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Editorial - Volume 13, Issue Number 2

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Leadership

In this issue we present the first article in a new IRRODL section, Leadership in Open and Distance Learning Notes. There is little doubt about the importance of leadership in all organizations in the complex and ever-changing context of the twenty-first century. The cult of leadership is especially visible to us now as the Americans, the French, and the Russians crank up their respective presidential leadership campaigns. But closer to home and the workplace, it is easy to think about leadership as being something for which someone else, higher up, is responsible. Surely our problems exist because the president, the provost, my department head, or my colleagues just aren't being effective leaders!

However, crowd sourcing, the viral influence of individual blogs and YouTube posts, and the power of tweets and Facebook posts force all of us to confront and take responsibility for our own leadership capacities. We can exercise a great deal of leadership in our homes, schools, and workplaces, but that leadership demands commitment, energy, and risk. All of us, as distance education researchers and practitioners, are challenged to maximize and optimize our respective leadership contributions. Our collective mission, to expand opportunity and to increase the development and effective use of knowledge, demands that we be leaders and develop our individual leadership capacities. We hope this new series will help all of us to become more effective leaders. We welcome new articles from both students and practitioners for this series.

The Leadership in Open and Distance Learning Notes section is edited by Professor Marti Cleveland-Innes from the Centre for Distance Education at Athabasca University. Dr. Cleveland-Innes will be familiar to many IRRODL readers as an active sociologist and distance education researcher and author. She has published on a variety of topics related to blended learning, the community of inquiry model, social change, and more. The premier

article in the series, by Athabasca University EdD student Willy Fahlman, focuses on leadership in e-learning in health care contexts.

Introduction to the Research Papers in Issue 13(2)

Insung Jung, from South Korea and now Japan, is one of the world's leading authorities on assessing quality in online learning. In "Asian Learners' Perception of Quality in Distance Education and Gender Differences," she reports on the results from a large survey study of distance students from 11 Asian countries. She develops a conceptual model overviewing and connecting the 10 dimensions of quality that emerged, and she then highlights significant gender differences in student perception of quality.

Many distance educators have experienced the deep bifurcation between students who relish, learn from, and even demand opportunities for collaboration with their peers and the equally opinionated students who remind teachers that they enrolled in distance education so they would NOT have to interact with peers. In an insightful article from Spain, "Are Online Learners Frustrated with Collaborative Learning Experiences?," the authors present empirical evidence documenting the factors that frustrate students when they are compelled to participate in collaborative learning activities. The article concludes with recommendations for reducing these frustrations, thus making these useful pedagogical activities more acceptable and accessible to distance learners.

IRRODL joins many distance education journals and recent conferences that have focused on open educational resources (OERs) and the critical issue of adoption and reuse with two articles on this topic. In the first of these, our colleagues from the USA (and past IRRODL special issue editors) present a study of the reuse of OERs. Partially in response to the need to make educational content culturally, linguistically, and pedagogically relevant, most OERs are licensed in ways that allow teachers to modify them to suit their own context. But do teachers actually modify OERs, or do they just reuse, as is? This study reveals current practices and provides recommendations for more effective OER use.

The second OER article examines the technical challenges of finding the OER resource (from among the tens of thousands available) that best matches the unique needs of individual teachers or schools. In "Conceptual Framework for Parametrically Measuring the Desirability of Open Educational Resources Using D-Index," scholars from Malaysia address this problem from a computer science perspective, and an algorithm for searching is described and tested.

"Contradictions in a Distance Course for a Marginalized Population at a Middle Eastern University" uses the lens of activity theory to explore the contradictions in lifestyle, technology, attitude, and work that confront a sample of distance education students in the often turbulent context of modern Iran. As you read this study you will realize why we are pleased to offer an outlet for distance education teachers and researchers who are providing educational opportunities—even in contexts of considerable religious discrimination.

We next present an article by Swiss researchers examining "The Relationship Between Flexible and Self-Regulated Learning in Open and Distance Universities." Obviously students are attracted to distance and open education because it meets their increased need and desire for flexibility. But such flexibility can require critical amounts of self-directed skill, motivation, and regulation—qualities not often acquired in campus-based education. The survey results presented in this article reveal the connections between self-regulation and flexibility in design, course requirements, and other components of distance education systems.

A common theme in the popular press is the loneliness and isolation of the distance learner. But increasingly, distance education *teachers*, whether working in blended or fully distance contexts, experience a similar disconnection from colleagues and the institution due in no small part to geographic, temporal, and institutional distance. "'Everybody is their own Island': Teacher Disconnection in a Virtual School," from the USA, helps us understand the extent of this phenomenon and challenges us to develop tools and techniques to alleviate it.

Although it is true that academics and researchers love to argue about definitions and distinctions between tiny differences in their theories, tools, and contexts, most of us are more than a bit fatigued with bickering over the diverse names associated with e-learning, online learning, distance learning, flexible learning, net learning, and other close or far synonyms. Thus, "Building an Inclusive Definition of E-Learning: An Approach to the Conceptual Framework," from Catalonia, Spain, is a welcome addition to the literature. You are welcome to join the debate to see if these researchers have finally 'nailed' the definition of e-learning, for all time!

I know that Athabasca University is not the only school in which e-portfolios are proving their pedagogical value. We see increased interest in this authentic and reflective tool in both distance and campus-based education systems. But when students are geographically distributed in practicum activities, the value of staying connected and documenting and reflecting on their experience is heightened. In a paper from Turkey, "Determining the Feasibility of an E-Portfolio Application in a Distant Teaching Practice Course," recommendations are made for increasing the effective use of this tool.

We also publish in this issue two insightful research notes from Africa. The first, "Developing and Deploying OERs in sub-Saharan Africa: Building on the Present" overviews the major African initiatives, documents challenges and accomplishments, and reviews the "factors necessary for creating and sustaining a vision for OER development and deployment." The second, "Assessment of Challenges in Developing Self-Instructional Course Materials at the National Open University of Nigeria," is a case study of the challenges and accomplishments of one of the newest of the world's mega universities as it provides opportunity for the hundreds of thousands of qualified Nigerian adults who have no traditional opportunity for higher education.

Conclusion

With articles from Japan, USA, Nigeria, Switzerland, Spain, Catalonia (Spain), Turkey, Iran, Canada, and Malaysia, this issue continues IRRODL's proud tradition of being the most international of the peer-reviewed distance education journals. We also hope you appreciate the wide range of topics and the underlying theme that unites them—continuing efforts to improve distance and open education practice. Enjoy!

Athabasca University

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Asian Learners' Perception of Quality in Distance Education and Gender Differences

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Abstract

There have been few efforts to investigate the concept of quality from learners' perspectives or to incorporate their needs and perceptions in quality standards in distance education. This is rather surprising, particularly in distance education contexts where the quality of the learning is not derived only from the products and services delivered to the learner but also from the knowledge, understanding, and relationships that are codeveloped by both teachers and learners during the teaching and learning processes. This study proposes and verifies a conceptual model of the 10 dimensions of quality in distance education from the learners' perspectives and investigates gender differences in the perception of quality in distance education with 1,665 distance learners from 11 Asian countries and one territory. The results show that all 10 dimensions across supportive, pedagogical, and environmental domains in the model are important in judging quality in distance education. Also, gender differences are found in the perceived importance of 10 quality dimensions, barriers to DE, important supporters, and types of support received. The implications of these findings are discussed and suggestions for further research and development are offered.

Keywords: Distance education; e-learning; gender; learner's perspective; quality

Introduction

As Jung (2011) observes, the quality assurance (QA) criteria developed in various settings tend to be responsive to the perspectives of distance education (DE) institutions, assessors, and funding bodies and often ignore learners' views on quality. For example, the E-xcellence Project's e-learning assessment tool, which was developed under the auspices of the European Association of Distance Teaching Universities, includes 33 benchmarks that are mainly concerns of European e-learning institutions, including *strategic management, curriculum/course design and delivery and support*. Similarly, India's Distance Educa-

tion Council's "Guidelines for Regulating the Establishment and Operation of Open and Distance Learning Institutions" requires DE institutions to attend to areas such as *management of academic and administrative matters, policies and mechanisms for curriculum development, and staff training*. Twenty-four common benchmarks for quality online education developed by the Institute for Higher Education in the USA also cover QA items important for e-learning providers to assess and improve their quality (Phipps & Merisotis, 2000).

While inputs from providers, assessors, and governments are valuable in managing and enhancing quality in DE as Frydenberg (2002) argues, learners' views also need to be taken into account since the success of DE does not derive only from the products and services delivered to the learner but also from the knowledge, understanding, and relationships that are codeveloped by both learners and teachers during the teaching and learning processes, and such success typically relies to a greater extent on learners' motivation and commitment (Ehlers, 2004; Jung, 2011; Tucker, 2010). Moreover, in order to improve learning experience and performance of distance learners, it is essential to fully understand their perceptions of quality DE.

Studies on Learners' Perceptions of Quality in Distance Education

Some studies have examined learners' views on quality in DE and are well documented in Jung (2011). For example, employing a survey, focus groups, interviews, and case studies, Cashion and Palmieri (2002) investigated Australian learners' and educators' views on the quality of online learning. Flexibility, or a flexible way of utilizing e-learning technology, was rated as the most important factor in quality e-learning by learners, while it was rated far lower by providers. Other quality factors cited as highly important by most educators, such as induction, communication with teachers and other students, and a hybrid mix of face-to-face and online learning, were rated as less important by the learners. In particular, learners did not indicate any need for a lot of induction, initial support, or technology training to study online, while educators believed that they would demand far more support.

In a European context, Ehlers (2004) found from interviews with experienced e-learners that European learners see course process–related dimensions, such as presence, didactics, and collaboration, as more important than institutional considerations, such as vision, planning, and finance, in evaluating e-learning quality. He also uncovered that while e-learning institutions view technology as an important factor in enhancing the quality of e-learning, learners do not agree with this view and perceive technology as important only when it is lacking. This result is consistent with the findings from Cashion and Palmieri (2002) and Jung (2011) that e-learners do not see technology or technology support as a critical factor in assessing the quality of e-learning. However, as Muilenburga and Berge (2005) and Selim (2007) report, e-learners with poor technology infrastructure and less experience with technology perceive problems with technology and access as serious barriers to e-learning.

In the United States, Ward, Peters, and Shelley (2010) reported the positive perception of both instructors and students toward the overall instructional quality of synchronous online learning. They found that instructors were pleased with the quality of student-to-instructor and student-to-student interaction in synchronous online classes, while students positively assessed the quality of learning experiences during online learning.

Jung (2011) found that South Korea's e-learners perceived staff support to be the most important indicator of e-learning quality, followed by institutional QA mechanisms and learning tasks. This finding clearly differs from the findings in the two Western studies mentioned above and may reflect the tendency for education in Asia to be more teacher-centered—a reminder that cultural factors also need to be taken into account when considering learners' needs. However, even in the same region, different findings have been reported. For example, in an edited book on DE in Asia (Baggaley & Belawati, 2010), Chen and Wang (2010) reported that Chinese online learners ask for more teacher-student and student-student interactions and flexible learning activities that offer guidance, while their institutions place more emphasis on provision of video lectures and multimedia resources and content design that follows a certain standardized procedure.

While these studies contribute to our understanding of learners' perspectives on quality in DE, they also point to the fact that there can be some significant differences across different contexts that are dependent on learner variables such as gender. This is particularly true in Asia, where gender is an important variable explaining barriers to distance learning (Bhushan, 2008), intensity of technology use (Jamtsho & Bullen, 2010), motivation and confidence to continue distance learning (Janaki, 2006), perception of the quality of DE courses (Yawan, 2001), and use of supports (Taplin & Jegede, 2001). Thus, in order to fill the knowledge gap in the literature and provide useful references to devise a balanced and improved QA framework for DE in Asia, we need to understand Asian learners' perspective of DE quality and consider learner differences, especially in gender.

Conceptual Model Development

The present study aims to investigate Asian learners' perceptions about the quality of DE and examines gender differences in such perceptions in an attempt to understand Asian learners' needs and concerns in assessing quality in DE and provide practical references for the improvement of existing QA frameworks for DE in Asia. DE in this study includes various forms of technology/media-supported education such as e-learning.

To develop an initial list of quality dimensions for use in the study, relevant previous studies were analyzed. In particular, the categories confirmed by Jung (2011) in an Asian context served as a foundation to create and define six dimensions.

1. The *faculty support* dimension deals with policies and procedures for training, support during course development and delivery, and faculty welfare.

2. The *student support* dimension deals with policy and guidelines for technical, financial, psychological, social, and administrative support, flexible payment, and appeal

mechanisms.

3. The *information & publicity* dimension refers to the provision of course-related and other logistical information and clear indication of requirements.

4. The *interactive tasks* dimension refers to learning activities that promote learner interactions in various forms of distance learning.

5. The *institutional quality assurance mechanism* dimension refers to policy measures and activities by a DE institution with regard to the existence of QA standards and guidelines specifically for DE, and periodic internal and external evaluations.

6. The *institutional credibility* dimension refers to the status of acquiring both national and international accreditations, showing strong leadership, and guaranteeing member qualifications that promote a DE institution's public credibility.

Four other dimensions (*infrastructure*, *course development*, *teaching and learning*, and *evaluation and assessment*) were added to the list as they were found to be common dimensions of Asian countries' QA systems for DE. Jung, Wong, Chen, Baigaltugs, and Belawati (2011) analyzed the existing QA frameworks in the identical Asian countries and one territory, excepting Thailand, and found that vision and mission, educational resources, infrastructure, course development, teaching and learning, student support, and evaluation and assessment are commonly included as QA areas in Asia. Among these common QA areas, the vision and mission area was excluded since it was not identified as a major quality concern for Asian DE learners in several studies, such as Chen and Wang (2010) and Jung (2011). Student support had already been included among the QA criteria of the present study, and the educational resources area was incorporated in the course development dimension. Thus the remaining four dimensions were added to the list of the present study.

1. The *course development* dimension refers to policies and guidelines that help ensure and maintain the quality of course development processes, materials, and resources, and the course content's adaptability to learners.

2. The *teaching and learning* dimension refers to activities related to pedagogy in DE as well as online and physical resource provision.

3. The *evaluation and assessment* dimension refers to activities and policies concerned with students' learning assessment and feedback as well as various stakeholders' evaluations.

4. The *infrastructure* dimension refers to the policies and measures that ensure the reliability and security of technology systems as well as the provision of physical spaces.

Once these 10 dimensions are identified, a model for quality in DE is built on three domains: supportive, pedagogical, and environmental. The three domains are used to categorize and organize the 10 dimensions in a meaningful and efficient manner.

1. *Supportive domain* refers to an assistive quality aspect that helps learners carry out distance learning effectively and efficiently and includes three quality dimensions: faculty support, student support, and information and publicity.

2. *Pedagogical domain* refers to a core quality aspect in DE that helps learners develop and adjust their knowledge, skills, and attitudes both independently and collaboratively and includes four quality dimensions: Course development, teaching and learning, interactive tasks, and evaluation and assessment.

3. *Environmental domain* refers to a contextual quality aspect that creates distance teaching and learning environments where learners work productively and flexibly with high confidence in DE and includes three quality dimensions: Infrastructure, internal QA mechanism, and institutional credibility.

In the model, gender, amongst several learner variables, is considered to be an important variable influencing Asian learners' perception of quality factors in DE as the barriers and supports necessary for successful distance learning are quite different between male and female learners (Bhushan, 2008; Taplin & Jegede, 2001). Figure 1 presents the proposed conceptual model for quality in DE, depicting the relationships between the three domains and the 10 dimensions as well as the gender effect in the perception of quality in DE as perceived by distance learners.

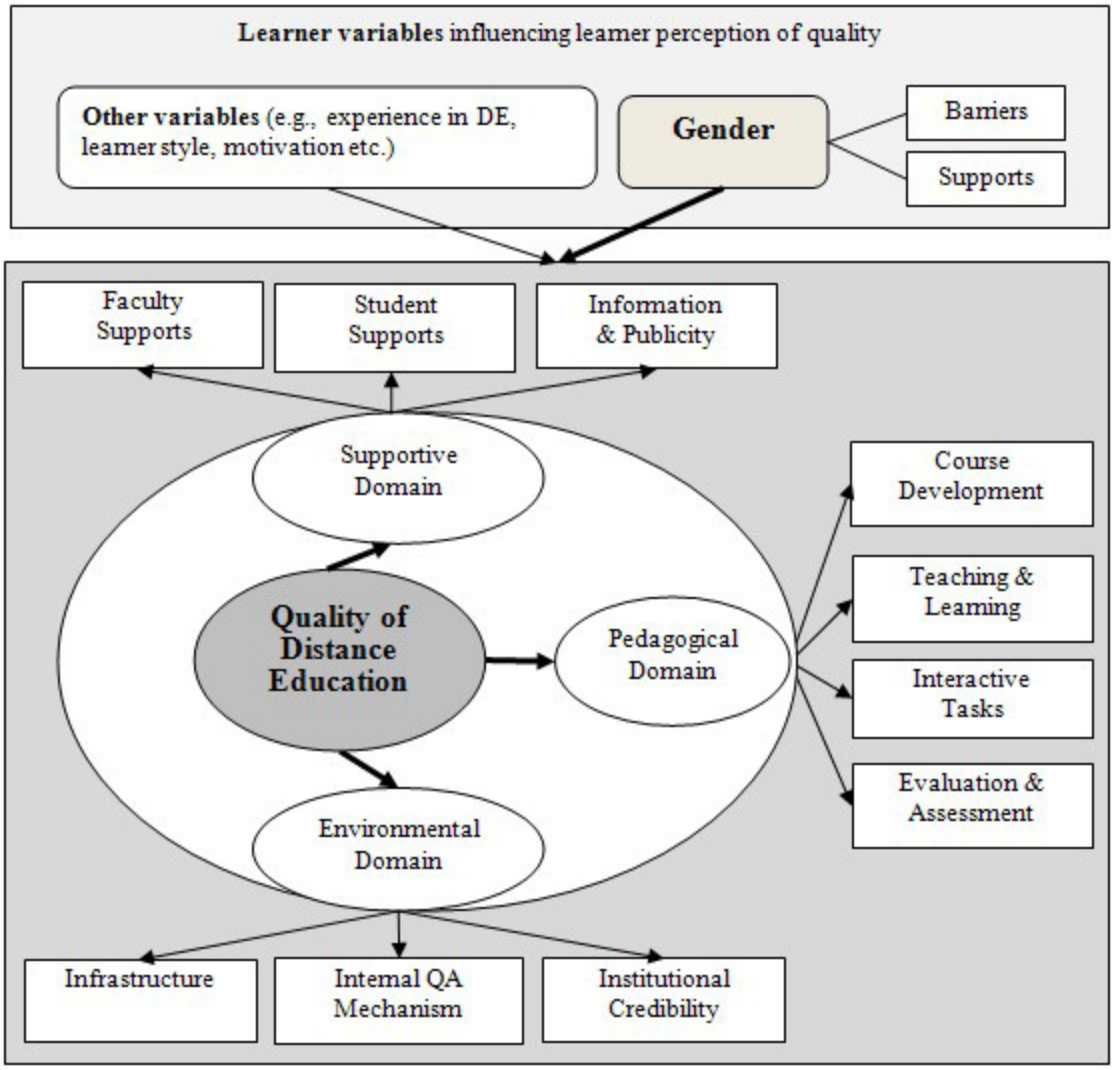

Figure 1. A conceptual model for quality in distance education.

Purpose of the Study

This study aims to (a) evaluate the factor structure underlying this conceptual model at the domain and dimensional levels; (b) identify important quality criteria within each dimension in assuring the quality of DE from the perspective of Asian learners; and (c) discover gender differences in learners' perceptions of quality in DE, learning barriers, and supports. The aim of this is to contribute to a better understanding of the quality dimensions and criteria identified by Asian distance learners and gender differences in such perceptions and to offer Asian DE providers and policy makers practical guidelines on how to integrate learners' perceptions and gender-considerate support strategies into their QA framework.

Methodology

This study was carried out in Asia, which is home to the world's largest number of learners studying at a distance. A survey was employed in the study to collect data from a large number of distance learners scattered across several Asian countries regarding their perceptions of DE quality that could not be directly observed.

Participating Institutions and Respondents

Participating institutions or programs include the following:

- fourteen DE universities, including India's Indira Gandhi National Open University, Indonesia's Universitas Terbuka, Malaysia's Wawasan Open University and Open University Malaysia, Korea's Korea National Open University and Hanyang Cyber University, Japan's Open University in Japan and Cyber University, the Philippines' University of the Philippines Open University, Thailand's Sukhothai Thammathirat Open University, China's Beijing Open University, Renmin University, and Open University Hong Kong, and Pakistan's Virtual University Pakistan;

- seven conventional universities that provide DE programs, including China's Beijing Normal University, Korea's Ewha Womans University, Japan's Kumamoto University and Waseda University, Mongolia University of Science and Technology, Hong Kong Baptist University, and Singapore Institute of Management;

- for-profit companies, including two e-learning providers in Korea (Credu and I-4-You); and

- others, including one Mongolian NGO (Mongolian e-Knowledge) .

The participants from these institutions or programs include individuals who were taking e-learning courses offered by foreign universities, for-profit companies, or community centers at the time of data collection.

A total of 1,665 learners who were enrolled in DE institutions or programs in 11 Asian countries and one territory (China, Japan, Korea, Hong Kong SAR China, Malaysia, Mongolia, India, Indonesia, Pakistan, Philippines, Singapore, and Thailand) participated in this study

between June and October 2010.

Over 45% of the participants came from DE institutions or programs in five of the countries and from the one territory where English was used as a main medium of instruction, 18.5% came from Indonesia, where the number of DE learners has reached 650,000, and about 10% came from Korea, where over 250,000 are DE learners. While we had fewer participants from China and more from Mongolia in proportion to the number of DE learners in each country, a fair distribution of survey participants was achieved overall.

Sixty-four percent of the participants were male students and slightly over 50% were between the ages of 21 and 30. Almost 52% were studying at a local distance teaching university, while 29% were from a DE program offered by a local conventional university. Around 44% were using print as a main medium of learning and almost 21% were studying totally online, while over 72% had basic or advanced experience with DE. These figures seem to reflect features of average Asian adult DE learners, even though the proportion of male participants was a bit higher compared with that of most participating institutions (the most common male-to-female ratio among participating institutions was around 50:50). It is suspected that Internet accessibility for male students may have made it easier for them to participate in the online survey. Thus, caution is needed to interpret the data due to the difference in gender distribution. Table 1 shows demographic features of the participants.

