsections that particularly describe the working framework, the web interface, the assessment experiments, and the results obtained.

Working framework.

The main objective of the tool is to help teachers in their evaluation tasks on a large number of students. These first experiments involve a controlled and relatively small number of students in order to establish the groundwork for further and more extensive experiments. The application framework covers the students in two consecutive semesters (with 54 and 70 registered students, respectively) of a single UOC's subject called *Circuit Theory*, a core subject belonging to the first year of UOC's Telecommunications Engineering Grade.

Apart from the single final evaluation that takes place at the end of the semester, the subject's assessment model contains four different single continuous assessment assignments (CAAs) distributed over the course of the semester and a single practical work that includes computer simulation exercises, structured as follows. The first three CAAs are made up of two different sections: a short question section and an exercises section. The fourth and last CAA contains only an exercises section. More specifically, the short question sections consist of a set of 5-6 questions about very concrete issues. Each of these questions is provided with four possible answers, where only one of them

is correct, in such a way that the students have to specify the correct answer and give reasons for their choices. Due to the technical nature of the subject matter, mathematical equations usually appear in the wording of both questions and answers as well as in the students' corresponding justifications.

Within this context, the short questions section of the first three CAAs have been chosen as a specific application framework to perform the automatic evaluation experiments, due to the suitability of the structure and length of both the question and answers as well as to the nature (short text plus a few mathematical equations) of the justifications the students have to provide.

Web interface.

The automatic test assessment system is presented as a web platform, where access can be realized from two different profiles: the teacher and the student. The main task of the teacher is to provide questions and correct reference answers. Thus, a teacher can realise two different actions for each subject: to create a new test and to modify an existing one. In order to create a new test, the teacher must first define the following attributes: the name of the test, the subject in which it belongs, the position within the test set of the subject, and a brief description (Figure 2a). Once these attributes have been inserted, the teacher can register the empty test in the database. Then teachers can insert as many questions as they wish in the test. For each new question, the following attributes need to be completed: (a) statement, (b) maximum possible mark (c) minimum mark to pass the question, (d) question difficulty, and (e) language of the statement (Figure 2b). Moreover, a set of reference answers is associated with each question. Additionally, the teacher can consult the obtained results as well as the answers given by the students.

Figure 2. Creation page of a new test (a) and creation form of a new question (b).

Once authenticated, the students can perform the following actions: (1) evaluating themselves by realising a test, (2) checking the history of the realised tests, and (3) consulting the obtained marks as well as the maximum and minimum marks defined by the teacher.

In order to evaluate themselves, students are shown a list of alphabetically ordered subjects in which they can realise the evaluation by choosing a subject and selecting the test they wish to start with and the difficulty level. The statement of each question is presented to the students together with their corresponding mark. The students must answer within a text editor, where they can insert formulas thanks to a JavaScript plug-in called MathEdit (Su et al., 2006), as seen in Figure 3a. Once the answer has been written and the test is finished, the system provides a score to the student together with the obtained marks in each of the questions (see Figure 3b). Likewise, the students can check, for each question, the answers they wrote as well as the reference questions written by the teacher.
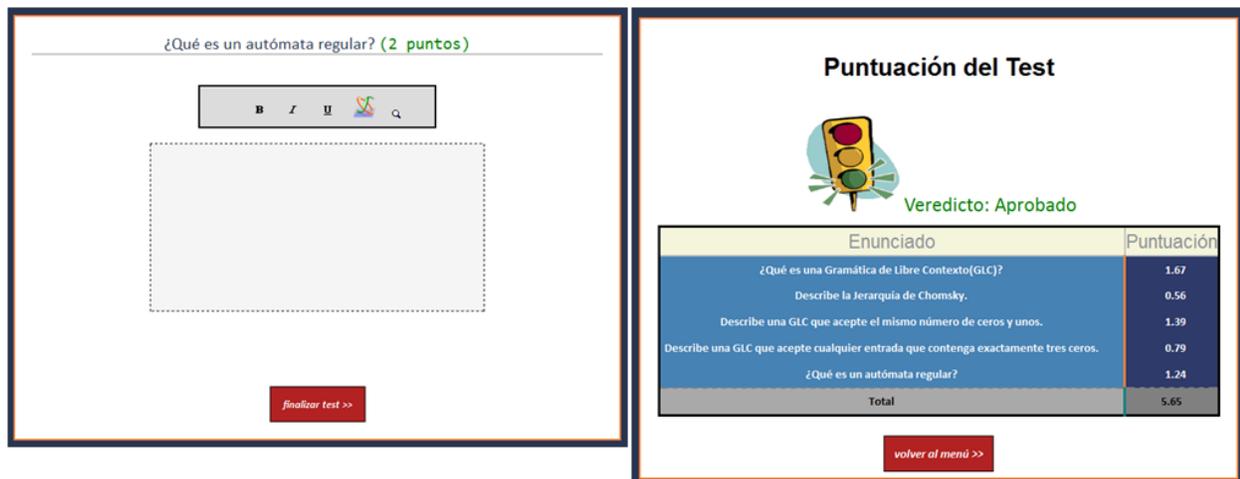

Figure 3. Question and text editor with MathEdit (a) and mark of the test once it is finished (b).

Apart from the realisation of the tests, the students have the possibility of logging into the platform in order to evaluate their progress. Thus, every student has access to a history in which they can see a list of completed tests. Once a completed test is chosen, the questions can be seen in detail, including the answer given by the student, the obtained mark, the maximum and minimum marks defined by the teacher, and the reference answers used by the automatic evaluation system in order to make the corrections.

Assessment experiments.

This section describes the automatic evaluation performed over the continuous assessment assignments of the students. The experiments carried out used the CAAs from two consecutive semesters, S1 and S2, in which 54 and 70 students were

registered, respectively. Each semester included a set of three different CAAs (CAA1, CAA2, and CAA3). The data were tokenized, lowercased. The 20 most frequent words were discarded. As follows, we describe the procedure for treating the set of solutions with LSA:

1. Compute N solutions in terms of tf-idf:

    a) Extract vocabulary

    b) Each solution is a vector of M dimensions

2. Matrix solution N*M

3. Compute SVD

4. Select L singular values

Then, for each student answer the procedure is as follows.

1. Vectorise the answer in terms of tf-idf, use the vocabulary of the set of solutions. We've got a vector of dimension M.

2. Project the vector into the reduced space.

3. Compute the similarity of this reduced space vector with each solution. We keep the maximum distance.

The material used in the analysis presented three main problems.

1. Format files. The students' CAAs are delivered in many different formats, although they are mainly in PDF, Word, and Open Office Writer. Some of them are even scanned documents pasted as image files in Word or Writer documents. Therefore, not all the CAAs can be easily transformed into TXT format to be treated properly. Consequently PDF documents and all those documents containing image files were removed from the original set of files. Table 1 shows, for each semester, the number of registered students, the number of original documents, and the number of used documents after removing PDF documents and documents with pasted images. The table also shows the vocabulary for each CAA. As can be seen, the vocabulary size is not correlated with the number of CAAs, so the vocabulary content of the CAAs varies largely among each set.

2. Mathematical formulation. Given that we are using a *bag-of-words* approach, the formulation extracted from Open Office documents was coded in MathML (Mathematical Markup Language), while the formulation extracted from Word documents was not, which made a big difference between CAAs regarding the final vocabulary.

3. Language. The students submitted the CAAs in both the Catalan and Spanish languages. In this case, we assumed that the method presented in the current paper is able to take advantage of the vocabulary that is language independent, such as the mathematical variables.

Table 1

Registered Students, Number of Original CAAs (#orig.), Number of Used CAAs (#used), and Vocabulary Size Used (vocab.) for each Semester

Semester	Students	CAA1			CAA2			CAA3		
		#orig.	#used	vocab.	#orig.	#used	vocab.	#orig.	#used	vocab.
S1	54	20	14	857	19	13	730	15	10	712
S2	70	28	20	1027	25	9	699	20	16	1291

Results.

In order to carry out the preliminary assessment experiments, CAA1 and CAA2 from semester S1 were used as development material, which allowed concluding that the best rank reduction in latent semantic analysis was five.

The results are shown in terms of the correlation obtained between automatic and human evaluations. We define *human evaluation* as the assessment made by the teacher in a traditional way, while *automatic evaluation* is defined as a computer-based assessment given by the methodology proposed in the current work (i.e., the quantifications obtained automatically using latent semantic analysis and the cosine distance).

Thus, by using the latent semantic analysis, automatic evaluations were obtained for each student, CAA, and semester. Then the correlations between automatic and human evaluations were computed for each semester and CAA collection. The correlation results obtained are reported in Table 2 (*correlation* column), together with the statistical significance of the correlation results (*p* column).

As can be seen from the table, in statistically significant results (i.e., where $p < 0.05$), the correlation varies from 52% to 69% (see CAA1 and CAA2 from semester S2). Although these results are lower than those presented in Miller (2003), they are promising given that we are dealing with a complete textual subject, but with a subject

containing a considerable number of mathematical formulas. The rest of the results (S1 and CAA3 from S2) are not statistically significant.

On the one hand, we must take into account that the reference answers were written in Catalan by the teachers, while the students could choose whether to answer the tests in Catalan or Spanish, so the language of the tests was not the same in all the students' CAAs. On the other hand, unlike the students' CAAs, all the reference solutions were available in Writer format. Since only the mathematical formulas of the Writer documents were transformed into MathML, there was also disparity in the formulas in each CAA collection.

In order to see how these disparities could have affected the results, we computed the percentage of CAAs in each set that satisfied the following two requirements at the same time (i.e., the same two characteristics satisfied by the reference solutions).