Table 1

Demographic Characteristics of Respondents (*N* = 1,665)

Characteristics	*n*	%	Characteristics	*n*	%
Countries			Age		
China	139	8.3	-20	118	7.1
Japan	89	5.3	21-30	835	50.2
Korea	165	9.9	31-40	377	22.6
Malaysia	101	6.1	41-50	185	11.1
Mongolia	105	6.3	51-60	82	4.9
Indonesia	308	18.5	61-70	13	0.8
Others [a)]	758	45.5	71-	11	0.7
Gender			Missing	44	2.6
Female	591	35.5	DE experience		
Male	1065	64.0	Extensive	233	14.0
Missing	9	0.5	Quite a lot	428	25.7
			Some experience	536	32.2
			Very limited	310	18.6
			None	128	7.7
			Missing	30	1.8

Affiliation		
A local distance university	864	51.9
A distance education course/program offered by a local conventional, campus-based university	481	28.9
A distance education course/program offered by a foreign university	35	2.1
A distance education course/program offered by a for-profit institution/company	28	1.7
A distance education course/program offered by a non-governmental organization	49	2.9
A distance education course/program offered by a community center	18	1.1
A distance education course/program offered by an internal organization	42	2.5
Others	98	5.9
Missing	50	3.0
Major learning method		
Reading textbooks/printed learning materials	729	43.8
Using broadcast programs	138	8.3
Content-based online study	345	20.7
Interactive online study	179	10.8
Face-to-face tutorials	206	12.4
Others	45	2.7
Missing	23	1.4

Note. [a)] DE institutions/programs using English as an instructional medium (Hong Kong SAR, India, Pakistan, Philippines, Singapore, and Thailand)

Survey Instrument

Based on the items confirmed by Jung (2011) and Jung et al. (2011), the initial 55 quality criteria across 10 quality dimensions were identified and refined to gain information about the learners' perceptions of DE quality. This initial list was then reviewed by five DE experts in Asia (India, Japan, Korea, Malaysia, and Thailand) regarding the relevancy and validity of the items for measuring DE quality. As a result of this review process, three items were deleted from the initial 55 because of redundancy, nine were revised for clarity, and five new items were added to reflect the diverse DE situations in Asia. In all, 57 items were included in the final survey. The largest number of items (12 items) was generated in the teaching and learning dimension and the second largest (nine items) in the student support dimension since these dimensions were considered to be the core of DE. In the survey questionnaire, respondents were asked to rate each item's importance in assessing and assuring the "quality" of DE (1 being *lowest*, 5 being *highest*). Additional questions were added to the questionnaire to obtain information regarding learner demographics, institutions, learning methods, study supports, and previous DE experience. In order to identify gender differences in barriers to distance learning and supports received to overcome the barriers, three more questions were asked.

The final English version of the questionnaire was translated into Chinese, Japanese, Kore-

an, Mongolian, and Indonesian by the author and the project team, and one or two bilingual professionals in each country validated each of the respective translations.

Procedure

First, an online survey site was created for the study. Since the study sought responses from distance learners from countries geographically dispersed throughout Asia, and all of the participating institutions used the Internet to communicate with their students, an online survey was believed to be more effective and efficient and better able to achieve large sample sizes. Concurrently, a printed version of the survey was prepared for those who could not access the Internet. Following a general ethics code for research, the survey proposal was reviewed by the Academic Affairs office at the author's university, and an open statement that explained the purpose of the study, the benefits and possible dangers, the voluntary nature of the study, and the contact information was presented on the first page of the survey. Once the online survey site, which included six versions in different languages, was ready, an invitation email was sent out to DE educators teaching various subjects at different types of Asian institutions, including state-funded mega universities, small- and large-scale private DE institutions, DE programs offered by conventional universities, for-profit e-learning companies, and community centers and NGOs that were offering DE courses.

Data Analysis

Multilevel confirmatory factor analysis (MCFA) via structural equation modeling (SEM) was carried out with AMOS 16.0 to address research goals (a) and (b). An independent-sample *t*-test, chi-square tests, and analyses of standardized residuals were conducted to identify gender differences.

Findings

Confirmation of Quality Domains and Dimensions

The results of MCFA confirmed the goodness-of-fit of the conceptual model of quality in DE and revealed that all three domains and all 10 dimensions in the model were important in assuring the quality of DE from the perspective of Asian learners. As seen in Figure 2, standardized coefficients for the three domains were high (.941 for the environmental domain, 1.013 for the pedagogical domain, and 1.021 for the supportive domain), which indicates that all three domains are highly important in assessing quality in DE. In the supportive domain, the student support dimension was the best indicator explaining DE quality. In the pedagogical domain, evaluation and assessment and course development were the two most influential dimensions, each explaining between 83% and 84% of the variance of the domain. In the environmental domain, the infrastructure and institutional credibility dimensions were powerful indicators of DE quality as perceived by the Asian learners, and each explained about 85–86% of the domain's variance.

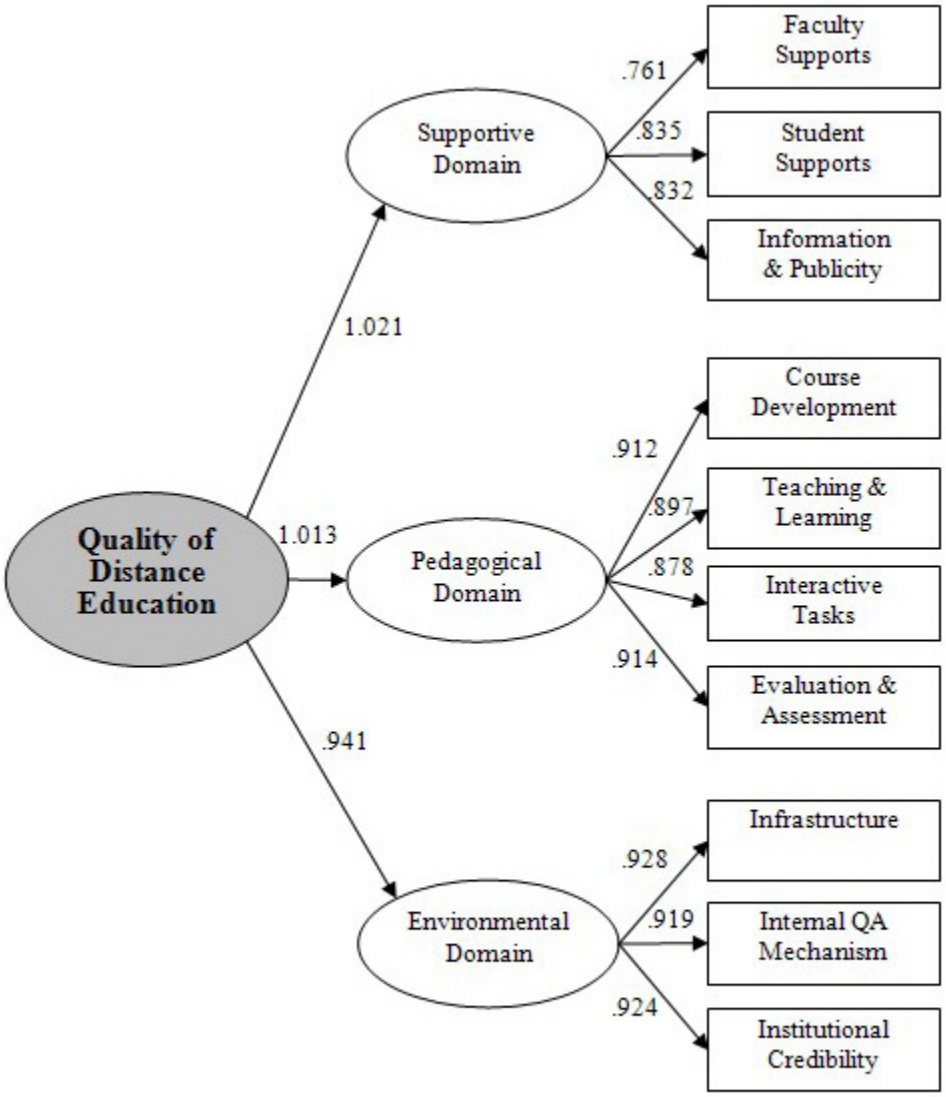

Figure 2. Results of multilevel confirmatory factor analysis.

Several indices were calculated to assess the goodness-of-fit of the model constructed of three domains and 10 dimensions. As Bentler (1990) cautions, the chi-squares (χ^2) statistic is highly sensitive to sample size to the extent that tests involving large samples, such as the one in this study, would generally lead to a rejection of the null hypothesis even if the factor model is appropriate. Thus, in this study, the root mean square error of approximation (RMSEA) was employed because it is less sensitive to sample size and takes into account the complexity of the model and the degrees of freedom. As suggested in Byrne (2001), the RMSEA cutoff was set at .08 or less. Additionally, comparative fit index (CFI) and incremental fit index (IFI) were adopted to assess the fitness of the model. Values of these indices close to 1 indicate a very good fit between the data and the model. RMSEA = .74, CFI = .848, and IFI = .848 were obtained, indicating an acceptable fit of the model to the observed data set.

At the quality criterion or item level, the results revealed that factor loadings varied from .11 (Physical classrooms) to .91 (Providing course information). A low factor loading indicates that an item is perceived not or less important by the participants.

- In the faculty support dimension, "Periodic training" and "Policy and procedures for faculty/tutor/staff selection" appeared to be the two most influential items.
- In the student support dimension, "Social support" and "Psychological support" were the two most important items.
- In the dimension of information and publicity, "Providing course information" was strong.
- In the dimension of course development, "Well-structured course materials" was strong. "Inclusion of video-recorded lectures" was the least influential item, explaining only 38% of the variance.
- In the interactive tasks dimension, "Inclusion of problem/case-based learning activities in courses" appeared to be influential.
- In the teaching and learning dimension, "Flexibility in learning methods" appeared to be influential. Items such as "Face-to-face tutorials," "Informal face-to-face meetings with instructors/tutors," "Informal face-to-face meetings with other students," and "Access to physical library resources" were not as strong in assessing the quality of the dimension, explaining only 26–30% of the variance.
- In the evaluation and assessment dimension, "Fair rubrics for learning assessment" and "Periodic student evaluation of teaching and learning" showed strong influence.
- In the infrastructure dimension, "Reliable media/technology infrastructure" appeared to be the most influential item. The item "Physical classrooms" did not appear to be important in assessing the quality of the infrastructure aspect of DE, explaining only around 1% of the variance.

- In the internal QA mechanism dimension, "Existence of quality standards specifically for DE" appeared to be highly influential.

- Finally, in the institutional credibility dimension, "Strong leadership" was the most important item, while "External accreditation at the national level" was the second most influential item.

Table 2

Factor Loadings for the Items of DE Quality

	Quality Criteria	Factor loading
Dimension 1: Faculty Support		
1	Continuous assistance for faculty	0.83
2	Periodic training for faculty	0.87
3	Policy and procedures for faculty selection	0.88
4	Faculty welfare (e.g., financial aid and health care for faculty)	0.77
Dimension 2: Student Support		
5	Distance learning skills training for students (e.g., how to succeed in DE, how to manage time)	0.74
6	Media/technology support for students (e.g., operating 24/7 help desk)	0.74
7	Social support for students (e.g., encouragement, interpersonal communication with faculty and tutors)	0.79
8	Psychological support for students (e.g., counseling services)	0.78
9	Administrative support for students (e.g., enrollment and admission services)	0.75
10	Guidelines for funding and financial management	0.73
11	Learner welfare (e.g., financial aid and health care for students)	0.69
12	An established appeal mechanism	0.75
13	Flexible payment method	0.66
Dimension 3: Information and Publicity		
14	Providing course information (course objectives, assignments, timelines, study requirements, resources, learning outcomes, etc., for each course)	0.91
15	Providing program/course administration information (admission requirements, tuition fees, technical and assessment requirements, student support services, etc.)	0.86
16	Clear indication of requirements for assignments (due dates, evaluation criteria, etc.)	0.87
Dimension 4: Course Development		
17	Clear guidelines for course development	0.81
18	Inclusion of multimedia components in courses	0.77
19	Well-structured course materials	0.86
20	Inclusion of video-recorded lectures	0.62
21	Course content adaptability to students' needs	0.81
22	Course content adaptability to students' levels	0.78

Dimension 5: Interactive Tasks		
23	Inclusion of collaborative learning activities in courses	0.76
24	Inclusion of individualized learning activities in courses	0.78
25	Inclusion of problem/case-based learning activities in courses	0.83
Dimension 6: Teaching and Learning		
26	Student interaction with instructors/tutors	0.74
27	Student interaction with other students	0.67
28	Asynchronous online interaction (discussion boards, email, etc.)	0.69
29	Synchronous interaction (video conferencing, chat, fixed line telephone/mobile/skype calls, etc.)	0.64
30	Flexibility in learning methods	0.79
31	Flexibility in learning pace	0.75
32	Face-to-face tutorials	0.51
33	Online tutorials	0.67
34	Access to online library resources	0.70
35	Access to physical library resources	0.55
36	Informal face-to-face meetings with instructors/tutors	0.51
37	Informal face-to-face meetings with other students	0.54
Dimension 7: Evaluation and Assessment		
38	Timely feedback to student assignments and questions	0.81
39	Fair rubrics for learning assessment	0.85
40	Periodic student evaluation of teaching and learning	0.85
41	Periodic institutional review of lecturers'/tutors' performance	0.82
42	Feedback from graduates	0.72
43	Feedback from employers	0.60
Dimension 8: Infrastructure		
44	Reliable media/technology infrastructure	0.85
45	Reliable learning management system	0.82
46	Physical classrooms	0.11
47	Media/technology production facilities	0.65
48	Security of student data system	0.71
Dimension 9: Internal QA Mechanism		
49	Existence of quality standards specifically for distance education	0.81
50	Periodic internal evaluation by a distance education institution	0.79
51	Periodic evaluation by external experts	0.69
52	Clear guidelines for quality assurance	0.78
Dimension 10: Institutional Credibility		
53	External accreditation at the national level	0.80
54	International accreditation	0.75
55	Strong leadership	0.81
56	Clear lines of authority in decision making	0.79
57	Qualified faculty/staff	0.74

Gender in Perception of DE Quality

Independent-sample *t*-tests revealed that there were mean differences between the female and male participants in rating the domains and dimensions of DE quality. Tables 3 and 4 show that the female students perceived all three domains and 10 dimensions as being more important in assessing the quality of DE than did the male students.

Table 3

Gender Differences in Perception of DE Quality at Domain Level

	Female			Male					
Quality domain		*SD*	*n*	*M*	*SD*	*n*	*df*	*t*	*p*
Supportive	3.92	0.83	585	3.74	1.00	1044	1627	3.80	.000
Pedagogical	3.87	0.77	586	3.65	0.91	1053	1637	4.86	.000
Environmental	3.94	0.79	588	3.78	0.96	1061	1647	3.60	.000

Table 4

Gender Differences in Perception of DE Quality at Dimension Level

	Female			Male					
Quality dimension	*M*	*SD*	*n*	*M*	*SD*	*n*	*df*	*t*	
Infrastructure	3.89	0.84	588	3.75	0.99	1061	1385.68	3.10	**
Internal QA	3.90	0.96	586	3.73	1.09	1049	1334.38	3.24	**
Credibility	4.02	0.92	587	3.84	1.10	1049	1396.63	3.45	***
Course Development	4.06	0.84	584	3.84	1.07	1050	1453.27	4.56	***
Interactive Tasks	3.77	0.99	577	3.59	1.11	1035	1308.74	3.51	***
Teaching & Learning	3.80	0.84	580	3.58	0.97	1041	1342.82	4.81	***
Information & Publicity	4.14	1.01	573	3.96	1.23	1023	1381.68	3.08	**
Student Support	3.81	0.92	584	3.61	1.06	1041	1349.29	4.07	***
Faculty Support	4.02	1.01	578	3.88	1.23	1032	1399.71	2.50	*
Evaluation & Assessment	3.98	0.93	582	3.78	1.12	1037	1392.99	3.81	***

* $p < .05$, ** $p < .01$, *** $p < .001$

A chi-square test was conducted to see if any gender differences exist in the types of problems experienced or barriers while studying at a distance. For further comparison, an analysis of standardized residuals designed to overcome the problem of different variances among the raw residuals was conducted. In this analytical method, the actual frequencies of each item were compared to the expected frequencies. Table 5 shows that there were

significant gender differences ($\chi^2(9, n = 1632) = 35.870, p = .000$). The analysis of the standardized residuals revealed that "Financial difficulties" was a more serious problem for male students, while "Conflict with family obligation" was more serious for female students. Some open-ended responses regarding concerns among the male and female students also confirmed this result and disclosed that for the male students the social and economic value (e.g., employment, promotion, increased salary, and recognition in society) of the degree earned through DE was another important concern.

Table 5

Gender Differences in Barriers to Distance Learning

	Female	Male	Total
Financial difficulties [a)]	40	124	164
Living far from study centers	48	60	108
Lack of study time	105	158	263
Conflict with other responsibilities at work	164	253	417
Conflict with family obligations [a)]	47	52	99
Inadequate technology environment	24	70	94
Lack of self-motivation to study	70	126	196
Lack of prior knowledge on subjects	37	74	111
Lack of distance learning skills	23	53	76
Other	24	80	104
Total	582	1050	1632

Note. a) Standardized residuals were significant at 5% level.

A chi-square test revealed significant gender differences in important support providers of distance learning, $\chi^2(6, n = 1600) = 12.968, p = .044$ (Table 6). The analysis of standardized residuals revealed that family members were more important support providers for the female students than for the male students, while academic staff and fellow students were equally important for both genders.

Table 6

Gender Differences in Support Providers

	Female	Male	Total
Academic staff	210	379	589
Administrative staff of my institution	16	43	59
Fellow students	106	187	293
Close friends	46	87	133

Family members [a)]	146	205	351
My employer	11	36	47
Other	37	91	128
Total	572	1028	1600

Note. a) Standardized residuals were significant at 5% level.

A chi-square test revealed that there were significant gender differences in supports received during distance learning, $\chi^2(5, n = 1586) = 18.949$, $p = .002$ (Table 7). The analysis of standardized residuals revealed that the male students received more academic support while the female students received more support socially, psychologically, and logistically.

Table 7

Gender Differences in Types of Support Received

	Female	Male	Total
Academic support [a)]	208	557	837
Social/psychological support [a)]	158	209	367
Financial support	48	112	160
Logistical support [a)]	29	39	59
Technical support	32	75	107
Others	20	36	56
Total	567	1019	1586

Note. a) Standardized residuals were significant at 5% level.

Discussion

As de Guzman and Torres (2004) point out, any higher education institution should look at its quality issues from a total quality or systems perspective. Similarly, Ingvarson and Gaffney (2008) argue for the importance of considering and connecting all important components in the educational environment to aid in providing quality learning opportunities for learners. In this study, a conceptual model categorizing 10 dimensions in three domains is suggested to cover a total quality environment for the distance learner.

It is confirmed that the proposed conceptual model is appropriate in explaining Asian distance learners' perception of quality in DE. All three domains and 10 dimensions proposed in the model appear to be important in explaining the quality of DE, and gender, amongst other learner variables, affects learner perception of DE quality. This finding suggests that the conceptual model proposed in Figure 1, along with the quality items presented in Table 2, contributes to an understanding of Asian learners' perception of quality in DE and thus

can be used to review, revise, and elaborate the existing QA frameworks of DE providers in Asia from the learners' perspective.

In the supportive domain, the student support and information and publicity dimensions were quite influential in assessing the quality of the support aspect of DE in the eyes of the Asian learners. In particular, the distance learners perceived a DE institution or program that provides social and psychological supports and clear course information to be of high quality. This finding suggests that DE providers need to explore cost-effective ways of providing demand-driven and learner-centered supports that include detailed information regarding admission, course registration, finances, previous students' opinions, opportunities provided by the program, and employment prospects (Ryan, 2004; Tao, 2008). A one-stop online portal could be a cost-effective referral center to provide technical, administrative, and academic services to DE learners, as suggested by Ryan (2004).

In the pedagogical domain, evaluation and assessment was the most powerful dimension in explaining DE quality. The learners saw fair and clear learning assessment guidelines and periodic students' evaluation of teaching and learning as particularly important. This finding is consistent with previous studies, which highlight the importance of evaluation and assessment in assuring the quality of e-learning (Frydenberg, 2002; Lodzinski & Pawlowski, 2006) in the Western context, as well as with QA guidelines suggested by QA agencies in Asia (Jung et al., 2011), but contradictory to the finding from the study conducted with Korean online learners (Jung, 2011). While further research is needed to resolve this result, it suggests that Asian DE providers must pay attention to the development of detailed measures to assess the quality of their learning evaluation system and to use student evaluations for continuous quality improvement.

The dimension of course development was also influential in assessing the quality of the academic aspect of DE. "Well-structured course materials," "Clear guidelines for course development," and "Course content adaptability to students needs" appeared to be important in explaining the course development dimension, meaning that Asian learners perceive a DE program that provides well-structured course materials that follow clear development procedures and are considerate of learners' needs to be of high quality. This finding confirms the arguments made by Phipps and Merisotis (2000) that quality online courses should be designed with a consistent structure and be adaptable to learners of varying learning needs and styles as well as the arguments made by Parscal and Riemer (2010) that course development guided by pedagogical principles is essential for a quality DE. However, while previous studies (Ho, 2005; Özkul & Aoki, 2006) report Asian learners' preference for videoconference lectures or streaming video lectures, the Asian learners in this study did not agree that the "Inclusion of video-recorded lectures" was significant in assessing the quality of DE. This indicates that, even though the high-context Asian cultures generally value inferences through tone of voice, facial expression, body language, and the status of speakers (Latchem & Jung, 2009), today's Asian learners value DE programs that offer greater flexibility and well-structured content that is adaptable to their needs rather than those that simply post video-recorded lectures on the Internet. Asian DE providers

need to make an effort to develop well-structured course materials and at the same time allow students to choose course content and/or activities that are adaptable to their needs and learning conditions.

Pedagogical aspects such as teaching and learning and interactive tasks were found to be slightly less important compared with course development and evaluation and assessment but still powerful in measuring the quality of DE. As evidenced in several previous studies (Jung, 2011; Selim, 2007; Sun, Tsai, Finger, Chen, & Yeh, 2008), this finding also suggests that Asian DE providers should offer opportunities for learner-learner and learner-instructor interaction and real-world problem-based activities via both asynchronous and synchronous technologies. Such approaches can present greater opportunities for some passive Asian learners to engage in active and higher order learning. Recent Web development, including Web 2.0 technology, permits interaction and collaboration through weblogs, social networking sites, wikis, podcasts, and so on. All of these offer new educational possibilities, although they also raise issues of copyright, intellectual property, and the trustworthiness and authority of user-created content.

In the environmental domain, infrastructure appeared to be most important in assessing the quality of DE. Items such as "Reliable media/technology infrastructure," "Reliable learning management system," and "Security of student data system" registered strongly in explaining the infrastructure dimension. But "Physical classrooms" did not appear to be important at all in assessing the quality of DE. This finding highlights the importance for DE providers to ensure that dependable technology infrastructure is in place and to consider combining analogue and digital technologies as much of Asia is still constrained by limited infrastructure and skills, high costs, and slow Internet speeds (Baggaley, 2007).

The internal QA mechanism and institutional credibility dimensions also appeared to be influential in assessing the quality of DE, which was supported in Jung (2011) in the context of South Korea. "Existence of quality standards specifically for DE" appeared to be highly influential in explaining the internal QA mechanism dimension, and "Strong leadership" and "External accreditation at the national level" were the two most important items in explaining the institutional credibility dimension. As mentioned by several DE educators and researchers, including D'Antoni and Mugridge (2004), there has been a constant struggle for parity of esteem in DE. This study shows that in the eyes of the Asian learners both institutionalization of an internal QA system under strong leadership and recognition by external accreditation agencies are instrumental to securing parity of esteem. Asian DE providers need to develop the necessary policies and procedures for both internal and external QA together with the external QA and accreditation agencies.

Gender differences in the perception of quality in DE suggest a need for considering these differences in developing, delivering, and supporting DE. The study revealed that the female students, compared with the male students, perceived all quality domains and dimensions as being more important in evaluating DE quality. In addition, gender differences were found in the perceived barriers to and support for DE. These findings imply that even though DE has contributed to widening access to education and reducing the gender dis-

parity in education, there still exists a lack of gender-considerate supports in Asian DE. "Conflict with family obligation" appeared to be the most serious barrier that the female learners faced, and family members were more important support providers for the female students than for the male students. This finding confirms Taplin's (2000) conclusion that personal or family problems, including difficulties with caring for young children and difficulties with getting course materials in time to complete assignments or examinations, were the major problems for female students who were considering dropping out of their DE programs. Perhaps this is why the Asian female students received more support socially, psychologically, and logistically than they did academically.

There is no doubt that DE has broadened opportunities for underprivileged or marginalized people—women and girls in particular—to access education. In Asia, female enrolment in most mega and dedicated distance teaching universities is over 50% (e.g., 70% in the Korea National Open University and around 50% in the Open University System of China). However, in newly established e-learning institutions, female enrolment is lower, ranging from around 25% to 60% (e.g., 26% in the Virtual University of Pakistan and 58% in Korea's Hanyang Cyber University), which may be explained by difficulties with technology access as noted in Bhushan (2008) or higher tuition costs in those e-learning institutions, which are mostly private. Green and Trevor-Deutsch (2002) observe that Asian women in DE face barriers when the course content is not directly relevant to their livelihood; when it does not value their knowledge, wisdom, and experience; when access to the content is too costly; and when they do not feel able to use the technology competently or confidently, which is supported by case studies that detailed how Asian female distance learners had overcome frustrations and succeeded in their learning (Kanwar & Taplin, 2001). For female learners, quality DE may mean a system that breaks down these barriers, that maximizes opportunity, and that is based on an understanding of their perceptions, concerns, and experiences, as Von Prümmer (2000) argues. The findings of the study suggest that Asian DE providers should consider these gender differences when designing their courses and support systems. For instance, social and psychological support that addresses issues of managing role conflicts and allocating focused time periods to accomplish learning tasks needs to be included in a support system for female learners.

Conclusion

With the competitive expansion of DE in Asia, Asian DE institutions must prove the quality of their courses, teaching, learning, and management systems for national and international accreditation. This increases their awareness of and responsiveness to the views and opinions of various stakeholders—not least of which are learners.

The conceptual model proposed and validated in the present study may contribute to a better understanding of Asian distance learners' views on the quality of DE and offer a theoretical basis in examining distance learners' perceptions in other regions. It can also serve as a framework for Asian DE providers and policy makers to integrate learners' perceptions into existing QA systems in DE since their views highlight important quality areas that are

not always reflected in the providers' QA guidelines. In addition, it can be used to identify weak areas in DE operations from the learner's point of view and suggest effective strategies for improving learner experience in DE. Further research is needed to investigate what specific strategies are effective in improving the quality of DE in general and the quality of learner experience specifically.

The study also leads us to the conclusion that Asian DE providers should consider gender differences when designing a learner support system. Some gender-considerate support strategies suggested in the study include offering flexible schedules that help distance learners, especially females, avoid time conflicts with other responsibilities in taking exams and attending face-to-face meetings, setting up virtual or face-to-face office hours to provide academic or learning content-related support to distance learners, offering both personalized counseling and tutoring services, especially to female students, and taking advantage of online technologies in providing such services, and providing information, especially to male students, on the values of degrees earned through DE based on policies and factual evidence.

One caveat of this study is that it combined all of the responses from the 11 Asian countries and one territory included and was not considerate of each country's differences in terms of culture and DE systems. Therefore, the results of the study may not be applicable to each Asian country since great diversities with regard to learning culture, DE policies and development, technology infrastructure, support systems, and pedagogies exist throughout Asia. Even though the conceptual model included the existence of variables other than gender that might affect the perception of Asian DE learning, this study did not consider other learner variables, such as individual learning styles, preferences, and motivations, that may play important roles in the way learners feel, interact, and learn in DE and will clearly influence their assessment of the quality of such experiences. The design of the DE environment can also affect learners' views on DE quality. Further research into these variables is needed.

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Are Online Learners Frustrated with Collaborative Learning Experiences?


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Abstract

Online education increasingly puts emphasis on collaborative learning methods. Despite the pedagogical advantages of collaborative learning, online learners can perceive collaborative learning activities as frustrating experiences. The purpose of this study was to characterize the feelings of frustration as a negative emotion among online learners engaged in online computer-supported collaborative learning (CSCL) experiences and, moreover, to identify the sources to which the learners attribute their frustration. With this aim, a questionnaire was designed to obtain data from a sample of online learners participating in the Master of ICT and Education program of the Universitat Oberta de Catalunya (UOC). Results revealed that frustration is a common feeling among students involved in online collaborative learning experiences. The perception of an asymmetric collaboration among the teammates was identified by the students as the most important source of frustration. Online learners also identified difficulties related to group organization, the lack of shared goals among the team members, the imbalance in the level of commitment and quality of the individual contributions, the excess time spent on the online CSCL tasks, the imbalance between the individual and collective grades, and difficulties in communication, among other factors leading to frustration. The analysis of the students' sources of frustration in online CSCL is followed by a list of recommendations to the distance education stakeholders, aiming to reduce students' frustration and improve the quality of their experiences in online CSCL contexts such as the UOC.

Keywords: E-learning; collaborative learning; computer-supported collaborative learning; learning experience; frustration

Introduction

Online learning programs are growing at exponential rates (Allen & Seaman, 2007; Bishop & Spake, 2003; Kariya, 2003), and most of their participants are adult learners (Kuenzi, 2005). The design of learning experiences within these online programs is also evolving. Quality requirements of higher education and the need for the assurance of learning outcomes are increasing the challenges with which online universities are faced. In order to meet these challenges, virtual campuses are promoting learning methodologies that prioritize learning "through interactions among students" (Stahl, Koschmann, & Suthers, 2006, p. 2) and contribute to the development and practice of teamwork competencies. While early online programs focused mainly on the transmission and mastery of bodies of information, more emphasis has been placed on collaborative methods in recent years (Bruffee, 1999; Dirkx & Smith, 2004), examples of which are case studies, problem-based learning, and the development of learning communities in online contexts. According to Dirkx and Smith (2004), in theory, online collaborative activities could be considered as the key to this new learning paradigm. Despite this, they stress that learners' perceptions and experiences could generate a profound sense of ambivalence when learning and working in a group. While many participants laud the opportunity to interact and work with fellow group members, they clearly find consensus decision making and production of a product much less satisfying (Baltes, Dickson, Sherman, Bauer, & LaGanke, 2002; Dirkx & Smith, 2004). Difficulties with interpersonal issues and trying to ensure that all group members do their share seem to cloud their initial enthusiasm. In addition, communication and interaction limitations caused by technology (Ragoonaden & Bordeleau, 2000; Ng, 2001) only serve to exacerbate these concerns, which then become a channel for frustrations.

In the next section, we introduce the concept of frustration in online computer-supported collaborative learning (CSCL). Then we provide an explanation of the methodology designed to analyze the frustration among a group of online learners in the Universitat Oberta de Catalunya's (UOC) virtual campus.

Frustration with Online CSCL

In learning contexts, students do report experiencing a range of emotions, and frustration is one of the negative emotions they deal with (Do & Schallert, 2004; Pekrun, Goetz, Titz, & Perry, 2002). Despite the advantages reported in literature about collaborative learning methodologies in terms of social and psychological benefits (Panitz, 2001; Roberts, 2005), students engaged in collaborative learning activities can feel a high level of frustration.

According to Mandler (1975), frustration can be defined as a negative emotion aroused upon encountering an obstacle in the achievement of a task, goal, or expectation, or in satisfying one's needs. Frustration is a concept related to goal attainment (Lazar, Jones, Bessiere, Ceaparu, & Shneiderman, 2004). People may feel frustrated when they are deprived of their expectations or are not able to complete their plans (Handa, 2003; Mandler, 1975). Frustration is one of the most commonly mentioned negative emotions associated with studying online. Recent studies have described emotional and motivational experiences students encountered during computer-supported learning projects (Hyvönen, 2001), which can

also cause negative effects (Artino & Stephens, 2007; Artino, 2008; Hickey, Moore, & Pellegrino, 2001; Järvenoja & Järvelä, 2005; Sierpinska, Bobos, & Knipping, 2008). In particular, some computer-supported collaborative learning environments may interfere with students' willingness to engage in the project. They may also experience stress and frustration in collaborating with people they do not know well (Curtis & Lawson, 2001).

In CSCL, the success and efficiency of the collaboration cannot be taken for granted (Dirkx & Smith, 2004; Järvenoja & Järvelä, 2009; Kreijns, Kirschner, & Jochems, 2002). In some cases, CSCL experiences may also evoke negative emotions and create new challenges for motivation when people experience conflict with their own characteristics, objectives, and requirements. Student frustration can be caused by internal or external factors (Bessiere, Newhagen, Robinson, & Shneiderman, 2006), and it can adversely affect a student's learning experiences. The consequences of student frustration (Borges, 2005) can generate a load that has to be borne by all the agents involved in the learning experiences: students, teachers, and institutions. Finally, disillusionment and frustration can lead students to abandon their studies and leave the institution (Conrad, 2002).

In online CSCL, students' frustration could be considered as the intersection of the frustration involved with both collaborative learning and online education. The specific sources of frustration in online CSCL are related to the delay of the interactions and feedback (Hara & Kling, 1999; Vonderwell, 2003), to time pressure (Goold, Craig, & Coldwell, 2008), to time zone differences (Grinter, Herbsleb, & Perry, 1999; Romero, 2006, 2010) and to the reduced level of cues within the social activity and context (Rettie, 2003; Sallnäs, 2004).

Objectives

Despite the identification of factors leading to online CSCL frustration, as previously referred to, only a few studies have addressed students' negative emotions such as frustration. Moreover, we have not identified studies focused on specifying the sources of student frustration in the online CSCL context. Considering the relevance of the well-being of students during their online learning experience, this research aims to estimate the magnitude of the phenomenon of frustration among students involved in online CSCL, with the sources of frustration being identified by the students themselves.

Context and Methodology

To study online CSCL frustration factors, we considered the analysis of a situated task at the Universitat Oberta de Catalunya's (UOC) virtual campus. The consideration of an authentic context aims to preserve the conditions that could lead to sources of frustration.

First, we will introduce the online CSCL context and its participants as well as the characteristics of the collaborative learning activities at the UOC's virtual campus. Then we will introduce the methodology for the analysis of the students' frustration perception in this real context.

Participants

The study was conducted on a group of students (N = 40) enrolled in the university's master's degree program on e-learning at the UOC's virtual campus during the second semester of the 2010–2011 academic year. The students were adults whose average age was 37 (SD = 8.91). There was a higher representation of females (n = 30) than males (n = 10). None of the participants were freshman, and most of them had completed at least three semesters at the UOC's virtual campus (SD = 1.03).

UOC's Pedagogical Model and the Online CSCL Tasks

The master's degree program follows the UOC's educational model (Sangrà, 2002), which is oriented toward collective participation and knowledge building from an interdisciplinary plan and is open to student-oriented learning and social and working experience. The UOC is committed to collaborative learning through methodologies that require resolving problems, project development participation, combined product creation, discussion, and enquiry.

During the master's program, the students were engaged in various collaborative learning activities in different courses simultaneously. The online CSCL tasks had a general duration of several weeks (between two and four weeks), and the groups were composed of four to six students for the development of the task. The online CSCL activities were to be developed in the UOC's virtual campus, and the interactions among the students were carried out in text-based tools, primarily through a discussion forum and email. The task concerned the collaborative writing of papers, where the students should develop a topic or solve a case study.

Online Collaborative Learning Experiences Frustration Questionnaire (OCLEFQ)

Educational research on subjective measures, such as emotions, uses both qualitative and quantitative approaches (Schutz & Pekrun, 2007), with a predominance of self-reported measures (Larsen & Fredrickson, 1999), learner log files, and online messages as data sources for analysis (Shih, Feng, & Tsai, 2008). Considering the lack of previous studies in the field of frustration characterization in online collaborative learning, we based the data collection on the students' declarations by creating an ad hoc survey that we named *Online Collaborative Learning Experiences Frustration Questionnaire* (OCLEFQ). The OCLEFQ was designed with the objective of identifying the sources of frustration of online learners in CSCL. The literature review has provided the background for studying the dimensions, categories, and conceptual elements needed to develop a set of variables and guidelines for the construction of the items.

After taking all of this into account, we designed the OCLEFQ and divided it into six sections.

Section 1 is composed of questions related to the learning and the learners' situation. It is used to obtain demographic information regarding the learner's gender, age, number of se-

mesters completed, number of courses per semester, and the time dedicated to the master's program.

Sections 2 and 3 aimed to collect information about the students' prior experiences in online collaborative learning and their attitudes and conceptions about teamwork.

In section 4, subjects were requested to report their own frustrating experiences through an open question wherein the students could describe their online collaborative learning experience in their master's program. The data collected from this section helped to develop an understanding about the personal experiences of the participants and their conceptions about online collaborative learning.

Section 5 was designed to focus on sources of frustration in order to determine if there were differences between results reported by students' own experiences and those that were observed by others. To address this concern, our assessment strategy used rating scales. The four themes that structured and organized this section were the four dimensions identified by Dillenbourg (1999) that must be considered in an experience expected to be collaborative: the learning situation, the interactions, the processes, and the effects.

Section 6 consisted of six questions that assessed how frustrated the individual was (level and frequency of variables) and how this frustration affected his perception of participating in appropriate training that would satisfy his personal and professional ambitions (affect variable).

To measure accurately beliefs and feelings of participants a total of 37 closed-ended and one open-ended question were considered in the six sections. The closed-ended questions in the questionnaire were multiple choice (used to gather demographic information) and interval scale questions (when a feeling, an attitude, or an agreement level had to be measured). An open-ended question was used to gain insight into how the respondent felt. To further enhance validity, the presentation of discrepant information was used to provide a full account of the responses (Creswell, 2003) and was implemented in multiple items.

Reliability was tackled by placing emphasis on the target audience and taking ethics into account (Dillman & Bowker, 2001) and included questions designed to be response-friendly (Dillman, Tortora, & Bowker, 2001) to maintain certain standards of quality, accessibility, and usability.

Students attending the master's program were invited to participate in the study via email. Each invitation provided an overview of the research and an explanation of how to access the online survey.

Results

First, the results section introduces the characterization of the feeling of frustration among the students involved in online CSCL at the UOC's virtual campus. Afterwards, the potential

sources of frustration are introduced.

Characterization of Frustration in Online CSCL

In this section, we estimated the magnitude of the phenomenon of frustration among students when involved in online collaborative learning experiences. The mean score for the level of frustration fell on a moderate level (M = 3.15, SD = 1.14). The largest number of scores fell also on a moderate level of frustration at 30% (n = 12), followed by a high level at 27.5% (n = 11). A low level received 22.5% (n = 9), and a very high range was 12.5% (n = 5). A very low level accounted for 7.5% (n = 3) of all the scores. The results of multiple regressions between levels of frustration as the criterion variable and each of the demographic variables found correlations of significance for attitude.

Focusing on the frustration perception of the online CSCL learners, the mean score (M = 2.58, SD = 1.2) indicated that, overall, respondents occasionally felt frustrated. The largest percentage of responses (40%, n = 16) rarely feel frustrated, and 17.5% (n = 7) of all responses, very rarely. However, 7.5% (n = 3) of the responses and 17.5% (n = 7) of the responses were very frequently and frequently frustrated.

The results of multiple regressions to find out if a relationship existed between frequency of frustration as the criterion variable and each of the demographic variables as predictors found no correlations of significance.

Scores for frustration with regard to the perception of participating in an appropriate and satisfying training program showed that the majority of respondents (45%, n = 18) felt little affect. The mean score was also at this rate (M = 2.10, SD = 1.01). Participants who had perceived no affect were 30% (n = 12) of scores. Scores for those who felt quite affected accounted for 15% (n = 10) of the scores, while the neutral position accounted for 10% (n = 4) of scores. None of the participants responded that they felt very affected. The results of multiple regressions between affect of frustration as the criterion variable and each of the demographic variables as predictors found a correlation of significance for attitude.

The bivariate correlation was used to explore the relationships among the three frustration variables. The results showed that there were significant, positive correlations for level and frequency, r (40) = .535, p < .05; frequency and affect, r (40) = .462, p < .003; and level and affect, r (40) = .431, p < .005.

Sources of Frustration in Online CSCL

To identify potential sources of frustration, qualitative data from the open-ended question and quantitative data, based on items from section 5, were used. All participants (N = 40) provided comments about factors believed to affect the quality of their own online collaborative learning experiences. As shown in the results in Figure 1, the sources of frustration that emerged from the responses to the Online Collaborative Learning Experiences Frustration Questionnaire (OCLEFQ) were (a) imbalance in the level of commitment, responsibility, and effort, 57.5% (n = 23); (b) unshared goals and difficulties in organization, 22.5% (n = 9); (c) difficulties in communication/dialogue in terms of frequency, 20% (n =

8); (d) problems with negotiation skills, 17.5% (n = 7); (e) imbalance in quality of individual contributions, 15% (n = 6); (f) excess of time spent and workload, 15% (n = 6); (g) conflict and problems in reaching consensus, 15% (n = 6); (h) imbalance between individual expected mark and group mark, 10% (n = 4); (i) misunderstandings 5% (n = 2); and (j) lack of instructor's support/orientation, 5% (n = 2).

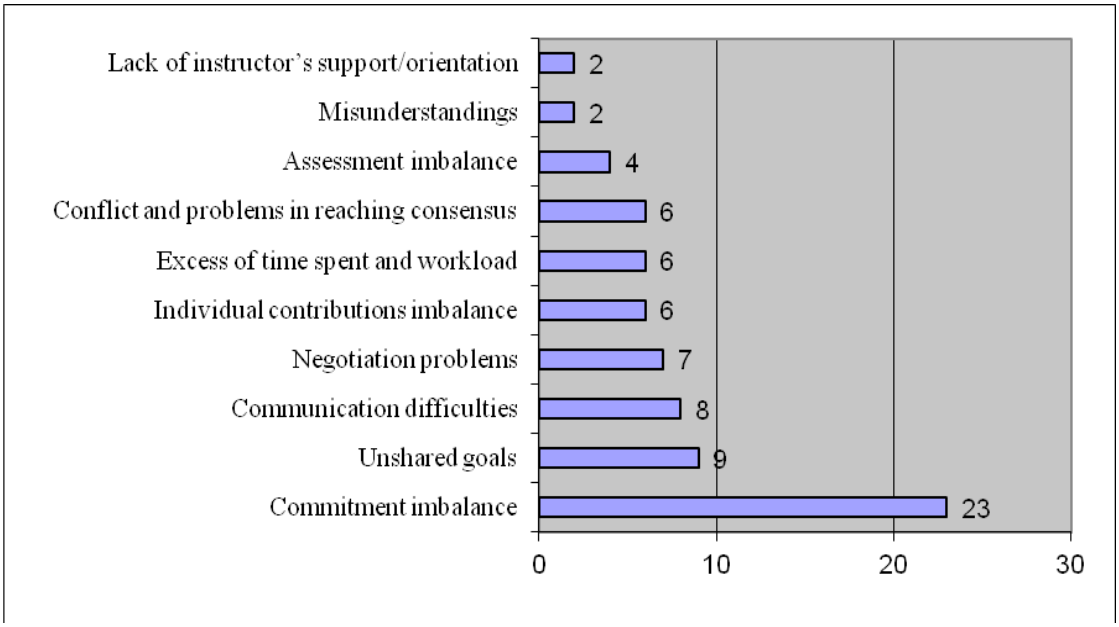

Figure 1. Students' sources of frustration in online CSCL.

Examples related to unshared goals included responses, as with participant number 7, such as, "There are differences in the objectives to be achieved by members of the group." Furthermore, participant number 35 pointed out, "Some people just want to pass courses while some others only want to be the best one." Participant number 16 mentioned difficulties with group organization: "It's difficult to coordinate among group members. Someone does the entire job a week in advance, and someone else prefers to do it at the very last day."

Mentions of imbalance in the level of commitment, responsibility, and effort were the most numerous. Often there are members of the group who do not actively participate or are totally absent, as found by participant number 3. In the experience of participant number 13:, "Sometimes I run into someone whose contribution was almost nothing. When that happens, I tend to do more than I can, to compensate, and this makes me feel nervous, causes some discomfort and feeling of injustice." The figure of the free rider is also mentioned by participant number 15: "There are people who want someone to take the lead and do all the work; that is totally opposite of what collaborative work is meant to be." Participant number 36 said, "People who do not work too much are interested in working with people who want to do everything." Some responses pointed to the imbalance of quality of contri-

butions to the task as a source of frustration. For example, participant number 38 states: "I feel frustrated when I work with people who are more competent than me and I become more and more aware of not being at their level."