1.   The formulas were coded in MathML.

2.   The students answered in the Catalan language.

The percentage of CAAs satisfying both characteristics are shown in Table 2 in the third column of every CAA result. It can be seen that the two statistically significant results with a correlation over 50% (i.e., CAA1 and CAA2 from semester S2) correspond to those results in which the codification and the language used is the same as the reference solutions in more than 25% of the cases. Therefore, it could be stated from the results that the correlation between human and automatic evaluations depends on the coherence of both the mathematical codification and the language used in the tests.

Table 2

Correlation Results (corr.) and Statistical Significance (p) between Automatic and Human Evaluation, and Percentage of CAAs Satisfying the Same Characteristics as the Reference Solutions (same charact.)

Semester	CAA1			CAA2			CAA3		
	corr.	*p*	same charact.	corr.	*p*	same charact.	corr.	*p*	same charact.
S1	16%	0.60	14%	12%	0.68	15%	15%	0.68	10%
S2	52%	0.04	30%	69%	0.04	28%	29%	0.27	25%

For example, from CAA1 and S1, one answer to a short question to be evaluated was, "Si introduïm un senyal sinusoidal en un circuit, la resposta forçada serà una sinusoide que l'entrada amplificada per H(s)" (in English, "If we introduce a sinusoidal signal in a circuit, the forced response is a sinusoid amplified by the input H (s)"). The answer was, "La resposta del sistema és una senyal sinusoidal de la mateixa freqüència amplificada per H(s)" (in English, "The system response is a sinusoidal signal of the same frequency amplified by H (s)"). There is only a detail de la mateixa freqüència (in English, the same frequency) which is not present in the student answer. This answer is ranked by the teacher as an 8 and by the system as a 9.

To conclude the presented results, it may be interesting to discuss briefly the role played by MathML, as opposed to the words in the written reports. At the time of realising the current experiments, mathematical formulas were merely treated as words. In fact, one of the drawbacks of the current study is that we are dealing with the bag of words method; therefore, the word order, which is definitely important in the meaning of mathematical formulas, is not taken into account. For instance, the method does not distinguish between $I=V/R$ and $I=R/V$. However, since the former is totally correct, the latter is completely wrong. This is one of the challenges to be solved in future research.

Conclusions

This paper has presented an analysis and a discussion of state-of-the-art assessment systems in education. Additionally, this work shows a detailed case study of an automatic correction tool embedded as part of virtual classrooms in UOC's web-based teaching-learning environment in order to help students' self-assessment by providing them with instant feedback. Thereby, adult e-learners, who usually have a lack of time, do not have to await teachers' assessments to be graded. This tool, based on a web interface is designed to be used in an online environment, both by the teacher (the correct design and assessment tests) and student (the self-assessed). The automatic evaluation process is based on testing techniques using natural language processing and latent semantic processing.

The case study carried out in this paper has had to overcome some problems regarding the available material, first of which is the existence of a lot of mathematical formulas in the engineering subjects treated. Although many research works have dealt with automated essay scoring, as far as we are concerned, they have not dealt with mathematical language. Moreover, the students' tests are available in different languages and file formats, which makes it even more difficult to treat the mathematical formulas by converting them into a homogeneous code.

In order to be able to treat the available material, PDF documents and those Word or Writer documents containing pasted images as responses were removed at the

beginning. However, we are aware that this is not the best method to collect the data, and both of them (PDF and image files) will be dealt with in future research.

Nevertheless, despite the difficulties in the material used, the preliminary experiments have shown some interesting results. After computing the correlation between the automatic and the human assessment tests it was shown that only two from the six evaluation tests provided correlation greater than 50% with statistically significant results. These two sets correspond to those set of PACs that have more similarity with the reference solution PACs: The mathematical formulas are coded in MathML, and the students answers were mostly written in the same language.

In automatic essay assessment we would expect a higher correlation. However, we are dealing with a challenging issue since it does include mathematical symbols and formulas, which makes the current analysis more difficult. Therefore, although for the time being the correlation results are not satisfactory, they have set a starting point that allows us to work with this kind of material in engineering subjects. Thus, future work will focus on improving the format of the materials to give coherence to them (i.e., by using the same formulation and dealing with the language issue). Additionally, we plan to experiment with non-linear space reduction such as multidimensional scalability in order to find further semantic similarities.

Acknowledgements

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« Opening » a New Kind of High School : The Story of the Open High School of Utah

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Abstract

The use of online learning at the primary and secondary school level is growing exponentially in the United States. Much of this growth is with full-time online schools, most of which are operated by for-profit companies that use proprietary online course content. In this article we trace the development of, and philosophy behind, a full-time online school that uses open access software and open educational resources for course content. As more nations begin to put in place plans for primary and secondary education in the event of natural disasters (e.g., the Christchurch earthquakes) or pandemics (e.g., avian flu or H1N1), the availability of open online content is of critical importance.