According to participant number 13, "Working in a group means to depend all the time on members' messages, communications, and timing." This situation led participant number 22 to feel frustrated about workload and having no time to breathe.

Problems with negotiation skills also account for sources of frustration, as mentioned by participant number 35: "It is a pity that there are people who are intolerant with others' opinions and who have no intention on reaching any consensus. The only thing they want it is to be obeyed." Conflict and problems in reaching consensus is one of the sources of frustration, as participant number 32 manifests: "There was not a good feeling between us because our points of view were extremely different and nobody was able to give in to reach consensus." Participant 30 describes frustration related to a focus only on results, specifically on the marks obtained: "Assessment focuses only on the final product, and individual participation was not taken into account. There are always people that take advantage of this."

Finally, a new source of frustration was found: the instructor role. In this case, participant 31 thinks that the instructors never interact with the group, and participant number 26 feels frustrated because of a lack of any type of orientation or guidance.

The descriptive analysis of nine quantitative variables were used to confirm the findings of the qualitative analysis: unshared goals/difficulties in organization; imbalance in the level of commitment, responsibility, and effort; imbalance in quality of individual contributions; excess of time spent and workload; problems with conversation skills; difficulties in communication/dialogue in terms of frequency; misunderstandings; conflict and problems in reaching consensus; and imbalance between individual expected mark and group mark.

Discussion

The purpose of this study was to explore the phenomenon of frustration among students involved in online collaborative learning experiences. We aimed to advance knowledge about the characterization of the frustration experienced by e-learners in online CSCL and identify the sources of frustration that may affect the quality of these experiences from a learner-centered point of view. First, we will discuss the characterization of frustration in this study then we will analyze the factors related to this frustration. We will conclude this section by introducing the main research prospects of this exploratory study on online CSCL frustration.

Characterization of Frustration in Online CSCL

Frustration is a common phenomenon among students involved in online collaborative learning experiences, according to the literature review previously introduced. In the context of the UOC's master's degree program, data indicated that the students deal with frus-

trating experiences sporadically (40%), and when this occurs it adversely affects students' emotions and learning experiences at a level between moderate (30%) and high (27%). This illuminates the fact that students deal with frustrating experiences sporadically, and a significant portion associates this with a high level of frustration towards the online CSCL experience.

Despite the initial consideration, the analysis of the students' self-reported declarations does not reveal any significant impact on student satisfaction related to the master's program. The majority of respondents (45%) felt little affect and had a positive perception with regard to participating in an appropriate and satisfying training program. This could be explained by data results that presented medium correlations through level, frequency, and affect frustration variables. Affect would increase in accordance with frequency and level of frustrating online collaborative learning experiences, but these experiences are only part of the whole learning experience in which students participate.

Attitude was the only demographic variable found to be a significant predictor of frustration. This finding is consistent with previous studies (Dirkx & Smith, 2004; Roberts, 2005) that suggest that prior experiences and attitudes would affect an individual level of frustration. Some students coming to online collaborative learning for the first time do not care for the idea of group work and can be apathetic or even on occasion actively hostile to the whole idea (Roberts & McInnerney, 2007). Students struggle with the development of a sense of interdependence and intersubjectivity with their online groups (Lushyn & Kennedy, 2000) but end up holding fast to subjective, individualistic conceptions of learning.

Sources of Frustration in Online CSCL

Participants in the study provided data about their own frustrating experiences and reported that when individuals were unwilling to participate or only minimally contributed to the activity, frustration appeared. A common frustrating experience was associated with a poor work ethic and with some members who did not fulfill their obligations. Creating more work for the other members in the group is the direct consequence. Mentions of 57.5% (n = 23) of participants have proved the imbalance in the level of commitment, responsibility, and effort to be the major source of frustration related to the task category and the CSCL experiences in general. This finding was confirmed by the main score for the related quantitative variable that shows agreement. It is also consistent with other studies that found that one or more students often end up taking responsibility for completing the work, whether they want to or not (Burdett & Hastie, 2009; Mills, 2003). In some cases, these leaders may be encouraged to do more by other members in the group, and greater responsibility and workload is the result (Payne & Monk-Turner, 2006). Social loafing behavior creates an imbalance of effort and participation (Goold, Craig, & Coldwell, 2008), such that *free riders* (Kerr & Bruun, 1983) are able to take advantage of the contributions of others.

Having unshared goals among the teammates of the group is the second most important factor, considered by 22.5% of the respondents. This finding is confirmed by the mean score from the quantitative analysis, which was in agreement, as well as by related literature. As the teacher role is de-authorized, group members are encouraged to assume responsibility

for their own structure and direction and demonstrate their development by creating their own goals, guidelines, and rules (Wheelan, 1994). Establishing common goals is part of the construction of common grounds since actions cannot be interpreted without referring to (shared) goals, and, reciprocally, goal discrepancies are often revealed through disagreement on action (Dillenbourg, 1999).

Qualitative analysis revealed difficulties with regard to communication as another source of frustration. Communication was reported to be essential in keeping group members focused on their responsibilities in relation to the common goal; further, a lack of communication prevented groups from clarifying goals, roles, and other group functions. A total of 45% of participants agreed that conversations are often characterized by multiple and somewhat schizophrenic patterns of interaction. This is a confirmation of existing research (Dirkx & Smith, 2004), which finds that students' perspectives and schema of group acquired from face-to-face groups are not appropriate for technologically mediated environments. There are often time lapses between contributions in asynchronous discussions (McConnell, 2000). Spatial and time distances are potential barriers that reduce the probability of spontaneous communication (Grinter, Herbsleb, & Perry, 1999; Romero, 2010; Saunders, Van Slyke, & Vogel, 2004), and the lack of connection, contact and sense of reality, and immediate social presence are strong influences as well as the sense of community (Melrose & Bergeron, 2006; Rettie, 2003, Sallnäs, 2004). Thus, a lack of nonverbal communication cues and a lack of spontaneity serve only to add to participants' ambivalence and uncertainty about the value of their learning (Ragoonaden & Bordeleau, 2000).

The fourth position in sources of frustration, registering with 17.5% of the participants, is related to problems with negotiation skills. Reponses mentioned a lack of member attributes that foster relationship building, such as amiability, openness, and respect for others. Frustration generated by the quality of communication in the group discussions confirms reports (Kreijns, Kirschner, Jochems, & Buuren, 2004) that identified a connection between quality negotiation skills and a sense of the development and maintenance of a mutual commitment to a common goal. Skill in learning collaboratively means knowing when and how to question, inform, and motivate one's teammates, knowing how to mediate and facilitate conversation, and knowing how to deal with conflicting opinions (McManus & Aiken, 1995).

A total of 15% of participants agreed that the imbalance in quality of individual contributions leads to frustration. There is no situation of pure knowledge or skills or development symmetry: There are no two individuals in the world with the same knowledge (Dillenbourg, 1999). Distributing the knowledge needed to accomplish a task may have the effect of distributing task roles, creating a local expert effect in which each student independently applies his or her knowledge (Stasser, 1999). When this happens, it may inhibit the group's ability to collaboratively construct new knowledge. The participants in the study reported feeling frustrated by the presence of an expert and dominant member who impeded the development of shared understanding and effort.

Student frustration and conflict often seem linked to uneven sharing of workload in group

assignments. Most group projects require extra time (Goold, Craig, & Coldwell, 2008), and groups must take responsibility for organizing their collaboration and individual inputs (Lizzio & Wilson, 2005). Students, in their desire to work on their own (Ragoonaden & Bordeleau, 2000), are often resentful of the time required to work in a small group because groups seem to always be meeting (McConnell, 2000). The 15% of participatants mentioning frustration related to workload and excess of time needed to work collaboratively confirmed these studies.

A total of 10% of the students reported, like Boud, Cohen, and Sampson (1999), the assessment of individuals within the group to be one of the major sources of complaint. Individual contributions, or lack thereof, of group members may not be acknowledged in the group mark awarded (Sharp, 2006). Assigning group grades without attempting to distinguish between individual members of the group is both unfair and deleterious to learning and may in some circumstances even be illegal (Kagan, 1997; Millis & Cottell, 1998).

Consensus is critical to the collaborative process (Crook, 1994) because it is only through consensus that members of the group are required to listen, understand, and finally accept the points of view of fellow group members. Mentions of frustration of 15% of participants are related to conflicts and problems in reaching consensus, but they were not confirmed by the quantitative analysis; as a result, this study will not consider it as a critical factor.

Finally, 10% of students considered the instructor role to be a source of frustration, which was not revealed in the pilot study. Instructor inaction was a frustrating factor that was reported as undermining the collaborative process, especially when an instructor is made aware of a problem but does not take any corrective actions. Participants expected the instructors to be actively engaged with learners, providing them with clear guidance, expectations, and requirements. This finding confirms that students expected consistent and timely feedback from the instructor (Vonderwell, 2003) and identified the lack of immediate interaction as a major source of frustration because they were concerned about their performance (Hara & Kling, 1999).

Educational Implications of Students' Frustration in Online CSCL

Findings from this study provided more understanding of the phenomenon of frustration, as well as the needs and requirements of students in online collaborative experiences. Based on these findings, in this section we will provide recommendations for distance education stakeholders to consider at the institutional level, the instructional design level, and the students' level.

First, there is a need at the institutional level to offer the students information about the learning models in general, and the online CSCL activities specifically, in order to allow them to adjust their expectations, preferences, and decision making concerning their enrolment in distance learning programs involving online CSCL activities. Moreover, online universities should explain the interest and objectives of online CSCL activities to the incoming students and provide an introduction to online CSCL and teamwork competencies.

In our study, we observed that the students' main source of self-declared frustration is the teammates' commitment imbalance. Preparing the learner for collaboration through instruction and development of the social and group skills necessary to work effectively in a group will have a positive effect upon the collaborative experience (Chapman & van Auken, 2001; Tideswell, 2004). The main implication for students is the need to have realistic expectations and exercise responsibility in course enrollment by ascertaining beforehand the time, effort, prior knowledge, volume, and quality of work required to carry out online CSCL. The students may struggle with the development of a sense of interdependence and intersubjectivity (Lushyn & Kennedy, 2000) and must abandon subjective, individualistic conceptions of learning (Dirkx & Smith, 2004). From the instructional perspective, we think that the online CSCL activities should be designed with the aim of guaranteeing a certain level of positive interdependence (Johnson & Johnson, 1998) and individual accountability (Slavin, 1989) to the students.

The analysis of student frustration in our study also shows that assessment inequities are important sources of frustration; the implication for institutions is that they must conduct a coherent assessment. The use of individual, self, peer, and group assessment techniques can be extremely beneficial for both students and instructors in all forms of online collaborative learning (Roberts, 2005).

Institutions may supply learning environments that facilitate social interaction and collaboration and assure effective support to students with technological difficulties. Technological difficulties can cause student frustration as well as communication problems, which in return hamper collaborative processes such as explanations, sharing answers, and negotiation (Ragoonaden & Bordeleau, 2000).

The implication for instructors is that it is improtant to to know when intervention is needed in online CSCL and to what degree. Teachers with instructional and student experience in online CSCL (having completed at least one course) will be aware of sources of frustration and will take corrective actions. The instructor should play an active role in the collaborative process. He or she should be proactive in monitoring and intervening in collaborative activities (Chapman & van Auken, 2001; Hansen, 2006) and should ensure that the group works effectively (Tideswell, 2004; Brindley, Walti, & Blaschke, 2009) through mechanisms for assistance, feedback, and evaluation.

Future Research

The study introduced numerous relations among sources of frustration variables from a student-centered perspective. The relations of these factors to the learning situation, the interactions, the processes, and the effects are the key to understanding collaborative learning (Dillenbourg, 1999) as well as student frustration. In this study, we advanced knowledge about the factors related to frustration in the authentic learning context of the professional master's student in e-learning at the UOC. Despite strong evidence on the perception of some factors, such as the imbalance in the level of commitment and the lack of common learning goals among the students, which are in agreement with previous studies, it is rec-

ommended that further research study a broader range of contexts, students from different online universities, different grades, and academic disciplines. Augmenting knowledge about sources of frustration could allow for improvement of the design and quality of online collaborative learning experiences so as to reduce the sources of frustration and thus promote the collaborative learning experience and the well-being of the online learners.

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Examining the Reuse of Open Textbooks


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Abstract

An important element of open educational resources (OER) is the permission to use the materials in new ways, including revising and remixing them. Prior research has shown that the revision and remix rates for OER are relatively low. In this study we examined the extent to which the openly licensed *Flat World Knowledge* textbooks were being revised and remixed. We found that the levels of revision and remix were similar to those of other OER collections. We discuss the possible significance and implication of these findings.

Keywords: Open educational resources; remix; reuse; open textbooks; electronic textbooks; Flat World Knowledge; open access

Only a decade ago textbooks existed only as a physical resource. When two roommates shared a textbook, if one roommate was using it the other could not. However, some resources (like textbooks) are now available in digital formats. Two people (or a million, for that matter) could all be online and using the same digital textbook at the same time. Because the resource is digital, it is more accessible.

One way to further increase the accessibility of the digital textbook is to make it an *open educational resource* (OER). By OER it is meant that others can reuse and/or modify the digital textbook (a more in-depth discussion of what it means to be an OER will follow). Assuming the textbook was written in English, the only people who will be able to benefit from the textbook are those who read English. But suppose the creators of the digital textbook had made it an OER (i.e., they allow others to make changes to it) and someone translates the textbook and makes it available in Chinese. The OER digital textbook is now more accessible to others—making the textbook increasingly accessible. But what if nobody had made any modifications to the textbook? It could be argued that any time or expense spent in openly licensing the textbook—such that it could be modified—would have been wasted

since this capacity was never utilized.

Today there are thousands of OER available for others to reuse and modify. In the present study we examine the question as to how many people are taking advantage of the open licensing feature of OER textbooks that allows these resources to be revised and remixed.

Review of Literature

Open educational resources have become an important topic of research. According to the Organisation for Economic Co-operation and Development (OECD), "The definition of OER currently most often used is 'digitised materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research'" (OECD, 2007, p. 10). These resources, made freely available on the Web, provide those with Internet access the opportunity to tap into a variety of educational materials at no cost.

The Cape Town Open Education Declaration (2007) states,

> Educators worldwide are developing a vast pool of educational resources on the Internet, open and free for all to use. These educators are creating a world where each and every person on earth can access and contribute to the sum of all human knowledge.

Similarly, India's National Knowledge Commission has written that stimulating "the development and dissemination of quality Open Access (OA) materials and open educational resources (OER) through broadband Internet connectivity" would be one of the most effective ways to disseminate educational resources in India (National Knowledge Commission, 2007, p. 51).

The *open* in OER is typically understood to mean that the resource is freely available for others to use in different contexts (McMartin, 2008). But the word *reuse* can describe several different types of use, and not everyone agrees on what reuse means (Downes 2007, Hylén, 2006). Hilton, Wiley, Stein, and Johnson (2010) describe four Rs that clarify nuances in what reuse means.

- *Reuse*—The most basic level of openness. People are allowed to use all or part of the work for their own purposes (e.g., download an educational video to watch at a later time).
- *Redistribute*—People can share the work with others (e.g., email a digital article to a colleague).
- *Revise*—People can adapt, modify, translate, or change the work (e.g., take a book written in English and turn it into a Spanish audio book).

- *Remix*—People can take two or more existing resources and combine them to create a new resource (e.g., take audio lectures from one course and combine them with slides from another course to create a new derivative work).

An important element of OER is permission to use the materials in new ways. In fact, D'Antoni (2009) cited the William and Flora Hewlett Foundation, a key donor for OER, as stating that OER are "resources that reside in the public domain or have been released under an intellectual property license that permits their free use or re-purposing by others" (p. 4).

How an individual licenses an OER significantly affects its openness. In many jurisdictions, all creative works are automatically copyrighted; therefore, they are legally "closed" unless the author takes explicit steps to open them (Lessig, 2004).

One way to take the steps necessary to open creative works is to use a Creative Commons license. Creative Commons provides several licenses to help creators of content license their work in ways consistent with their desires for openness (e.g., Creative Commons, 2009; Bissell, 2009). These licenses generally allow people to take digital objects (like the textbook) and reuse them in other settings. For example, elementary school teachers could put the textbook on their personal Web sites and point their students to those sites.

There are certainly benefits to this level of openness, which allows for reuse. However, Windle, Wharrad, McCormick, Laverty, and Taylor (2010) pose questions about reuse:

> This current OER movement is opening up repositories to be populated with all sorts of materials but does it matter if OER is concerned with simply filling repositories with resources, and have institutions fulfilled their 'public' obligation by doing so? Are they also responsible for whether people actually use it and for supporting and monitoring whether they do so? (n.p.)

They argued that reuse is an important part of OER, but their research stopped short of quantifying how much OER are being reused. Similarly, Koper (2003) asks, "Do users actually make use of our systems? In reality, do they share and reuse objects?" (47). Thus a key question is, given the fact that OER are being created and licensed for revision and remix, is anybody revising and remixing?

Although little research has been done in this area, the literature indicates that when OER are used, they are typically adopted wholesale (reused), and *not* revised or remixed (Duncan, 2009; Petrides, Nguyen, Jimes, & Karaglani, 2008). This distinction is important. As with the textbook example given in the introduction, reuse is simply taking the OER and using it as is. Revision would be modifying the textbook in some way (e.g., translating it) in order to increase its usefulness. A textbook could also be revised by having professors remove chapters that were not germane to their classes or add in material they wanted to

cover. Such a textbook could be remixed by taking preexisting openly licensed images, videos, or writings and merging them into an existing textbook.

Allowing for revisions and remixing can potentially enhance the reach of a work (Bissell, 2009). And this does happen in some cases. For example, Hilton (2009) found that in one instance a book was translated into several languages and file formats as a result of being openly licensed. However, this is atypical. Duncan (2009) found that in one OER collection the rates of revision or remix were quite low. Of 3,519 modules created and used (an important distinction, since 32.6% of created modules were never used), only 2.98% of modules were translated, and only 2.87% were modified in some other way. Thus, according to the definitions of revision and remix we have set forth, approximately 6% of OER in this collection were ever revised or remixed.

Petrides et al. (2008) found that while a large number of what they termed "reuses" occurred on the same OER collection studied by Duncan, they also stated that "88 percent [of these reuses] . . . involved author users manipulating their own content" (p. 350). People revising their own work does not seem to fit the spirit of revision or remix embodied in the idea of open educational resources. These findings challenge the idea that people are eager to take OER that others have created and revise or remix them for their own purposes. Vuorikari and Koper (2009) found a reuse rate of approximately 20%. However, their definition of reuse was significantly more inclusive than those used by Petrides et al. (2008) and Duncan (2009). Van der Baaren and de Vried (2010) tell of pilot efforts to increase the reuse of OER; however, they also state that it is too early to report on the outcomes of these pilot studies.

Of course, none of these studies can fully take into account remixing that was done outside of the OER collection. For example, had a teacher taken content from the collection offline, remixed it with other content, and posted it on his or her own Web site, it would not have been counted as a remix in these studies. This unobservable exercise of the 4R permissions has been called "dark reuse" (Wiley, 2009).

The Present Study

We examined the extent to which professors reused, revised, and remixed OER in the form of textbooks published by *Flat World Knowledge*. Founded in 2007, Flat World Knowledge (FWK) makes all of its textbooks available with an open license (Creative Commons BY-NC-SA). Digital versions of these books are freely available to anyone with an Internet connection. Flat World Knowledge makes its money from sales of print versions of textbooks (some students still prefer the traditional book) as well as other supplemental materials (like digital flash cards, study guides, etc.).

A key measure used by FWK is the "adoption" of textbooks. *Adoption* means that a professor formally decides to use a FWK textbook in his or her classrooms for a given semester. For example, if an English professor taught three sections in the fall semester and four sections in the spring semester using a FWK book, this teacher would have accounted for

seven adoptions.

FWK has a proprietary system that allows professors to revise and remix the content of the book they will use. Professors can make changes such as deletions, reorderings of material, additions of a professor's own material, and additions of FWK or other openly licensed materials. According to the definitions of 4 Rs set forth by Hilton et al. (2010), deletions, reordering, and other adaptions would be classified as revisions, and additions of other pre-existing openly licensed materials (from FWK, YouTube, etc.) would be classified as remix.

Our specific purpose was to determine the following: (a) how many of the total adoptions did any kind of revising or remixing; (b) in cases where revisions or remixes occurred, what kinds of changes were made; and (c) if there were any consistent patterns or trends in the remixes.

Measuring Revisions

In order to measure the extent of a revision, we used a multistep approach. First, we matched all corresponding sections of the custom book and the original book. Flat World Knowledge's customization framework allows for rearrangement at the table of contents level: chapters may be reordered within the book, sections may be reordered within a chapter, and sections may be moved between chapters. There is no tool provided for reordering the content within sections, so sections were treated as 'atomic' from the rearrangement perspective. As sections are moved and edited, they maintain a unique ID that can be used to find matches.

If a section in the original had no match in the custom, then the section had been deleted, and its entire length was counted toward the *delete score*. If a section in the custom had no match in the original, then the section had been added, either directly from the customizer or as a remix from other books in the Flat World Knowledge catalog. The length of the section then counted toward the *add score* or *external add score*, respectively. If an existing paragraph was cut and replaced by a new paragraph this counted as an addition and a deletion.

When a match was found, we directly compared the pair to find shared text. Given two sections, we measured the similarity between them by finding the length of the *longest common subsequence*, or LCS, which represents the text that is contained, in order, in both sections. Here is an example:

```
First, this is the original sentence.
And this is a revised sentence.
```

These have lengths of 37 and 31, ignoring spaces. We match them up as well as possible by adding spaces.

```
First, this is the original sentence.
And    this is a    revised sentence.
```

The LCS here is "this is r i sentence." because these characters appear in that order in both sentences. This has length 16. To get from the first sentence to the second, one could delete everything that is in the first but not the second ("First, the o ig nal", length 37 - 16 = 21) to get down to the LCS, then add everything in the second but not the first ("And a ev sed", length 31 - 16 = 15). So the add score for this minirevision is 15 / 31 = 48%, and the delete score is 21 / 31 = 68%.

Toolkit

FWK data regarding the contents of textbooks, customizations, and adoptions is stored in MySQL databases (see http://dev.mysql.com/) and privately accessible through their proprietary BookServer API. We extracted and processed data using Python (see http://python.org/), relying heavily on difflib (see http://docs.python.org/library/difflib.html) and Microsoft Excel for our analysis. Graphs were created using the R statistical environment (see http://www.r-project.org/) and the ggplot2 graphing library (see http://had.co.nz/ggplot2/).