Keywords: K-12 online learning; cyber school; virtual school; open education

Introduction

While distance education at the primary and secondary level has been used since the late 1800s in the United States (Moore & Kearsley, 1996), the first fully online school (i.e., Laurel Springs private school) was not introduced until 1991. The first public online school was the Utah Electronic High School, which was first introduced in 1994-95 and offered supplemental or single distance courses to students enrolled in traditional brick-and-mortar schools (although much of its delivery was still correspondence-based) (Clark, 2003). The first fully online public schools (i.e., the Florida Virtual School and Virtual High School Global Consortium) were created in 1996-97 using a state and federal grant, respectively (Clark, 2007). With the introduction of this online or web-based delivery of education, there came a need for the creation of content that took advantage of the online medium.

For most of the past two decades, these online schools have sought to either create their own proprietary online content or to lease the proprietary content of another online school or content provider. In instances where there is more than a single online school operating in a given state, this has created multiple versions of the same course used by different students who could be sitting next to each other in the same computer lab. It was this duplication of resources, along with a philosophical belief that education should be open and accessible, that led to the creation of the first open high school in the United States.

In this article, we will begin by describing the current state of online education within the K-12 environment. Next, we will briefly introduce the open education movement. This will be followed by a detailed discussion of the Open High School of Utah (OHSU), including its history and philosophy, its impact on teachers and students, its procedures for assuring quality, its challenges, and why it was needed, from those individuals who have been closely associated with its development. These individuals include: DeLaina Tonks, who served a one-year term on the OHSU board of directors prior to the school opening and was subsequently hired on as the principal during 2009, the first year of operation; Sarah Weston, who is the curriculum and technology director for OHSU and has built 12 secondary school courses using open educational resources and currently oversees all course development and teacher training on building with OER; and David Wiley, who is the founder of the OHSU. Finally, we conclude with an outline for what an open school, or even open education resources (OER), could mean in other jurisdictions.

Overview of K-12 Online Learning In the United States

A decade ago, Clark (2001) estimated that there were approximately 40,000 to 50,000 student enrolments in online courses in the United States. About a decade later, Wicks (2010) estimated that number to be over 1,500,000 students. In their annual *Keeping*

Pace with K-12 Online Learning publication, Watson, Murin, Vashaw, Gemin, and Rapp (2011) reported significant online learning activity at the K-12 level in all 50 states and the District of Columbia. In 2006, Michigan became the first state in the United States to require that all students complete some form of online learning experience in order to graduate from high school. This has been followed with similar requirements in states like New Mexico, Alabama, and Florida. Finally, Christensen, Horn, and Johnson (2008), in their book *Disrupting Class*, went as far as to predict that in the next decade the majority of K-12 education will be delivered using online learning.

In recent years, the area that has seen the most significant growth within the K-12 online learning field is that of full-time online learning (Watson, Gemin, & Ryan, 2008). Students who are full-time in these online schools are not enrolled in a traditional, physical or brick-and-mortar school, but take all of their classes using the online learning program (usually at home). Greenway and Vanourek (2006) described the experience of one sixth-grade full-time online student:

> In a 'typical' day, a student might take mostly core courses with some electives and log on to the computer for an hour or two, clicking through interactive lessons with text, audio or video clips, Flash animation, and links to related sites; completing an online math quiz; emailing the teacher; and 'chatting' with classmates online. Students complete the majority of their work offline in many of these online schools, for example, reading assignments, drafting an essay, conducting an experiment with school-supplied materials, and studying for an exam.... A parent or other responsible adult is asked to supervise—and sometimes to assist with instruction and motivation, all under the direction of a licensed teacher. (¶ 17)

In many instances, as students get older the amount of time they spend in front of the computer completing online lessons increases (and the amount of time completing activities offline decreases). In most instances, these full-time online schools are created under charter school legislation in the states were they operate.

Charter schools "are legally independent, innovative, outcome-based, public schools" (North Regional Central Laboratory, 1993, ¶ 1). Essentially they are schools that are based around a charter or contract, which is proposed, negotiated, and agreed to by the school's founders and an authorizing agency (and depending on the state this could be a government agency or some other organization that has that responsibility delegated to it). The charter or contract outlines the specific outcome-based conditions and expectations for this publicly funded school. First introduced in the United States in 1991 in the State of Minnesota, the first full-time online charter school was Choice 2000, created in California in 1994 (Darrow, 2000). At present, 25 states allow for the creation

of full-time online schools under charter school legislation, and that number continues to grow each year (Watson et al., 2010). Over the past decade, for-profit entities have become the dominant force behind the support, authorization, and lobbying for charter schools (Kozol, 2007). The same is true for full-time online charter schools, with most of them being operated by for-profit companies (the largest operator being the publicly traded K12, Inc. [NYSE:LRN]). In these situations, the authorizing organization usually receives an initial administrative fee of 1%-5% of the funding the school receives through the per student full-time equivalent model. The remaining funds are provided to the for-profit operator to run all aspects of the online school (e.g., hiring of teachers and administrative staff, the learning management system [LMS], the online course content, the student information system [SIS], computers and Internet access for the students, state testing requirements, etc.). As these are for-profit companies, the LMS, SIS, and online course content are proprietary in nature, although other schools can purchase the use of those proprietary products.