Results

Between fall 2009 and summer 2011, there were 3,304 adoptions of FWK textbooks, 247 (7.5%) of which were adoptions of custom books that differed from the original.[1] In addition, we examined this subset of books (referred to as *custom books*) to see how these custom books were altered.

Analysis of Customization Behavior

Four types of customizations were available to users of the FWK customization system: additions, deletions, reorderings, and remixes.

Additions.

An addition occurred when a user added material to a book by inserting one or more new chapters, sections, paragraphs, or characters in an existing paragraph. The total number of custom books with additions was 41 (out of 247), or 16.6% of all custom books. Five custom books included only additions and no other customizations (2% of custom books). The amount of material added to a book ranged from 0.1% to 6.8% of the total content of the

1 Interestingly, some of the books customers took through the customization process emerged from that process unscathed. Twenty-eight of the adopted books marked "custom" in the database were identical to the original books. One example of how this might happen would be a faculty member deciding to customize a book, opening it in the customization engine, and then deciding on further inspection there's nothing he actually wants to change and hitting 'save.' These books are excluded from our analysis of customization behavior. There were also several customized books that were never adopted. One example of how this might happen is a faculty member playing around with the customization engine just to see how it works. These books are also excluded from our analysis of customization behavior. This in itself is an important finding of this study.

custom book, as shown in Figure 1.

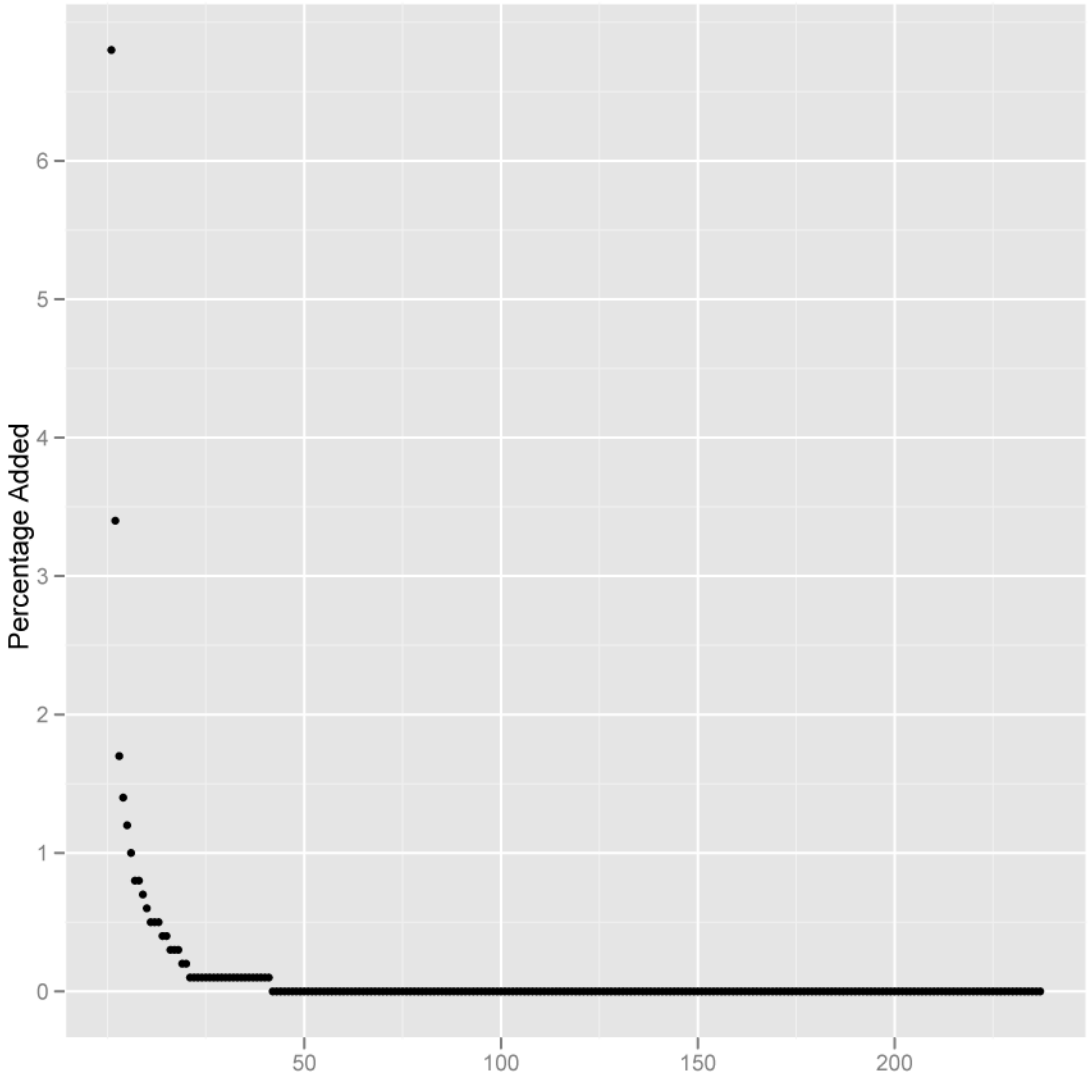

Figure 1. Amount of material added to custom books.

Deletions.

A deletion occurred when a user removed one or more chapters, sections, paragraphs, or characters from an existing paragraph. The total number of custom books with deletions was 149 (out of 247), or 60.3% of all custom books. Fifty-six custom books included only deletions and no other customizations (22.7% of custom books). The amount of material deleted from a book ranged from 0.1% to 94.1% of the content of the original book, as shown in Figure 2.

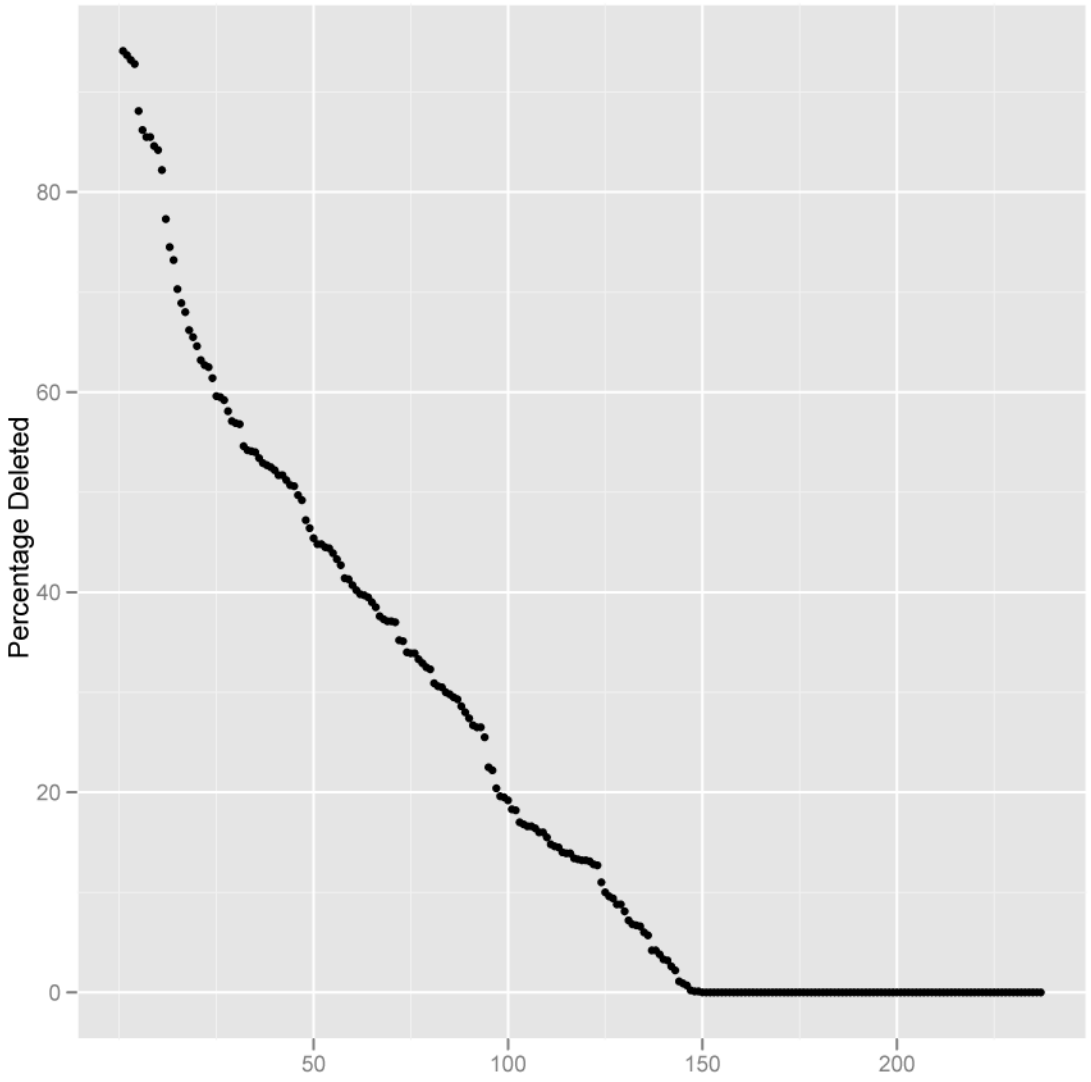

Figure 2. Amount of material deleted to custom books.

Reorders.

A reorder occurred when a user changed the sequence in which chapters appeared in the book or the sequence in which sections appeared in a chapter. The total number of custom books with reorders was 100 (out of 247), or 40.5% of all custom books. Ten custom books included only reorders and no other customizations (4.1% of custom books).

Remixes.

A remix occurred when a user imported content from another FWK book into the custom book. The total number of custom books with remixes was four (out of 247), or 1.6% of all custom books. No custom books included only remixes and no other customizations. The amount of material from other FWK books added to a book ranged from 12.3% to 79.6% of

the total content of the custom book. It is important to note that the remix rate could have been underestimated because it was assumed that all additions were of the professors' own creation. However, a professor could have copied and pasted material from a non-FWK textbook, and our methodology would not have detected this as a remix.

Patterns in Customization Behavior

We found a strong relationship between user customization behavior and the simplicity of accomplishing the different types of customizations. The simplest customization task, deletion, requires only a single click. Reordering the elements in the table of contents requires dragging and dropping. Adding original material to a book requires clicking and typing. Remixing material from another FWK book cannot be done directly by users and requires support from the publisher. The simpler a customization is to perform, the more customers perform it.

Table 1

Customization Types

Customization type	Number of custom books	Percentage of custom books
Deletions	149	60.32%
Reorderings	100	40.49%
Additions	41	16.60%
Remixes	4	1.62%

The same pattern holds for customized books including only one type of customization.

Table 2

One Customization Type Only

Customization type	Number of custom books	Percentage of custom books
Only Deletions	56	22.67%
Only Reorderings	10	4.05%
Only Additions	5	2.02%
Only Remixes	0	0.00%

Deletions were both the simplest customization to make and the most common customization. Some customizers deleted aggressively.

Table 3

Deletions

Amount of original book deleted	Number of custom books	Percentage of custom books
At least 25% deleted	94	38.06%
At least 50% deleted	45	18.22%
At least 75% deleted	12	4.86%

A strong relationship exists between the length of a book and the average number of chapters deleted from the book. A Pearson's product-moment correlation was calculated to reveal the relationship between the number of chapters in a book and the average number of entire chapters deleted from custom versions of the book, resulting in a correlation of 0.71. Figure 3 demonstrates this relationship.

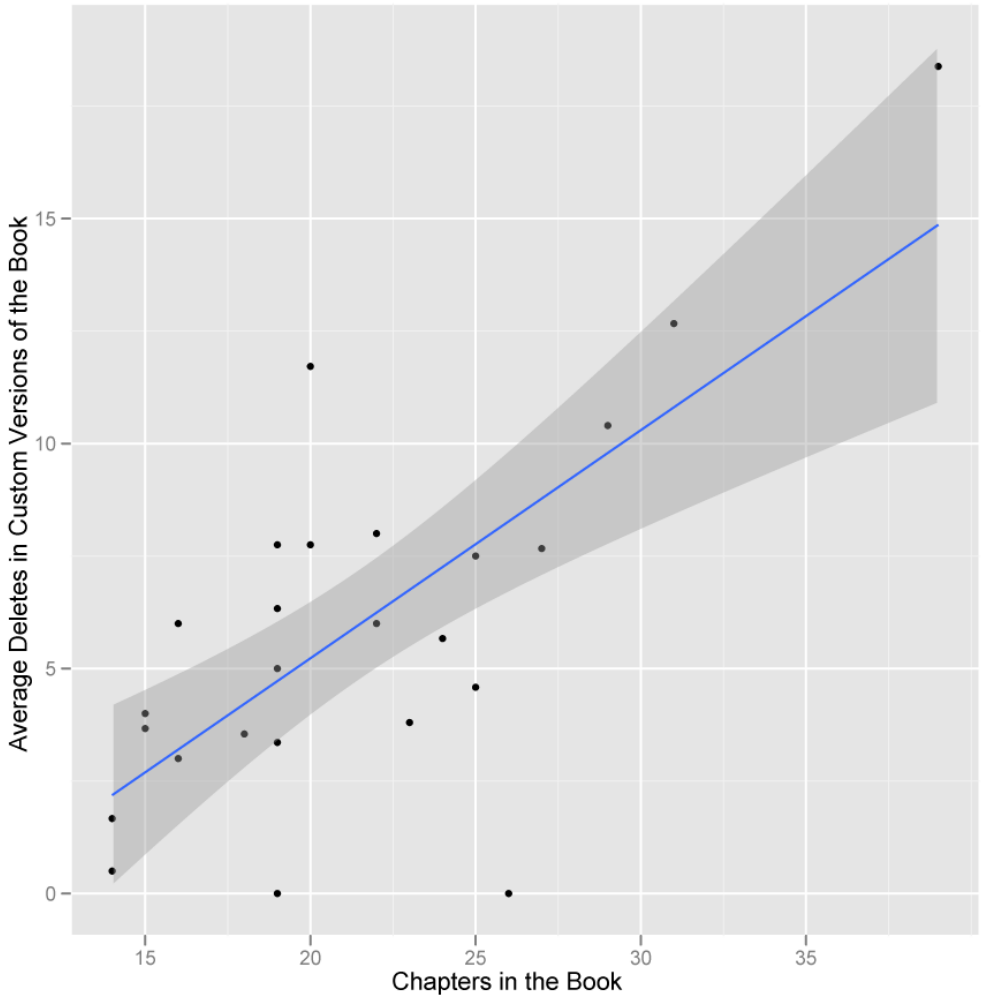

Figure 3. Relationship between book length and material deleted from custom books.

This propensity to remove entire chapters is particularly interesting given that the removal

does not lower the price of the online book (which is free) or the print book (which has a fixed cost, regardless of how it is customized). Given the lack of financial incentive to engage in the book customizing process, one interpretation of this pattern of behavior is that faculty who customize books do so because they prefer shorter textbooks tailored specifically to their course designs.

Discussion

As with Duncan (2009), we found that the rates of revision and remix were relatively low. Only 7.5% of textbook adoptions over a two-year period were adoptions of custom books. This indicates that while the ability to revise and remix sounds exciting, the number of those who take advantage of this opportunity is relatively small.

One tentative key finding of the study is that the easier it was to make a change, the more changes of that type were made. Of the different kinds of changes that can be made, the easiest to make is a deletion. And as was seen, deletions were by far the most common kind of change made to the FWK text. While we cannot state that deletions were made because they were easiest to make (perhaps they are the type of change that people wanted to make the most), this could have been a part of the reason. If this is the case, it stands to reason that the easier it becomes to revise, the more revisions will take place. While beyond the scope of the present study, it would be interesting to do additional studies to determine whether OER in easy-to-edit formats (e.g., text) are revised more frequently than OER in formats that are more difficult to edit (e.g., video).

Another finding was that not only were deletions the most common type of revision made, but they were also sometimes used heavily. Specifically, 38% of customizations deleted at least 25% of the original textbook and an additional 18% deleted at least 50%. Why did such steep deletions take place? While such deletions would have made the textbook shorter, the cost of the textbook to the students would have remained the same. In other words, there was no financial incentive for deletions to be made. We speculate that professors made deletions in order to remove material that was irrelevant to their class. It is also possible that some professors were using the FWK textbook as a supplement to another textbook, and thus only wanted to use a smaller part of it.

Limitations and Future Research

The primary limitation of the current study is that we only had access to modifications made within FWK's editing program and could not examine "dark reuse" of FWK content. It is possible that people revised or remixed FWK books outside of this system. For example, one of the authors of this article is currently revising the FWK project management textbook to focus on project management in the instructional design field. Consequently, this study undercounts (potentially significantly) the amount of actual remix that has taken place. In addition, FWK has recently added a new feature to its system in which people who customize textbooks can make their revised version of a textbook available for sale and

receive a portion of the profits from the sales of these remixed books. This incentive may encourage more professors to revise and remix textbook content.

Another limitation of this study is that it included only one collection of OER (those published by FWK). While our results are not significantly different from those found by Duncan (2009) and Petrides et al. (2008), additional research should examine other collections of OER to determine if these emerging trends in reuse, revision, and remixing hold in other venues.

Further work should be done not only to determine the extent to which OER are being remixed, but also how important this remixing is to OER in general. It may be that other outcomes of OER (simple reuse, decreased costs, increased access) overshadow the overall importance of how much remixing takes place.

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Conceptual Framework for Parametrically Measuring the Desirability of Open Educational Resources using D-Index



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Abstract

Open educational resources (OER) are a global phenomenon that is fast gaining credibility in many academic circles as a possible solution for bridging the knowledge divide. With increased funding and advocacy from governmental and nongovernmental organisations paired with generous philanthropy, many OER repositories, which host a vast array of resources, have mushroomed over the years. As the inkling towards an open approach to education grows, many academics are contributing to these OER repositories, making them expand exponentially in volume. However, despite the volume of available OER, the uptake of the use and reuse of OER still remains slow. One of the major limitations inhibiting the wider adoption of OER is the inability of current search mechanisms to effectively locate OER that are most suitable for use and reuse within a given scenario. This is mainly due to the lack of a parametric measure that could be used by search technologies to autonomously identify desirable resources. As a possible solution to this limitation, this concept paper introduces a parametric measure of desirability of OER named the *D-index*, which can aid search mechanisms in better identifying resources suitable for use and reuse.

Keywords: Open educational resources; OER; desirability of OER; locating suitable OER; use and reuse of OER; D-index

Introduction

Open educational resources (OER) are fast becoming a global phenomenon, which provides hope for bridging the knowledge divide among the masses (Geith & Vignare, 2008). With increased funding and advocacy by governmental and nongovernmental organisations buttressed by generous philanthropy, many OER repositories boasting a large volume of quality resources have mushroomed over the years. With the movement gaining credibility among many an academic community and with the drive toward opening up knowledge for the benefit of the less fortunate taking centre stage (Johnstone, 2005), these repositories have grown rich in knowledge. However, this has in turn given rise to the new challenge of locating resources suitable for use and reuse from the large number of disconnected and disparate repositories available around the globe (Geser, 2007).

As discussed by Hilton, Wiley, Stein, and Johnson (2010) the use and reuse of an OER depends on two factors: the permission and the technologies needed. The authors introduce the four Rs of openness and the ALMS analysis, which can be used to effectively gauge these factors for identifying the most suitable OER for use and reuse. However, at present, all of the three types of OER repositories, which include content OER repositories, portal OER repositories, and content and portal OER repositories (McGreal, 2010), consider only the relevance of a resource to the search query when locating internal and external resources. Thus, the rank of the search result is not a direct indicator of the suitability of a resource as it does not take into consideration the permission nor the technologies needed to successfully use and reuse. This challenge is further heightened by the common use of OER formats such as PDF, which renders resources useless with respect to reuse (Baraniuk, 2007), and the inability of average users to use the available technological tools to remix the resources (Petrides, Nguyen, Jimes, & Karaglani, 2008). Additionally, as resources are constantly added to these repositories (Dholakia, King, & Baraniuk, 2006), a static method of defining the suitability for use and reuse within the metadata becomes an impossible task.

As a possible solution to this issue, this paper introduces the concept of *desirability* of a resource, which parametrically takes into consideration (i) the level of openness with respect to the copyright license, (ii) the level of access with respect to technologies, and (iii) the relevance with respect to search rank. The desirability of an OER is then expressed as the *D-index* which allows search mechanisms as well as users to make informed decisions with respect to the most desirable OER for their needs.

Desirability of an OER

Rationale

In the academic community, the perceived quality of an academic publication or a resource is largely governed by peer review. However, with the present day influx of research publications being made available online, the peer-review mechanism becomes inefficient as not all the experts can review all the publications. As such, an alternative method of measur-

ing the quality of a publication or a resource is needed. According to Buela-Casal and Zych (2010),

> If an article receives a citation it means it has been used by the authors who cite it and as a result, the higher the number of the citations the more utilized the article. It seems to be an evidence of the recognition and the acceptance of the work by other investigators who use it as a support for their own work.

Therefore, at present the number of citations received is widely accepted as an indication of the perceived quality of an academic publication or resource.

As the styles of citation for academic publications are very well established, search mechanisms such as Google scholar (see http://scholar.google.com) have a usable parametric measure for providing an indication of how useful a publication would be for one's academic research. Although there are established styles of citation and attribution for OER as well, these styles are not standardised or widely practiced when using, reusing, remixing, and redistributing OER. As such, it is extremely difficult for a search mechanism to autonomously identify the number of citations or the number of attributions received by a particular OER material. This issue is further amplified as not all the OER repositories available over the Internet are searched and indexed by popular search mechanisms. Providing potential solutions to this issue are systems such as AnnotatEd (Farzan & Brusilovsky, 2006), which uses web-based annotations, use of brand reputation of a repository as an indication of quality, allowing users to review resources using set scales (Hylén, 2005), and the "popularity" in the Connexions repository, which is measured as percentile rank of page views/day over all time. Despite these very specific methodologies, there is still no generic methodology available at present to enable search mechanisms to autonomously gauge the usefulness of an OER for one's teaching and learning needs.