The Open High School of Utah

OHSU was founded by Dr. David Wiley and approved for charter by the Utah State Office of Education in 2007. OHSU opened its virtual doors in 2009 and completed its inaugural year with 125 9th grade students. Currently the school serves 350 full-time 9-12th grade students and 50 part-time students who take up to two credits online as part of a statewide policy initiative to allow broader access to educational options. Over the next few years, OHSU is poised to offer 9th-12th grade courses to potentially 1,500 students throughout Utah.

A policy commitment to OER was written into the school's charter documents (OHSU, 2009), the contract with the state of Utah under which the school operates:

> Open High School of Utah is an online charter high school that is 100% committed to the use of open educational resources (OERs). This approach allows unprecedented levels of individualized instruction with a highly responsive curriculum. (p. 2)

> The core philosophy of the Open High School of Utah is that education is a universal human right and that the most effective education is hands-on, service-oriented, and available to anyone. Because of this philosophy, OHSU is committed to using open educational resources – educational materials that can be freely and legally copied, changed, and shared.

> Open educational resources enable our educational mission by providing the greatest pedagogical flexibility possible to OHSU students, parents, and teachers. Open educational resources enable our service mission by providing the greatest number of opportunities to improve our communities and revolutionize schooling around the world. (p. 10)

Most explicitly of all, the charter includes an effectiveness goal regarding OER which states, "All courses will be made accessible free of charge on the Internet" (OHSU, 2009, p. 36).

Also, as a matter of policy all course materials produced by the OHSU are licensed under a Creative Commons (CC) Attribution 3.0 License. This does not mean, however, that all the OER used by the OHSU use this specific CC license. OER produced by other individuals or organizations that are embedded in OHSU course materials may be licensed under a different open license, so potential users are notified to confirm the license status of any third-party resources before reusing, revising, or remixing them.

The charter document highlights the pedagogical flexibility of open educational resources. This comment derives from the fact that open licenses remove the copyright restrictions from curriculum materials. Consequently, in an OER context a teacher can give assignments impossible with commercial curriculum like "write a new unit for the history textbook about the Arab Spring" or "create new instructional artwork about the mitosis for our biology book" and then proceed to actually put these assignments directly into the new version of the textbook. More generally, the commitment to open educational resources allows OHSU to engage in ongoing continuous quality improvement, making its curriculum better year after year. This kind of program is impossible with traditional online content leased from a commercial provider.

Conceptually this commitment to openness appears to be a good goal to have in place. The practical application is more difficult to implement, however. On a granular level the challenges become several fold:

- *Awareness*: educating administrators, faculty, parents, and students on the intricacies of when and how to use the Creative Commons licenses

- *Logistics*: creating a repository or streamlined method of cataloging, and distributing OER content once it is Creative Commons licensed; otherwise, multiple filing cabinets and hard drives contain countless licensable lesson plans that never see the light of day

- *Motivation*: cultivating intrinsic motivation for OHSU teachers to share their resources with teachers outside of their department, school, and district, as well as parents, learners, and others around the world

Outside of the OHSU, especially in the virtual setting, much of the curriculum is designed by corporations and delivered part and parcel to the students with little to no input from the teachers. A textbook publisher in Texas is designing curriculum for students in Indiana, and the people closest to their students, the teachers, have very little local ability to customize the curriculum to meet the needs of their learners. That said, in a brick-and-mortar setting, good teachers find or create supplemental content on a regular basis, but are either unaware that they are able to openly license their work (i.e., for those who are allowed to) or do not have a common repository in which to share their work outside of their department.

In Utah, an *Administrative Rule* was recently passed that allows teacher-created materials to be OER (State of Utah, 2009). This is contrary to long-standing traditions of school ownership. Teachers are typically continually told to be very careful with regard to copyright laws, that whatever is produced as a teacher actually belongs to the school since it is created with taxpayer dollars. Teachers are generally allowed to distribute within the department but not throughout the district or even the school. Time will tell if the Utah Administrative Rule has the type of impact we would hope it could have, particularly if educators everywhere followed it.

Why Open Educational Resources?

Education is an elaborate process of sharing: teachers sharing what they know with students through lessons and activities, students sharing their current understanding with teachers through homework and other assignments, teachers sharing feedback on students' current understanding through comments and grades, teachers sharing encouragement and support with students through hallway conversations and lunchtime counseling sessions, and so on. Education *is* sharing.

The primary purpose of copyright is to prohibit individuals and organizations from sharing creative works unless they have procured (frequently expensive) permission. Inasmuch as education is about sharing and copyright is about restricting sharing, education and copyright are fundamentally at odds with one another. Different legal doctrines (like "Fair Use") and legislation (like the *TEACH Act*) try to decrease the enmity between education and copyright, but the tension is fundamental and cannot be adequately addressed with piecemeal or band-aid approaches.

OER are educational materials available for free that come with four important copyright permissions, known as the "4Rs":

1. Revise: You have permission to change an OER in any way you need: translate it into Spanish, make an audiobook version, replace the urban examples with examples your rural students will understand, and so on.

2. Remix: You have permission to combine an OER with other OER to make new OER.

3. Reuse: You have permission to use the original, revised, and remixed OER in any context (e.g., online, in the classroom, etc.).

4. Redistribute: You have permission to copy and share the original, revised, or remixed OER with anyone and everyone.

OER are educational materials whose copyright license freely permits copying, revising, remixing, and sharing. In other words, open educational resources are educational materials whose copyright licenses are compatible with the broader goals of education.

Impact Of "Opening" A High School

Implementing an OER curriculum and its results are perhaps the most exciting aspect of the OHSU. Every student's educational experience can be customized to best fit their needs, turning the one-size-fits-all, teach-to-the-middle education system on its head. For example, at OHSU if a student is struggling with factoring, the teacher creates an additional, personalized screencast highlighting specifically where the student is going wrong, complete with suggestions and examples on how to fix the problem. The online delivery allows the curriculum to perform the majority of the content delivery function, freeing up teacher hours that would have been spent delivering the same lecture over and over to multiple classes to instead work with students in a one-on-one setting, giving them individualized attention just when they need it.

Teacher Ashley Webb shares her thoughts on transitioning to OER: "If something isn't working for a particular set of students, it's not like you can rip that chapter out of the textbook and replace it with something else. But with OER curriculum, you can." The impact of using OER curriculum in a digital environment is ground-breaking to say the least. Teachers have the ability to customize the educational experience for specific groups of students in ways not possible with traditionally copyrighted materials. For example, with a traditionally licensed textbook (whether printed or online), a teacher's only choices are to use or skip chapters (or smaller units). By contrast, with open educational resources, a teacher can click, edit, and revise the materials directly, writing new examples that speak to her students' life experiences and placing them directly in the book.

Pedagogically, OER makes it possible to manipulate curriculum to meet student needs in a variety of ways. Special education is an area where OER and technology are critical to the success of our students. Teachers at OHSU have the ability to create MP3 files of OER lessons so that aural learners or students with reading disabilities have an alternate way to receive the information. The use of open resources also makes it possible to very easily modify the curriculum to meet student needs. Some special needs

students read at a third grade level, so the special education teacher reworks the existing higher level curriculum so that her students can understand it better.

The grand experiment of a school based on OER curriculum is showing promising initial results. The percentage of OHSU students deemed proficient by state standardized tests ranged from two to 14 points above the state averages in English, science, and math in both 2010 and 2011. The school has received two Best of State awards, receiving the designation as Utah's best in the Curriculum Development and Charter School categories by beating commercial curriculum providers, local brick-and-mortar schools, and national franchise online schools in the process. The school has also received national recognitions, including two gold medals and a silver medal from the US Distance Learning Association (USDLA) for excellence in computer technology education programming and best practices in distance learning teaching.

Assuring Quality in Open Courses

Because open learning environments empower local teachers and staff so significantly, quality assurance in these environments requires more active involvement by local teachers and staff. This additional commitment takes at least two forms.

First, additional effort is necessary in the initial screening and filtering process. In a traditional textbook adoption or virtual curriculum adoption environment, a publisher's reputation serves as an initial quality check. If past performance is the best predictor of future behavior, then new books or online courses created by publishers who have previously released quality materials are likely worth a closer look. This limited subset of materials can then be subjected to further expert review at the level of adoption. With OER targeted for use in K-12 contexts, few brands exist that signal consistent, high quality. This means that local teachers and staff working for institutions that make policy commitments to openness have a far broader range of material to include in the initial review process.

Second, additional effort is necessary in the ongoing, continuous quality improvement of the curriculum. In a traditional textbook or virtual curriculum environment, local teachers and staff are powerless to effect direct change of the curriculum. Consequently, they spend their time trying to "supplement" their way around holes in the curriculum and directing students around less-relevant parts of the curriculum. The closest path they have to directly effecting change is sending an email to a customer service representative and waiting for the next edition of the material to be published. However, when schools make a commitment to OER, local teachers and staff are immediately empowered to take direct action when they find issues in their curriculum. Redundant or irrelevant parts can be removed, deleted, or rewritten and made relevant before students ever see the materials.

Additionally, because learner interactions with online curriculum generate so much data about learner behaviors, "learning analytics" approaches to working with these data can drive empirical programs of continuous quality improvement. These data provide teachers and staff with specific information about how to exercise their 4R rights to revise, adapt, and improve the materials over time. Teachers are empowered and professionalized by this ability to conduct iterative experiments, tweaking curriculum in real-time in response to rich, real-time data about learner behavior, rather than waiting helplessly for a publisher on the other side of the country to release a new edition of materials in 18 months. Increased local empowerment comes with increased local responsibility and requires additional local effort.