Definition

The usefulness of an OER for a particular teaching or learning need can only be accurately assessed by reading through the content of the resource. As this is quite a subjective exercise due to one's needs differing from another's, it is extremely difficult for a software-based search mechanism to provide any indication of this to a user. This aspect of use and reuse of OER will remain a human function regardless of the improvements in technology. When considering the use and reuse of an OER, there are other aspects of a resource that are fundamental to the usefulness of that particular resource and can be parametrically identified by a software-based mechanism. The first aspect is whether a resource is relevant to a user's needs. This can be assessed by the search ranking of a resource when searched for with a search mechanism. The search mechanism will compare the title, description, keywords, and sometimes the content of the material to find the best match for the search query. The second aspect is whether the resource is open enough for using, reusing, remixing, and redistributing. This becomes important depending on what the user wants to accomplish

with the resource. The third aspect is the accessibility of the resource with respect to technology. If the user cannot easily use, reuse, and remix a resource with available technology, the resource becomes less useful. Therefore, the usefulness of an OER with respect to (i) the level of openness, (ii) the level of access, and (iii) the relevance can be defined as the *d*esirability of an OER, indicating how desirable it is for use and reuse for one's needs. Within the requirement of being able to use and reuse a particular OER, these three parameters can be defined as follows:

1. *level of openness*, the permission to use and reuse the resource;
2. *level of access*, the technical keys required to unlock the resource; and
3. *relevance*, the level of match between the resource and the needs of the user.

As each of these mutually exclusive parameters are directly proportionate to the desirability of an OER, the desirability can be expressed as a three-dimensional measure as shown in Figure 1.

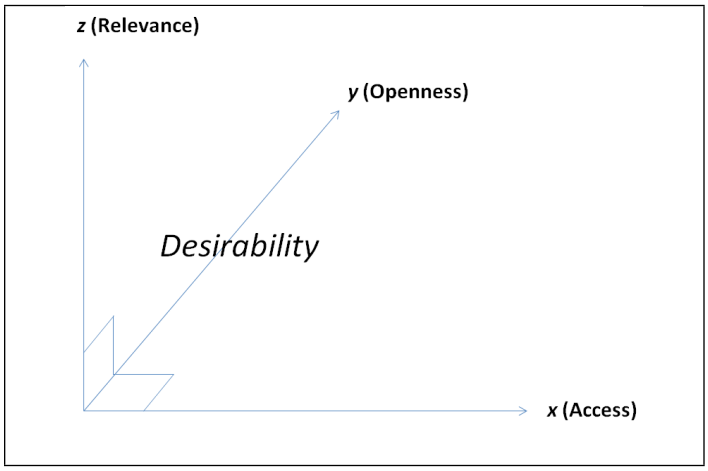

Figure 1. Desirability of an OER.

The Scales

In order to parametrically calculate the desirability of an OER, each of the parameters discussed above needs to be given a numeric value based on a set scale. These scales can be defined in the following ways.

The level of openness can be defined using the four Rs of openness (Hilton, Wiley, Stein, & Johnson, 2010) as shown in Table 1. The four Rs stand for *reuse*, the ability to use all or part of a work for one's own purposes; *redistribute*, the ability to share one's work with others; *revise*, the ability to adapt, modify, translate, or change the form of a work; and *remix*, the ability to combine resources to make new resources. The values 1 to 4 were assigned to the four Rs where 1 corresponds to the *lowest level of openness* and 4 corresponds to the *highest level*.

Table 1

The Level of Openness Based on the Four Rs of Openness

Permission	Value
Reuse	1
Redistribute	2
Revise	3
Remix	4

The level of access was defined on a scale of 1 to 16 using the ALMS analysis (Hilton, Wiley, Stein, & Johnson, 2010), which identifies the technical requirements for localisation of an OER with respect to access to editing tools, level of expertise required to revise or remix, ability to meaningfully edit, and source-file access. As shown in Table 2, the value 1 corresponds to the *lowest accessibility* and value 16 to the *highest accessibility*.

Table 2

The Level of Access Based on the ALMS Analysis

Access **(A**ccess to editing tools | **L**evel of expertise required to revise or remix | **M**eaningfully editable | **S**ource-file access**)**	Value
Low | High | No | No	1
Low | High | No | Yes	2
Low | High | Yes | No	3
Low | High | Yes | Yes	4
Low | Low | No | No	5
Low | Low | No | Yes	6
Low | Low | Yes | No	7
Low | Low | Yes | Yes	8
High | High | No | No	9
High | High | No | Yes	10
High | High | Yes | No	11
High | High | Yes | Yes	12
High | Low | No | No	13
High | Low | No | Yes	14
High | Low | Yes | No	15

High | Low | Yes | Yes	16

The relevance of a resource to a particular search query can be measured using the rank of the search results. According to Vaughan (2004) users will only consider the top ten ranked results for a particular search as the most relevant. Vaughan further suggests that users will ignore the results below the top 30. Based on this premise, the scale for the relevance was defined as shown in Table 3, where the value 1 is the *least relevant* and value 4 is the *most relevant*.

Table 3

The Level of Relevance Based on Search Rank

Search rank	Value
Below the top 30 ranks of the search results	1
Within the top 21-30 ranks of the search results	2
Within the top 11-20 ranks of the search results	3
Within the top 10 ranks of the search results	4

Calculation

Based on the scales, the desirability of an OER can then be defined as the volume of the cuboid, as shown in Figure 2, calculated using the following formula.

$$\text{desirability} = \text{level of access} \times \text{level of openness} \times \text{relevance}$$

As a result, the desirability becomes directly proportionate to the volume of the cuboid.

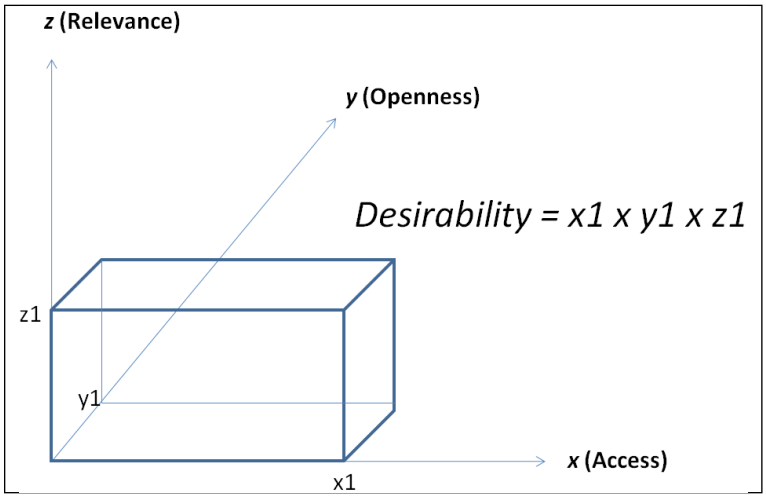

Figure 2. Calculation of desirability.

By normalising the values indicated in Table 1, Table 2, and Table 3 to make the scales uniform for the calculation, the D-index of an OER can be calculated using the following formula.

D-index = (level of access x level of openness x relevance)
/ 256

Based on the above calculation, a resource becomes more desirable as the D-index increases on a scale of 0 to 1, where 0 is the *least desirable* and 1 is the *most desirable*.

Verification of Concept

The most commonly used method for locating OER is to use a generic search mechanism such as Google or to use a search mechanism specific to an OER repository such as Connexions (see http://cnx.org/) or Wikieducator (see http://wikieducator.org). However, both of these types of search mechanisms only consider the relevance of the resource either by matching the title and description or the keywords to the search query provided by the user. Therefore, the resources returned as the top search results might not always be the most desirable for use and reuse in a given scenario as they might be less open or less accessible. The D-index is specifically designed to overcome this limitation by taking into consideration the openness and the accessibility of an OER in addition to the relevance to the search query. When applying the D-index to an OER repository, the level of access, discussed in Table 2, needs to be implemented using the file formats of the OER, where their features are mapped against the ALMS. The level of openness, based on the four Rs discussed in Table 1, needs to be measured using the copyright licensing scheme under which the resource was released. The de facto scheme used in most repositories is the Creative Commons (CC) (see http://creativecommons.org/) licensing scheme, which has six derivations based on the level of openness. However, other specific licensing schemes such as the GNU Free Documentation License (see http://www.gnu.org/copyleft/fdl.html) can also be used for this purpose as long as they can be categorised into the four levels of openness constituting the desirability. Table 4 maps the six CC licences to the four Rs of openness. However, it should be noted that the level of openness of the CC licenses starts at the redistribute level.

Table 4

Mapping the CC Licences to the 4 Rs

Permission	Creative Commons (CC) licence	Value
Reuse	None	1
Redistribute	Attribution-NonCommercial-NoDerivatives (CC BY-NC-ND) Attribution-NoDerivatives (CC BY-ND)	2
Revise	Attribution-NonCommercial-ShareAlike (CC BY-NC-SA) Attribution-ShareAlike (CC BY-SA)	3
Remix	Attribution-NonCommercial (CC BY-NC) Attribution (CC BY)	4

Methodology

To verify the accuracy of the proposed D-index, experiments were carried out in three widely used OER repositories: OER Commons (see http://www.oercommons.org), Jorum (see http://jorum.ac.uk/), and MERLOT (see http://www.merlot.org/). These repositories were selected for the experiments due to (i) the repositories providing users with native search mechanisms to locate OER available within the repository as well as hosted outside and (ii) the variety of OER available through them in different levels of openness and access. Each repository was searched using the term *calculus* to locate OER on the topic of calculus in mathematics. The term calculus was intentionally selected for these experiments due to the large number of OER written and made available on the topic. Only the top 40 search results from each repository, returned based on relevance, were considered in the experiments as the users tend to ignore results below the rank of 30 (Vaughan, 2004).

Calculation of the D-index

To demonstrate how the D-index was calculated for each search result, a general search was conducted on the OER Commons repository for the term calculus using its native search mechanism. Out of the 165 resources returned as results, three resources at the postsecondary level with different search rank were chosen for comparison as shown in Table 5.

Table 5

Selected Search Results at Postsecondary Level Returned by the OER Commons Search Mechanism for the Search Term Calculus

Resource	Title	Search rank	License	File type
A	Calculus I	2	Creative Commons Attribution-Noncommercial-Share Alike 3.0 (CC BY-NC-SA)	PDF
B	Topics in Calculus	8	Creative Commons Attribution-Noncommercial 3.0 (CC BY-NC)	HTML
C	Calculus I (MATH 151)	23	Creative Commons Attribution 3.0 Unported (CC BY)	MS Word

The search rank, licence, and the file type of each resource in Table 5 was then compared with Table 3, Table 4, and Table 2 respectively to identify the parameters required to calculate the D-index as shown in Table 6.

Table 6

Parameters Required for Calculating the D-index

Resource	Relevance	Openness (four R's)	Access (ALMS)
A	4	3	1 (Low | High | No | No)
B	4	4	16 (High | Low | Yes | Yes)
C	2	4	8 (Low | Low | Yes | Yes)

Looking at Table 6 we can see that the search mechanism has ordered the results according to the relevance where resource A is the most relevant. However, resource A is less open and less accessible when compared with resource B. Table 7 shows how the results would be reorganised when the D-index is applied to the same search results.

Table 7

After Applying the D-index to the Same Search Results Shown in Table 5

Resource	Relevance	Openness	Access	D-index
B	4	4	16	1.00
C	2	4	8	0.25
A	4	3	1	0.05

From the results in Table 7, it can be seen that resource B would be the most desirable OER for use and reuse due to its level of openness and access even though resource A was the most relevant.

Experiment Results

Table 8, Table 10, and Table 12 show the top 10 results returned by the native search mechanisms of MERLOT, JORUM, and OER Commons respectively for the keyword calculus. Table 9, Table 11, and Table 13 show the top 10 results when the D-index is applied to the search results returned by MERLOT, JORUM, and OER Commons respectively.

Table 8

Top Ten Search Results Returned by MERLOT for the Keyword Calculus

Search rank	Title	CC license	File type
1	18.01 Single Variable Calculus	CC BY-NC-SA	PDF
2	Calculus for Beginners and Artists	CC BY-NC-SA	HTML/Text
3	18.01 Single Variable Calculus	CC BY-NC-SA	PDF
4	18.013A Calculus with Applications	CC BY-NC-SA	HTML/Text
5	18.02 Multivariable Calculus	CC BY-NC-SA	PDF
6	Single Variable Calculus	CC BY-NC-SA	PDF
7	Calculus Online Textbook	CC BY-NC-SA	PDF
8	Calculus for Beginners and Artists	CC BY-NC-SA	HTML/Text
9	18.075 Advanced Calculus for Engineers	CC BY-NC-SA	PDF
10	MATH 140 - Calculus I, Summer 2007	CC BY-NC-SA	Protected

Table 9

Top Ten Results when D-index is Applied to the Results Returned by MERLOT

Rank after applying D-index	Original search rank	Title	CC License	File type	D-index
1	2	Calculus for Beginners and Artists	CC BY-NC-SA	HTML/ Text	0.75
2	4	18.013A Calculus with Applications	CC BY-NC-SA	HTML/ Text	0.75
3	8	Calculus for Beginners and Artists	CC BY-NC-SA	HTML/ Text	0.75

4	14	Multivariable Calculus	CC BY	HTML/ Text	0.75
5	19	MATH 10250 - Elements of Calculus I, Fall 2008	CC BY-NC-SA	HTML/ Text	0.56
6	20	18.022 Calculus	CC BY-NC-SA	PDF	0.56
7	22	Single-Variable Calculus I	CC BY	HTML/ Text	0.50
8	25	Single-Variable Calculus II	CC BY	HTML/ Text	0.50
9	15	Highlights of Calculus	CC BY-NC-SA	Video	0.42
10	21	Calculus I	CC BY	HTML/ Text	0.38

Table 10

Top Ten Search Results Returned by JORUM for the Keyword Calculus

Search rank	Title	CC License	File type
1	Introduction to Calculus	CC BY-NC	Video
2	Introduction to Artificial Intelligence - Neural Networks	CC BY-NC-SA	MS Word
3	Calculus (integration) : mathematics 1 level 4	CC BY	Slides
4	Calculus - Income Growth, Consumption and Savings	CC BY-NC	Video
5	Introduction to Econometrics: EC220	CC BY-NC	PDF
6	Further Mathematical Methods	CC BY-NC-SA	XHTML
7	Transient Responses : Laplace Transforms : Electrical and Electronic Principles : Presentation Transcript	CC BY	Slides
8	Calculus - Determining Marginal Revenue	CC BY-NC	Video
9	Film Series Four - Conclusion	CC BY-NC	Video
10	Finding the Optimal Number of Floors in Hotel Construction - Part One	CC BY-NC	Video

Table 11

Top Ten Results when D-index is Applied to the Results Returned by JORUM

Rank after applying D-index	Original search rank	Title	CC License	File type	D-index
1	1	Introduction to Calculus	CC BY-NC	Video	0.75
2	4	Calculus - Income Growth, Consumption and Savings	CC BY-NC	Video	0.75
3	6	Further Mathematical Methods	CC BY-NC-SA	XHTML	0.75
4	8	Calculus - Determining Marginal Revenue	CC BY-NC	Video	0.75
5	9	Film Series Four - Conclusion	CC BY-NC	Video	0.75
6	10	Finding the Optimal Number of Floors in Hotel Construction - Part One	CC BY-NC	Video	0.75
7	13	Maths Solutions	CC BY	HTML/Text	0.75
8	11	Finding the Optimal Number of Floors in Hotel Construction - Part Two	CC BY-NC	Video	0.56
9	12	Finding the Optimal Number of Floors in Hotel Construction - Conclusion	CC BY-NC	Video	0.56
10	14	Mathematical Analysis	CC BY-NC-SA	HTML/Text	0.56

Table 12

Top Ten Search Results Returned by OER Commons for the Keyword Calculus

Search rank	Title	CC License	File type
1	Whitman Calculus	CC BY-NC-SA	HTML/Text
2	Calculus I	CC BY-NC-SA	PDF
3	AP Calculus	CC BY-NC-SA	HTML/Text
4	Applied Calculus	Propritery	HTML/Text
5	A Summary of Calculus	Propritery	PDF
6	Advanced Calculus	CC BY-NC-SA	PDF
7	Multivariable Calculus	Propritery	PDF
8	Topics in Calculus	CC BY-NC	PDF
9	Highlights of Calculus	CC BY-NC-SA	Video
10	Vector Calculus	Propritery	HTML/Text

Table 13

Top Ten Results when D-index is Applied to the Results Returned by OER Commons

Rank after applying D-index	Original search rank	Title	CC License	File type	D-index
1	1	Whitman Calculus	CC BY-NC-SA	HTML/Text	0.75
2	3	AP Calculus	CC BY-NC-SA	HTML/Text	0.75
3	11	Vector Calculus	GNU Free Documentation License	HTML/Text	0.75
4	9	Highlights of Calculus	CC BY-NC-SA	Video	0.56
5	16	Calculus (Student's Edition)	CC BY-NC-SA	HTML/Text	0.56
6	22	Calculus II (MATH 152)	CC BY	HTML/Text	0.50
7	23	Calculus I (MATH 151)	CC BY	HTML/Text	0.50
8	24	Calculus III (MATH 153)	CC BY	HTML/Text	0.50
9	15	Calculus Revisited, Fall 2010	CC BY-NC-SA	Video	0.42
10	21	Calculus (Teacher's Edition)	CC BY-NC-SA	HTML/Text	0.38

Discussion

By comparing Table 8 and Table 9, which show the search results returned by MERLOT, it can be seen that the original top 10 search results (Table 8) only contain resources that are released under the CC BY-NC-SA license. This license significantly restricts the user's freedom with respect to the four Rs. Also six of 10 resources returned are in PDF format, which make them difficult to reuse and remix. It must also be noted that the resource ranked as number 10 is a protected resource, which requires a specific username and password to access. Looking at Table 9 where the results are reranked according to the D-index, it can be seen that eight of 10 resources are in HTML/text formats, which are the most accessible in terms of reuse. Four of 10 resources are available under the CC BY licence, which make them the most open resources in the list. Similarly, by comparing Table 10 and Table 11, we can see that the use of the D-index has reranked the top 10 results so that the most accessible resources are ranked at the top instead of resources that use proprietary software applications. The video resources returned were given an accessibility value of 12 according to the ALMS, where access to editing tools = high; level of expertise required to revise or remix = high; meaningfully editable = yes; and source-file access = yes.

Analysing Table 12 it can be seen that four of 10 results returned by the OER Commons search mechanism are copyright protected. As such these cannot be considered as OER and are the least useful for a user who is searching for open material. A value of 0 for openness was assigned to these resources during the D-index calculation. Furthermore, five of the top 10 results returned by the OER Commons search mechanism were in PDF format. Looking at Table 13, it can be seen that the application of the D-index has reranked the resources to provide eight of 10 HTML/text resources. Also the proprietary content has been replaced with open content released under the CC BY and CC BY-NC-SA licenses. The third-ranked resource which is released under the GNU Free Documentation License was assigned a value of 4 for openness during the calculation of the D-index.

By referring to the above results from the experiments conducted on three widely used OER repositories, it can be concluded that the application of the D-index would greatly improve the effectiveness of the search with respect to locating the most suitable resources for use and reuse.

Application and Limitations

The D-index can be incorporated into any search mechanism of an OER repository provided that the resources in the repository are appropriately tagged with the necessary metadata, such as title, description, keywords, copyright license, and file type. Many OER repositories now require authors to define the basic metadata, such as the title, description, keywords, and copyright license. As such, the use of these parameters to gauge the values for relevance and openness becomes an easier task. However, gauging the access parameter which uses the file type of the OER becomes a much more challenging task as some resources consist of multiple files of multiple formats. This can be rectified by breaking a collection of OER into individual learning objects, which allows software applications to determine the file type of

the individual OER.

A couple of practical limitations can also be identified with respect to the implementation of the D-index in OER repositories. One of these limitations is that the desirability becomes one dimensional due to the copyright license and the file format being fixed in repositories such as Connexions or Wikieducator. As a result, the D-index becomes only a function of the relevance parameter which does not add much value to the existing search mechanism. Therefore, the D-index is best suited for use in portal repositories/content and portal repositories, such as the OER Commons, MERLOT, and JORUM, which have a wide variety of resources of different file types released under various copyright licenses. It will also be quite effective when used with search mechanisms which query multiple repositories to identify resources.

The other practical limitation is the subjectivity of the search algorithms used by the various native search mechanisms, which results in disparity of the search rank. In turn, this disparity results in the relevance parameter becoming a function of the effectiveness of the search algorithm.

Conclusion and Future Work

Open educational resources (OER) are fast becoming accepted sources of knowledge for teachers and learners around the globe. This is especially true in the case of open distance learning (ODL) institutions where the teaching and learning philosophy is based on open access to education. With the recent developments in technology as well as the establishment of many high quality OER repositories freely available online, the use and reuse of OER should have become mainstream practice. However, as it stands, the use and reuse of OER are still inhibited by a number of technological, social, and economic factors. One of the major technological limitations dampening the use and reuse of OER is the inability to effectively locate useful resources for specific teaching and learning needs from the variety of disconnected and disparate repositories available. This gives rise to the challenge of identifying a parametric measure of the usefulness of an OER, which will enable users to effectively identify suitable resources without reading through countless unsuitable ones.

The concept of desirability of an OER introduced in this paper attempts to lessen the pain of OER users with respect to identifying resources that are relevant, open, and accessible for one's particular needs. Currently, users who search for OER in specific repositories use search mechanisms native to the repository to identify relevant resources. Depending on the algorithms used by the native search mechanisms, the search query will be compared against the metadata of a resource such as title, description, and keywords to provide a list of resources which might be of relevance. However, these search mechanisms do not take into consideration the level of openness or the technological skills required with respect to using, reusing, remixing, and redistributing a resource. The D-index is an attempt to factor in the openness and accessibility in addition to the relevance in order to provide OER users a useful set of search results which are appropriate to their needs.

The D-index can be incorporated into any OER repository provided that the necessary metadata for calculation are available. It is most effective when used in portal repositories/content and portal repositories which search multiple disconnected OER repositories to locate relevant material. The greatest benefit of the D-index to teachers and learners is its ability to locate and list the most desirable OER for use and reuse from the numerous combinations of relevance, openness, and access under which OER are released. The authors are currently working on incorporating the D-index into an artificial intelligence (AI) based text mining system named *OERScout* which is used to cluster OER available in all the disconnected repositories based on autonomously identified keywords. The use of the D-index in this clustering process will enable search mechanisms to effectively locate OER which are most desirable for use and reuse.