Specific OHSU Quality Assurance Measures

OHSU courses are developed and taught in *Moodle*, the LMS. A combination of LMS and third-party analytic tools provide the school with disclosure of course content efficacy and instructional performance. An essential component of instructional design is the editing and augmentation of course materials and assessments. OHSU places a high priority on using their collected data to determine allocation of school resources for targeted course refinements. Teachers and administrators use the data reports generated by LMS to examine multiple aspects of a course to determine its effectiveness. Reports yield data that aids in analyzing and judging the performance of individual assessment questions. Teachers are able to view the percentage of students selecting each answer, a comparison between highest and lowest quiz takers, and overall difficulty level of each question. This information provides instructors with crucial direction in course assessment edit and design.

The LMS can also show actual student use of the course resources. Instructors can track individual and group use of course activities and assignments. Undervalued resources can then be strategically improved, replaced, or discarded after identifying patterns of student engagement.

Both student and teacher performance are additional benchmarks of course and instructional quality. OHSU uses a third-party tool, Genius SIS, to provide timely performance data. Variables, including student time spent in class, grades, and activity completion, are layered and analyzed to target 'just-in-time' student intervention. Genius SIS also aggregates student pacing and grade data at the teacher level, providing a measure of teacher performance. By tracking frequency and type of teacher/student communication, enrollment trends, and completion and drop rates, OHSU can accurately respond, when needed, with appropriate administrative intervention.

OHSU follows a data-driven practice of quality assurance in both courses and instruction, which includes

1. a learning management system (LMS) that collects and houses data;

2. LMS and 3rd party tools leveraged for analytics; and

3. revisions to curriculum and instructional strategies implemented according to reported data.

By leveraging analytics, OHSU exercises targeted refinement of courses and instructional techniques and is able to quantitatively monitor the impact of these revisions on student performance.

Challenges in Credentialing an Open School

Despite the measures of success experienced by the OHSU, there have been some challenges due to the implementation of an OER curriculum, the first being the State Charter Board, the authorizer of the initial charter. Making the commitment to OER the core, foundational commitment of the school's charter protected the school from later misunderstandings by the State. Once the school was charted with this core commitment, the OHSU was determined to meet the OER commitment as long as the school is operational.

After approving the OHSU's charter, there was some concern that the school would not be using textbooks from a credible corporate provider. Helping the members of the Charter Board to understand the philosophy and rationale behind using OER was a challenge even though doing so was already approved according to charter commitments. Flipping the traditional textbook method and focusing on quality instructional resources gathered online combined with made-from-scratch materials was a foreign concept for most of the members. The OHSU has found that the most effective way to ensure standards alignment (a proxy for quality about which the Board cares deeply) is to use standards as the organizing framework for each course. Teachers can then gather existing OER materials, organize them accordingly, and fill in any gaps with teacher-created materials. As mentioned above, the greatest challenge curriculum writers face is working through the available OER and determining which content to use in order to create a cohesive and effective course.

One last challenge centers around accreditation and assessment. OHSU has a responsibility to protect its assessments and keep them secure so that student performance can be consistently and accurately measured. If the school were to release assessments as part of its curriculum, the results could be disastrous to the accreditation process by compromising test security.

The acquisition of quality assessments also presents challenges of its own. There are very few open source automated assessment tools or question banks that can be implemented into OER curriculum; therefore, OHSU has supplemented what is

available with proprietary question repositories to ensure assessment validity. Now that the initial bottom-up curriculum development phase for grades 9-12 is complete, more resources can be allocated to the development of quality assessments that integrate into the *MoodleRooms* LMS. OHSU can concentrate on a top-down approach to the assessment conundrum and create quality assessments to dovetail with quality curriculum, replacing proprietary materials.

An Open Education Resource Versus an Open School

OHSU is an online charter school whose charter commits it to using OER curriculum. Why would a school make such a commitment? There are several reasons. First, using OER makes sound financial sense over the long-term. During the first three years of operation the school spent significant resources aggregating and standards aligning OER for delivery as meaningful, well-designed online courses. Much of this financial investment was possible because there were no textbooks for the school to buy or other online curriculum to lease. Now that this initial course development is completed, the school's ongoing curriculum expense is the cost of new course creation, ongoing maintenance, and improvements. Contrast this with the cost of using a commercial online curriculum provider like K12, Inc., where ongoing access to course materials (without any teacher support) costs $30 per month per student (http://www.k12.com/enroll-or-buy/course-pricing). As the OHSU grows to enroll 1,000 students, the math would be: 1,000 students x 7 courses per student x 10 months of school x $30 per course = $2,100,000 per year to *lease* 10 months of access to course materials. "Lease" is the operative word in the previous sentence because at the end of the 10-month lease the school no longer has any access. Even after accounting for time teachers and staff spend in maintenance and continuous improvement activities each year, OHSU will save millions of dollars each year as it grows to reach its state-approved enrollment cap (i.e., 1,500 students). Moreover, every penny spent on curriculum is invested in the school's teachers rather than transferred to multinational publishers.