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Contradictions in a Distance Course for a Marginalized Population at a Middle Eastern University

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Abstract

This study explores six cases of non-native English speaking students engaged in a distance English-medium course on critical thinking at a university in Iran. Framed within activity theory, the study investigated students' course-related activity systems with a particular focus on contradictions that underlie any human activity. The construct of contradictions provides a theoretical lens to understand a web of relationships among a number of elements in course-related activities situated in a cultural-historical setting beset with political controversies, technological challenges, and needs for a bilingual curriculum. The findings indicate that all student participants had multiple activity systems within the course environment. Most participants had primary, secondary, and quaternary contradictions that had positive and negative consequences on the expansion of their activity systems. Discussion also includes practical implications for the distance university under study that could potentially be applied to similar distance schools.

Keywords: Activity theory; contradictions; open; distance; English as a foreign language; Middle East

This paper discusses a qualitative case study of a distance course offered in English to non-native English speaking college students in Iran. The researchers represent an insider perspective as faculty members. The study has grown out of their personal motive to analyze the inner workings of this distance university placed within a unique sociopolitical setting.

Subsequent to the 1979 Islamic Revolution in Iran, many non-Muslim minorities were severely marginalized. Among them were the followers of the Bahá'í Faith, who have been systematically precluded from attending tertiary educational institutions. The Bahá'í Institute for Higher Education (henceforth, Institute) was founded in 1987 to restore the birthright of Bahá'í youth to access higher education (History and overview, 2011). Bahá'í professors and instructors who were themselves dismissed from universities and colleges on the grounds of their religious beliefs volunteered to provide the Iranian Bahá'í youth with a means to acquire higher education. As a result, they joined forces to establish the Institute. At the initial stages, very few programs were offered by the institute and due to security cautions courses were generally delivered by correspondence or, where possible, in small classes held in private homes. Today, the Institute has grown to offer 32 university-level programs across five colleges in Sciences, Engineering, Business and Management, Humanities, and Social Sciences. The advent of new technologies has made it possible for the affiliated global faculty (AGF), which consists of many professors outside Iran, to assist the Institute in offering courses in a distance or blended mode. Many of these courses are offered in English by non-Farsi speaking faculty. This has added yet another layer of complexity; now students' English proficiency should be high enough to handle college-level courses in English. Although the Institute has been successful in providing students with needed knowledge and skills, the oppression does not seem to cease and the faculty and students have been subject to numerous arrests, periodic raids, and confiscation of school equipments.

To investigate this complex web of interrelations and understand how distance learning operates under such conditions, the researchers have chosen a qualitative method of inquiry with a case study design framed within activity theoretical perspective. The following is a discussion of activity theory that will contextualize the methodology, analysis of data, and findings.

Theoretical Framework of Activity Theory

Activity theory represents one of the valuable assets of qualitative naturalistic inquiry. Since its birth in the first part of the 20th century, many forms of activity theory have emerged. This study adopts the activity theory framework, often referred to as the third generation of activity theory, which was developed by the Scandinavian school and spearheaded by Yrjö Engeström and his colleagues. What follows is a concise chronological description of activity theory as presented by Engeström (1987, 1999a, 1999b, 2001).

Activity theory evolved from cultural historical psychology, whose origins are rightly attributed to Lev Vygotksy, a Russian psychologist and educator. His theory is based on the ideas

of German philosophers Kant, Hegel, Marx, and Engels (Engeström, 1987). At the heart of Vygotsky's theory is the idea that human beings perform all conscious actions towards achieving their goal by means of mediating instruments, either physical, such as a pen or hammer, or psychological, such as language (Vygotsky, 1982b). This original theoretical model is considered the first generation of activity theory (Engeström (1987, 1999a, 1999b, 2001).

The second generation of activity theory came about through the efforts of Leont'ev (1975, 1981, 1989), who actually coined the term *activity theory*. He took individual human actions theorized by Vygotsky to the level of collective activity. By doing this, he connected his theory directly to the original sources of Vygotsky's ideas: Kant, Hegel, and Marx. Thus, activity becomes the smallest unit of analysis that contains all the elements of human collective activity, namely subject, instruments, object, division of labor, community, and rules (Figure 1).

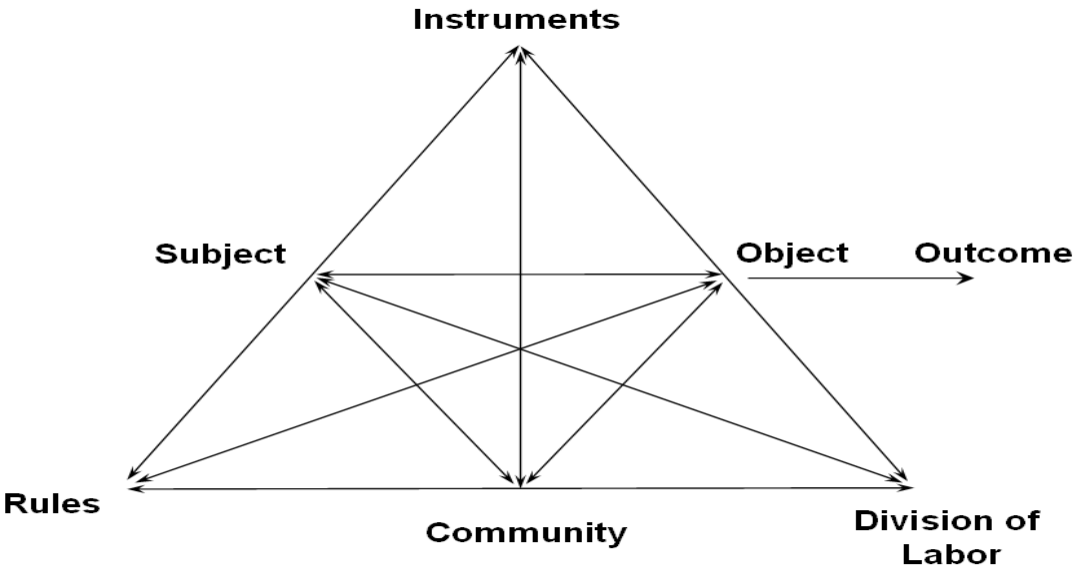

Figure 1. A model of human activity proposed by Leont'ev (cited in Engeström, 2001, p. 135).

By changing the focus in the unit of analysis, Leont'ev (1981) shifted attention from the individual to the collective. Lantolf and Thorne (2006) offer a concise summary of the three levels of activity in the form of a chart (Table 1). Starting from the bottom, each level of activity is built upon the preceding one. Action is built upon operations, and activity is built upon actions. The same set of operations can be used to accomplish different actions. Similarly, the same actions can be driven by different motives or objects.

Table 1

Hierarchy of Activity (Adapted from Lantolf and Thorne, 2006, p. 217)

Everyday description	Unit of analysis	Oriented toward	Carried out by	Time frame
Why something takes place	Activity	Motive, transformation of object	Community and/or society	Recurrent, cyclic, iterative
What is being done	Action	Goal	Individual or group	Linear, finite
The actual doing	Operations	Condition(s)	Individual	Present moment, process ontology

Engeström (2001) further adds interactivity among different activity systems, which becomes the third generation of activity theory. Figure 2 shows how two objects formed in two separate collective activity systems come together to form a new object common to two different groups of people (Engeström, 2001).

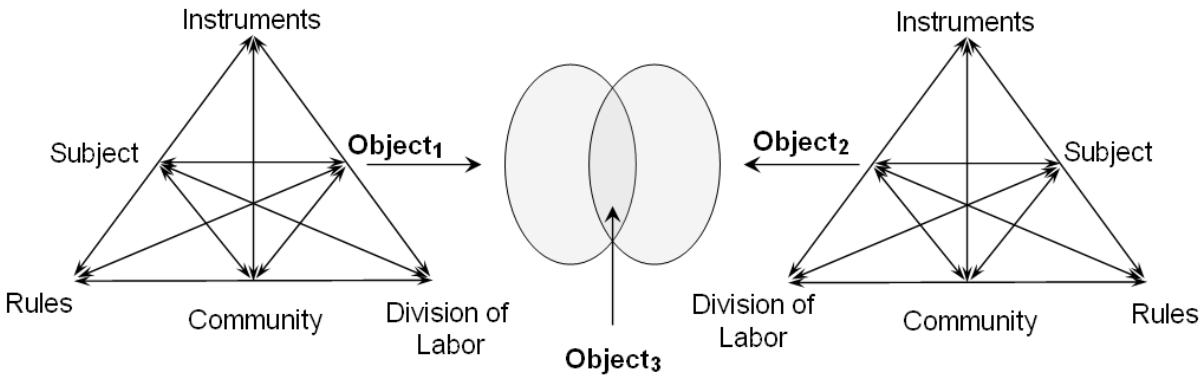

Figure 2. A model of activity theory (Engeström, 2001, p. 136).

Engeström (2001) suggests several principles of activity theory. The first of these principles is that "a collective, artifact-mediated [same as instrument-mediated], and object-oriented activity system" should be viewed in the context of other surrounding activity systems, that is the network of activity systems (Engeström, 2001, p. 136). In Figure 3, one can see these activity systems within a central activity system of a doctor's medical practice (Engeström, 1987). The second principle that Engeström (2001) suggests is the multivoicedness of activity systems, realized in participants' traditions, interests, opinions, and the diversity of instruments, rules, and histories present in any activity system. The third principle highlights the historicity of activity systems in that they always carry past history and change over time.

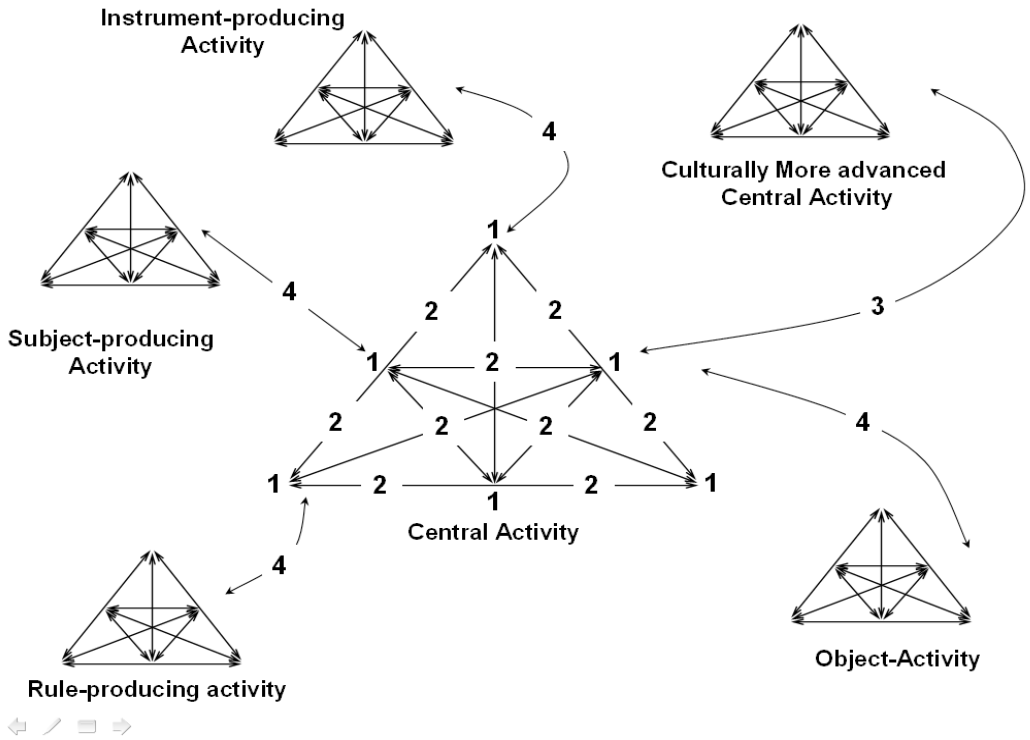

Figure 3. Interactions of surrounding activities and potential contradictions within and between them (Engeström, 1987).

The fourth principle is the role of contradictions in activity systems, the concept central to this case study. Originally introduced by Leont'ev (1981) and further explicated by Ilyenkov (1982), contradictions are understood as potential causes of desirable changes in all activity systems. A contradiction is often "characterized by ambiguity, surprise, interpretation, sense-making, and potential for change" (Engeström, 2001, p. 134). They become visible through disturbances and innovations at the action level of individual participants of activity systems. When contradictions are resolved an activity system undergoes a transformation or sometimes enters a new expansive cycle of growth, the last of the five principles of activity theory proposed by Engeström (2001).

Engeström proposes four levels of contradictions: primary (1), secondary (2), tertiary (3), and quaternary (4) (Figure 3). The primary contradictions arise within the elements/nodes of the activity system: subject, object, instruments, community, rules, and division of labor.

Engeström (1987) argues that in schooling settings with a capitalist socioeconomic formation, the primary contradictions within the nodes of activity acquire the nature of *use* and *exchange* value. In his example, text represents the object of learning, which can be studied in exchange for grades or for meaningful use in real life. Instruments oriented towards exchange value require recall and memorization; whereas, instruments that call for meaningful use of knowledge provide means for investigation and real-life problem-solving. Division of labor oriented towards exchange value calls for isolated roles, while division of labor oriented towards use value encourages cooperation. Community oriented towards

exchange value produces a class of separate individuals, but when it is oriented towards use value, it creates a team of inquiry. Rules oriented towards the exchange value create competition. Rules oriented towards the use value encourage risk-taking. Finally, a student as a subject is either a grade-maker when oriented towards the exchange value of the object or is a sense-maker when oriented towards the use value of his or her object. Thus, an activity where the subject is oriented towards the exchange value of the object leads to alienation because there is no true collaboration in the community node. An activity where the subject is oriented towards the use value of the object leads to inclusiveness and collaboration.

Secondary contradictions occur between the nodes of an activity system, and tertiary and quaternary contradictions occur between different activity systems. Engeström (1987) provides an example of instruments that a doctor uses in his practice. A doctor may be faced with a contradiction of how much to spend on the instruments to maintain his/her cost efficiency (i.e., a contradiction between use value and exchange value of medical instruments). The secondary contradictions (2) are those that emerge between these nodes within an activity system. According to Engeström, traditional instruments used in biomedicine (instruments) may be inadequate for diagnosing the patients with complex illnesses (object).

The tertiary contradictions (3) arise when a culturally more advanced activity within the central activity of interest introduces a more advanced object or motive. This could be illustrated with a clinic administration introducing new methods of diagnoses that run counter to the traditions of some doctors in that clinic.

Finally, the quaternary contradictions (4) exist between the central activity system and the outside activity systems. The latter could be of four types: a) an activity system of object (e.g., diagnosing and treating patients); b) a rule producing activity system (e.g., the clinic administration); c) a subject producing activity system (e.g., medical schools that prepare doctors and nurses); and d) an instrument producing activity system (e.g., a company that provides drugs and other medical instruments).

To date, some thought-provoking research has been done to investigate distance education or technology-enhanced environments through the lens of contradictions. Fåhræus (2004), Basharina (2007), Berge and Fjuk (2006), and Dippe (2006) have analyzed contradictions in activity systems in distance and online environments. Their methodologies vary from analyzing survey results for potential disruptions to working with heavily triangulated data and changing the unit of analysis from action to activity. Some other studies have looked at contradictions caused by instructional technologies in nondistance settings (Barab et al., 2002; Hardman, 2007; Russell & Schneiderheinze, 2005). Again, the researchers conceptualize contradictions slightly differently from keeping it simple to very complex.

One underlying theme in all these studies is the assumed complexity of reality. Many of them also connect contradictions to transformations in activity systems. As such, this kind of research looks for patterns of growth or failure and identifies disruptions that cause them. Murphy and Rodrigues-Manzanares (2008) offer a concise summary of many of these and other studies in terms of their scope, methodologies, findings, and implications.

This study approaches contradictions methodologically somewhat differently from many of the studies cited above. First, we go down to the levels of actions to identify specific disturbances and innovations and then map them out to the level of activity systems. Similar zooming-in-and-out approaches have been adopted by Barab et al (2002) and to some degree by Basharina (2007) and Berge and Fjuk (2006). However, this study particularly operationalizes contradictions as consistent occurrences of disturbances and innovations at the action level. We believe this approach is more justified theoretically and affords a more fine-tuned view of interactions between individual actions and their repercussions in the web of activity systems. Another new take of contradictions in this research is the focus on primary contradictions between use and exchange values. This approach allows us to explore how individual participants make philosophical decisions and how they impact central activity systems.

This case study views learners of a distance course as subjects of their own activity systems. Each activity system had its own object, that is motive that provided impetus and direction to the activity. Each subject was mediated by his or her instruments, community of classmates and instructors, division of labor, and rules outlined in the course syllabus. The activity systems of each individual student also interacted with other external activity systems including the Internet provider in the country, students' family and work, the Institute, and the government, thus creating a web of complex contradictions that led to consequences, that is transformations either positive or negative.

To this end, the study addresses the following research questions:

1. What types of contradictions arise at the four levels of the central activity systems of individual learners: primary, secondary, tertiary, and quaternary?

2. What are the consequences of the identified contradictions?

Methodology

Research conducted within the activity theoretical framework calls for a research design that would afford an in-depth study of an activity system or a constellation of interacting activity systems. A single activity system belongs to an individual subject, such as a person, or a collective subject, such as a class, school, or society. Movement from the unit of analysis of actions to that of activity is also a critical aspect of activity theoretical methodology (Barab et al., 2002; Engeström, 2001). Given that the main unit of analysis in this study is an activity system with an individual student as a subject, we opted for a case study design. A single case in this design represents a central activity system of one student taking the critical thinking bridge course. There were a total of six student cases.

Lincoln and Guba (1985) characterize this kind of research as naturalistic inquiry that typically employs qualitative methods of investigation. Many studies conducted within the framework of activity theory abide by the principles of naturalistic inquiry (Barab et al, 2002; Lantolf & Thorne, 2006; Mwanza, 2002; Nardi, 1996a, 1996b).

The Institute

Two major forces have shaped the current state of the Bahá'í Institute for Higher Education (the Institute): the persecution of the Bahá'í community by the Iranian government and the Bahá'í culture that calls for the pursuit of high quality education and positive change in society. Among the victories of this struggle are the extended academic programs at the Institute, restructuring of courses for distance or blended mode of delivery, affiliated global faculty (AGF) outside Iran, and a new curriculum for academic English delivered at a distance. This clearly makes the Institute infrastructure more independent of the physical facilities, hence less vulnerable to the detrimental activities of the government. Some Institute graduates have been able to continue their education in graduate schools outside Iran. However, because the Institute cannot be formally accredited in this country for political reasons, the potential of this education to exert influence on the lives of the young Baha'is remains embryonic.

A number of other constraints counteract the efforts of the Institute. Among them is a constant threat to the administrative body of the Institute that sometimes results in the imprisonment of key personnel. Internet services in Iran are scrutinized by the government and technically are not reliable. Because the Institute does not have a formal status, many students tend to prioritize other more tangible goals such as work and family over their Institute courses. While the distance model has attracted affiliated global faculty (AGF) teaching a wider range of courses, this shift has also introduced a new challenge. Many students come to the Institute without sufficient English proficiency to handle successfully college-level content in English. Extending the curriculum beyond the existing four years to include English preparation so far has not been an option for the Institute. Some students do end up taking degree courses in English without the expected proficiency level in English.

The Critical Thinking Course

To address some of the problems with the English proficiency level, the Institute opened a critical thinking course. It served as a bridge course between the academic English language courses and degree courses taught in English from students' major departments. As a bridge course, it pursued two goals: 1) teach critical thinking specific college-level expectations, and 2) improve students' English. The course included eight modules:

- History of Critical Thinking,
- Intellectual Attributes of Critical Thinking,
- Ethical Components of Critical Thinking,
- Faith and Critical Thinking,
- Asking Questions,
- Evaluating Evidence,
- Detecting Fallacies,
- Consensus Building and Critical Thinking.

Students completed several types of assignments throughout the course:

- a draft and final paper based on each reading assignment;
- asynchronous threaded discussions (forums);
- two optional assignments for bonus points, a wiki prewriting activity and a synchronous session (audio- or chat-based) with the instructors.

The course was delivered via Moodle and lasted 15 weeks. Due to poor Internet connectivity in Iran, and sometimes the absence thereof, the reading materials were also available on CDs.

Figure 4 summarizes some of the aspects of the setting in the form of a course taking activity system. Many features of this activity system are the same across all student participants (e.g., certain rules, such as due dates and plagiarism policy, division of labor, and technological instruments, such as Skype, Yahoo Messenger, Moodle, telephone, CDs). However, some others differ across students. Among those unstable features is the student's object.

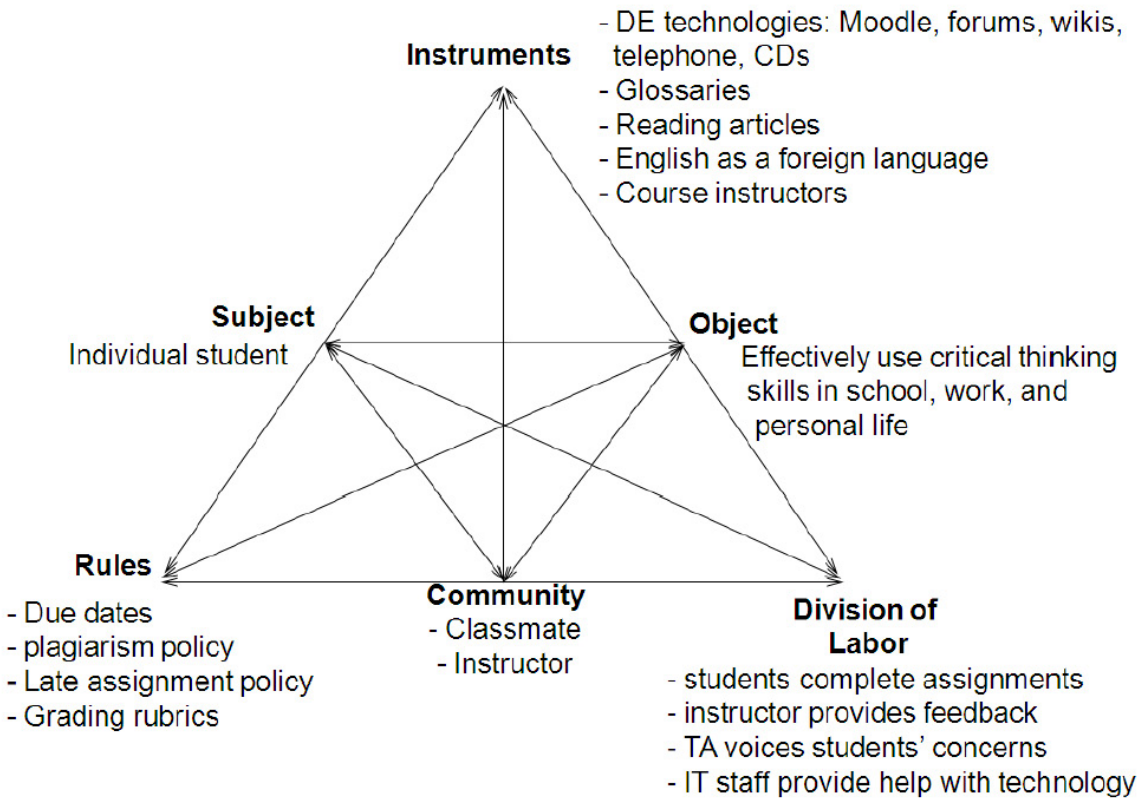

Figure 4. A generic course taking activity system.