Second, "the core philosophy of the OHSU is that education is a universal human right and that the most effective education is hands-on, service-oriented, and available to anyone" (OHSU, 2009, p. 10.). Consequently, OHSU has released its ninth and tenth grade curriculum online as OER, completely free for any individual or school to download and use. The eleventh and twelfth grade curriculum will be released under these same terms in the fall of 2012 and 2013. We believe the free availability of a complete 9-12 online curriculum with an established record of supporting academic achievement will fundamentally change the economics of the K-12 curriculum market in the favor of schools. We also believe there are significant implications for at-risk and underserved populations where financial resources have historically kept students separated from quality curriculum materials.

Third, using OER can have profound quality implications. When teachers are able to make necessary revisions to curriculum directly rather than "supplementing around" problems and directing students around irrelevant material (e.g., "please turn to page 29 and look at the third paragraph"), the instructional impact can be significant. We are currently exploring the shape and nature of this significance in other research.

Fourth, using open educational resources significantly empowers teachers. Gur and Wiley (2007) describe the way in which purchasing commercial curriculum contributes to the deskilling of teachers:

> Deskilling is the separation of conception from execution (Apple, 1986, 1995). Deskilling is part of a process in which labor is divided to increase productivity and control labor. Recall that, since the 1950s and 1960s in the U.S., the view that teachers were unsophisticated in skills and major curricular areas forced the creation of "teacher-proof" materials.... In many American classrooms, the pre-packaged curricular materials ("systems," as they are sometimes called) include everything that a teacher needs, such as curricular content, pre-specified teacher actions/plans and student responses, assessment items, and so forth. Accordingly, teaching skills such as designing teaching and curriculum planning for specific students atrophy because they are really not required (Apple, 1986, 1995). The teaching becomes a matter of something one purchases; the school is transformed into a market.... With their role reduced to manager, teachers see little incentive to improve their pedagogical skills; thus, instruction becomes "a managerial concern, not an educative one both for teachers, and, ultimately, for students. (Shannon, 1989, p. 92)

When a school decides to adopt OER, on the other hand, this policy requires teachers to identify resources, judge their quality, align them to standards, aggregate them in meaningful collections, and choose or design accompanying activities and assessments. Teachers and staff also become involved in ongoing processes of evaluation and continuous quality improvement. Where "teacher-proof" curriculum assumes few or no skills on the part of the local teacher, adopting OER is the ultimate expression of confidence, empowering teachers to bring all their expertise to bear in the classroom.

Conclusions and Implications

Within the United States, K-12 online learning has grown significantly since it was first introduced over two decades ago, and it is continuing to expand at exponential levels as legislatures remove restrictions to both supplemental and full-time online learning. One of the areas where K-12 online learning is still growing the most is the full-time online charter schools, many of which are operated by for-profit corporations. Unfortunately, to date there has been limited evidence of the "success" of these full-time online learning programs, with most of the data indicating that these programs often have severe challenges in meeting students' needs (Hubbard & Mitchell, 2011; Innovation Ohio, 2011; Joint Legislative Audit Committee, 2010; Miron, Urschel, Yat Aguilar, & Dailey, 2011; Office of the Legislative Auditor, 2011; Ryman & Kossan, 2011). Further, there has been much recent criticism concerning the motives and tactics of the for-profit corporations that operate many of these full-time online programs (Boyd, 2012; Brown, 2012; Fang, 2011; Hood, 2012; Layton & Brown, 2011; Saul, 2011). As we have demonstrated above, using one of these for-profit providers would cost OHSU millions of dollars more per year than the school's OER strategy does. This would be an indefensible decision given the academic success the school's OER is helping students achieve.

Jizelle Jurquina, third year OHSU student, validates the use of OER, technology, and quality faculty:

> The teachers are one of the factors that have really impacted me – without their expert teacher skills, I would be on the road to destruction. Before I joined OHSU, I was given textbooks for everything; textbooks that were impossible to understand. This made it exceptionally difficult for math. I was barely able to multiply and divide correctly and I couldn't grasp the idea of fractions when I joined OHSU. It would only be a matter of time before I was held back because of my shaky math knowledge. Mrs. Weston saved me from such doom and taught in such an effective manner. I have learned almost everything that I did not understand the years before, and I am understanding math concepts easily now even after just one or two of her videos. I used to be terrified of math, but I actually enjoy it sometimes, now!

We hope every teacher possesses the skills necessary to successfully use curriculum materials and educational media in support of student learning. However, successfully using OER requires teachers to possess additional information literacies that will enable them to find and evaluate the quality of OER and additional technical skills that will enable them to take full advantage of the 4R permissions granted by open educational

resources. In contexts where teachers lack these additional skills, or where appropriate administrative and policy support is missing, it will be extremely difficult to successfully use open educational resources.

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