Participants

Out of the total 68 students in the course, we selected six student participants based on a purposive sampling approach. Key criteria for ensuring maximum variation included age, gender, English-proficiency, major, and employment. Among the six students, three were male and three female; age ranged from 18 through 36 (M=23). Their English proficiency level roughly ranged from low-intermediate to advanced. All except two students majored in different academic programs: management, psychology, pharmacy, computer engineering, and biology. Three were employed and three unemployed.

Of the five instructors involved in this distance course, four taught the selected student participants. None of the instructors spoke Farsi, the students' native language. Two of them had MA degrees and two PhD degrees in areas related to critical thinking and/or English as a second language.

One of the researchers was also a course instructor. The other researcher performed administrative duties and was familiar with the inner workings of the Institute and students' academic routines. By the time data collection started, all six student participants and their instructors had established trustworthy relationships with the researchers.

Data Collection and Analysis

To ensure an accurate representation of student activity systems and their dynamics, data had to be collected and analyzed consistently throughout the semester. The following are the datasets collected and analyzed during and after the course:

- student background questionnaire,
- all student assignments submitted to the Moodle course site,
- Moodle-tracked logs to identify students' online presence and behavior,
- interactions between the student and instructor participants,
- monthly semistructured interviews with the student participants,
- an interview with the students' instructors at the end of the semester,
- researcher field-notes.

Most of the data collection and analysis took place concurrently and recursively. Overall, the study procedure can be summarized in three stages (Figure 5). The second stage involved three to four cycles of data collection and analysis procedures: 1) observing the students' online participation, 2) confirming the emerging evidence through interviews with the students, 3) interpreting preliminary contradictions and their consequences (identifying patterns of disturbances and innovations within activity systems), and 4) preparing data for member checking in the subsequent interview. Cycles 1 through 4 proceeded in an iterative manner, each lasting about two weeks. Observation of students' online participation was done through Moodle tracked data. Stage 3 took place when the critical thinking course was over and all the data were collected.

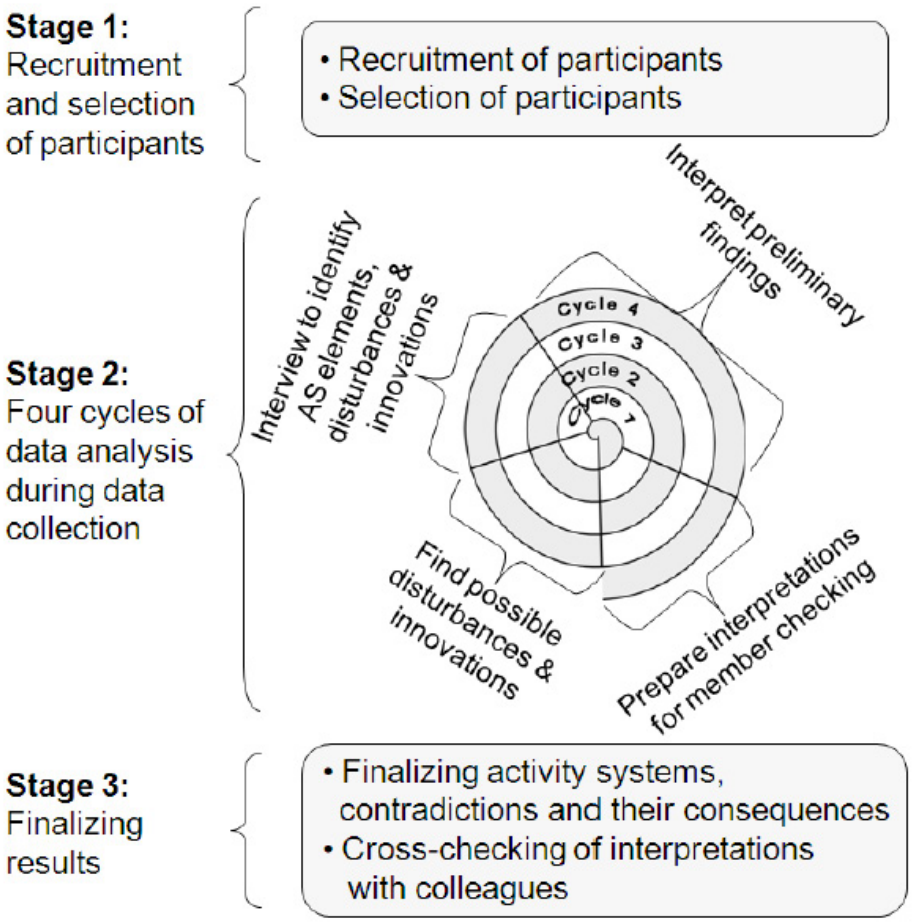

Figure 5. Three stages of data collection and analysis.

All the data were collected and analyzed in the ATLAS.ti software application. Each dataset was read and preliminarily coded as possible evidence for

- disturbances or innovations;
- elements of activity system (instruments, object, division of labor, community, and rules); and
- consequences of contradictions.

Theoretically, disturbances or innovations occur at the action level of activity systems, and if they occur consistently, they lead to underlying contradictions (Engeström, 1999a). The next step was to generate questions for the follow-up interview based on the collected data in ATLAS.ti. Finally, when the activity systems, contradictions, and their consequences were finalized in stage 3, the interpretations were cross-checked between the researchers.

Findings

Given the thick description and extended discussion of the analysis, this article illustrates the analysis of data using one of the six cases only and then draws generalized conclusions based on all six student cases. The names of the participants of the study have been changed to protect their identity.

Azita's Activity Systems

Azita, 23, was a student majoring in management. She was single, lived with her mother and father, and had a Bahá'í religious background. Her sister, who taught English, lived separately, but they saw each other twice or three times a week. While taking an average of 16 credit hours of coursework at the Institute per semester, Azita worked part-time for a computer company where she repaired computers and did related secretarial paperwork.

According to activity theory, actions performed in our daily life are poly-motivated meaning they may belong to multiple activity systems; in other words, they are driven by multiple motives or objects (Leont'ev, 1978). The boundaries between activity systems are hard to demarcate, but methodologically they could be defined by their objects. Within the critical thinking course, all student participants had multiple activity systems.

Azita was engaged in three activity systems that corresponded to the following three objects or motives: 1) learning critical thinking, 2) improving English as a foreign language (EFL), and 3) maintaining a good self-image (Figure 6).

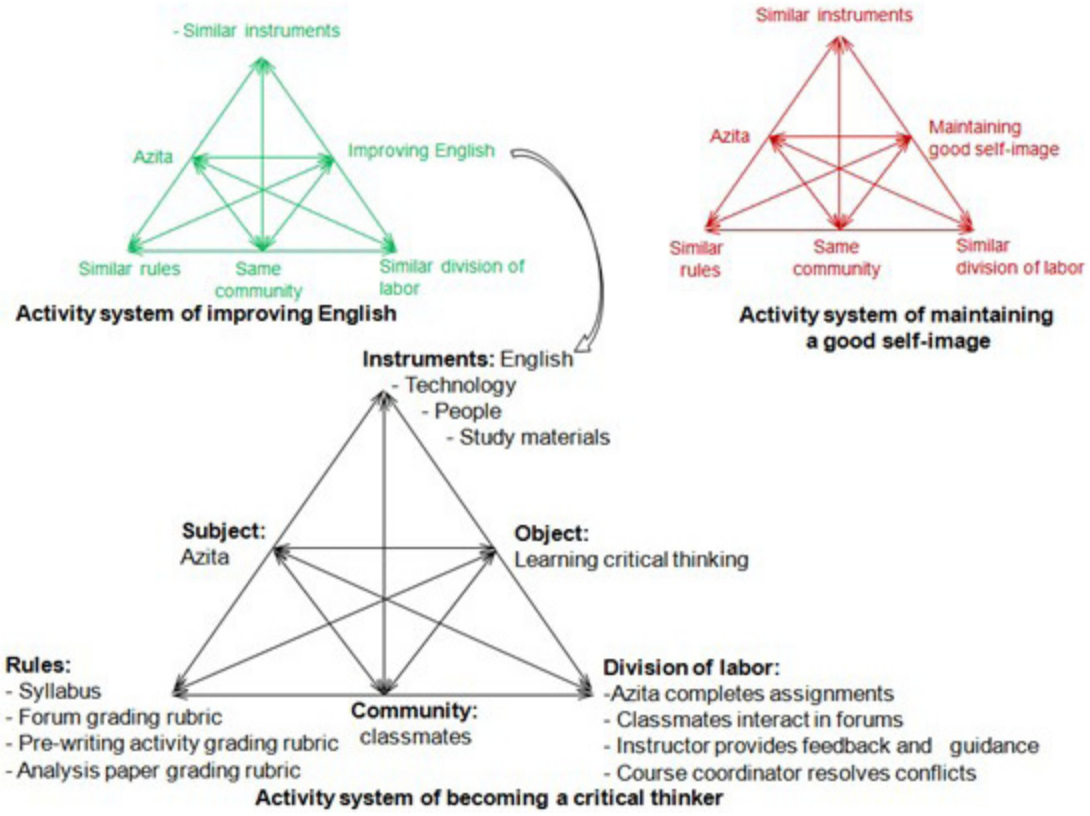

Figure 6. Azita's three activity systems in the critical thinking course.

The activity system of learning critical thinking appears more salient in Figure 6 because the original intent of the course was to teach critical thinking. In this activity system, one of the mediating instruments was English as a foreign language (EFL). This is due to the nature of the course to teach college-level content via English. This is one of the enlightening advantages of activity theory in that it is able to demonstrate that the linguistic medium of instruction in a course like that is a mediating instrument, and as such it begs for improvement if not adequate to fulfill its mediating functions. Such a dual role of certain elements as objects and instruments in two different activities is common (Engeström, 1987).

Other mediating instruments included study materials and assignments. In Azita's group, the teacher occasionally posted PowerPoint slides to facilitate their reading assignments. Assignments were also part of the mediating instruments, and they included the analysis papers for every module, three problem-solution forums, and two optional assignments: 1) prewriting assignments, and 2) conference calls.

Under the technology category, the mediating instruments included the Moodle content management system, the articles in HTML format with hyperlinked glossary items, an ADSL Internet connection, and computer-based dictionaries. Another mediating instrument in Azita's activity system is her English-speaking sister. From the interviews with Azita, it appeared that her sister acted as a help-on-demand resource.

The rules were established by the course designers through the course syllabus: course goals, objectives, topics, and the calendar. The syllabus stipulated the grading policy and due dates. For every day late, the assignment would lose 10% of the grade. The grading rubrics were also part of the rules in this course context, and they included the grading rubrics for the problem-solution forums, analysis papers, optional prewriting activities, and optional conference calls.

Finally, the community consisted of Azita's instructor and her classmates. The instructors in this course played a critical mediating role in transforming and shaping the student participants' objects.

Of the three activity systems that Azita engaged in, some maintained stability, while others changed due to contradictions. Figure 7 provides a simplified representation of the historicity of the three activity systems. Activity systems cannot possibly be represented with three activity triangles within the span of a semester because of their inherently dynamic nature. Nevertheless, this diagram gives an idea of what the student participants felt most (a large triangle) and least (a small triangle) motivated about. One can also observe that there is no growth of any of the three activity systems over time. Instead, they tend to shrink. The changing dynamics of the three activity systems and their objects are largely due to their interactions with other activity systems, a conclusion that we can draw when interpreting data based on Engeström's (2001) explication of activity theory.

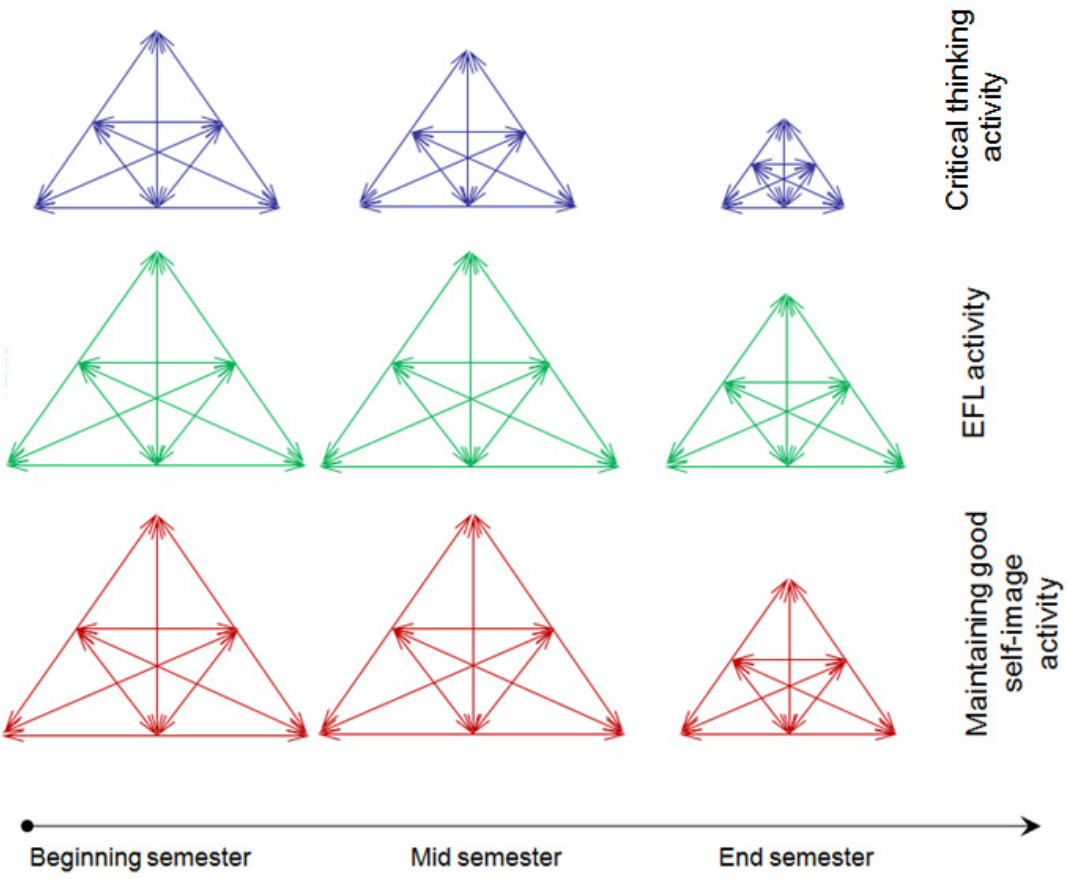

Figure 7. Illustration of the historicity of Azita's activity systems in the course.

Azita's Primary Contradictions and Consequences

One of the primary contradictions in the node of technological instruments was that between the use and exchange value of the Internet. This instrument is a pure commodity where the relationship between the use and exchange values is obvious. Azita must have made a conscious decision to purchase a high-speed Internet connection, and her decision saved her from potential secondary contradictions between the Internet-based technologies and her course-related objects.

Another primary contradiction that emerged in the data belongs to the node of community, in particular in relation to Azita's classmates. Some of Azita's initial forum posts made an impression that she was initially genuinely interested in communicating with her classmates,

> Hi Dears, As you know we are going to write some analysis papers about some specific articles. [...] Let's help each other and share ideas to do our best. I just wanted to start the discussion of pre-writing activity. I am waiting for your co-operation.

This forum post was met with a wall of silence for the rest of the semester. Her intention was to *use* her classmates' ideas to mediate her own understanding of the articles and assignments. This kind of relationship in the online community, where members share ideas that they have and receive in return helpful ideas from other members, is obviously highly desirable. However, having experienced a lack of interest from her classmates, she retreated and interacted with them minimally for the sake of the grade. In other words, this primary contradiction was primarily oriented towards the exchange value of the community.

Azita's Secondary Contradictions and Consequences

Most contradictions that transpired in this study were at the secondary level, which is also consistent with theoretical literature (Engeström, 1987, 1999, 2001).

One secondary contradiction in Azita's activity systems occurred between Azita's instrument and her object of critical thinking. EFL as an instrument prevented Azita from a smooth transformation of the critical thinking object. This contradiction was manifested through the instructor-initiated disturbances in the feedback on draft analysis papers. Some of this feedback was caused by the instructor's genuine confusion over what Azita wanted to say. Azita herself also initiated some disturbances, such as this explicit statement in her paper: "I do not understand what he [the author] means." The instructor would then follow up on such comments in her feedback. Other positive consequences of this contradiction included repeated use of dictionaries, hyperlinked glossary words, her sister's help, and, less rarely, referring to a grammar book. The most frequent way to resolve those disturbances was rereading the articles many times to gain a better understanding. When unresolved, this contradiction potentially could have impeded Azita's activity systems, which we do not have data to support.

Another secondary contradiction occurred between the rule (due dates) and Azita's objects of learning critical thinking and EFL. There were several instances of late paper submissions and two of them were caused by Azita's illness. According to the course syllabus (rule), Azita would lose 10% for every day late. In spite of this, she did not because the instructor thought it unfair to drop points for lateness because this would wrongly imply a poor quality of the paper. Thus, this particular contradiction did not lead to any consequences in Azita's activity systems.

Azita's Quaternary Contradictions and Consequences

The data show that there were two quaternary contradictions in Azita's activity systems. The first one was a contradiction between Azita's activity systems in the critical thinking course and the activity system of the Iranian government directed against the Bahá'í community in Iran. In Spring 2008, the government shut down many Institute facilities in Tehran making it impossible for many classes to meet face-to-face. Many such courses were urgently forced to go online well underprepared the same semester when this critical thinking course was investigated.

This disturbance in Azita's other online courses hastily launched that semester affected her experience in the critical thinking course. In the last interview she stated, "they [students] can't learn anything. I think it has ... bad effect on students. ...Because the Institute became online, many students don't like this university. ... I'm not learning much from online courses."

Another quaternary contradiction emerged between Azita's work at a computer company and potentially all three of her activities in the critical thinking course. The disturbances that underlay this contradiction included late submissions and poor quality of papers and forum posts. This contradiction created a secondary contradiction in Azita's course activities between the due dates (rules) and two of her course-related objects: critical thinking and EFL.

Summary of the Findings

Now that we have illustrated the data analysis and interpretation within this methodological framework, let us turn to the synthesized findings of all six student cases.

Student Objects

One general conclusion one can draw from the findings of the six cases is that five student participants had multiple activity systems in the critical thinking course. This goes back to Leont'ev's (1978) argument that actions are often poly-motivated and rarely driven by one motive alone. One of the students had only one activity system, and that is perhaps why he dropped out of the course halfway through the semester. The most obvious pattern is that most students had the objects of improving English and critical thinking. There were three participants who had either of these two objects. Two other participants had a more general object of intellectual self-development that subsumed either EFL or critical thinking learning. Clearly, a course environment with all its mediating elements fosters the emergence of certain types of objects/motives in the students.

Contradictions and Consequences

The construct of primary contradictions as a duality between use and exchange value in academic-oriented activity systems (e.g., improving English, learning critical thinking) generated some enlightening interpretations. As Engeström (1987) suggests, exchange value orientation leads to student alienation and lack of genuine learning motives in their activity systems, while use value orientation produces self-motivated, collaborative, and critical learners. Most participants shifted from being use value-oriented to exchange value-oriented. Sadly, the course overall was not conducive to orienting the students towards use value. Many reasons for this unfavorable transformation are traced to the role of the rules in the activity systems and the exchange value orientation of individual classmates.

Another interesting finding is that when a participant had an exchange value orientation to the object of learning (i.e., for the sake of the grade), such orientation would spread to the community and rules of the activity system. Simply put, a grade orientation towards

learning promoted individualistic learners who bend to the rules, such as a grading policy, and become regulated by them. The data provided evidence for three nodes of the activity system: 1) community, 2) rules, and 3) instruments. The latter did not seem to be affected by the orientation in the object possibly because these instruments were pure commodities, such as the Internet and the content management system.

This study confirms Engeström's (1987) argument in that secondary contradictions are the engine of development. All primary and quaternary contradictions inevitably led to secondary contradictions. This course produced a number of consistent secondary contradictions. First and foremost is the contradiction between the insufficient English proficiency of the students and their objects. All six participants had this contradiction, and it resulted in a number of anticipated and innovative transformations, which ultimately engaged students more actively in the use of English.

The next most typical contradiction was between due dates and students' objects. In most cases, this contradiction was resolved by the instructors who adjusted the rule and did not penalize the students for late submissions. However, because this secondary contradiction was primarily caused by quaternary contradictions (e.g., work, family, and government activity against Baha'is in Iran) that could not be negotiated and resolved, their consequences were drastic. These consequences always caused considerable weakening of the object, which manifested itself in the participants' frustration and diminished quality of work. It also resulted in the shift of the orientation from use to exchange value

Three participants had a secondary contradiction between a poor Internet connection and their objects. More often than not this contradiction was caused by the quaternary contradictions coming from the activity system of the local Internet provider. Sometimes it was combined with the primary contradiction between use and exchange value of the Internet connection. This contradiction was resolved by a reduced use of the Internet which in turn negatively affected the transformation of the participants' objects. A few students experienced contradictions with distance technologies as instruments. Asynchronous means of communication such as forums and email were not appealing because of the missing immediacy of responses. Synchronous means of communication, such as Skype, Yahoo! Messenger, or the phone bridge, were not satisfactory because of the poor Internet connection and inflexibility with scheduling the calls. The data showed that this contradiction did not lead to any positive transformations, but instead led to reduced engagement in the course assignments and students' frustration.

Discussion and Conclusion

Activity theory as a qualitative naturalistic method of inquiry offers some insights that could otherwise have been left unnoticed.

First, at the surface level, five student participants successfully completed the critical thinking course. However, if we apply the constructs of activity motive/object, use and exchange value orientation, and activity systems, the reality emerges in a different light. The students

who originally were genuinely interested in learning the content, by the end of the course worked only towards their grades. The only student participant who failed this and many other courses that semester did so because he remained use value oriented and naturally refused to work in exchange for a grade when external circumstances (i.e., his work) prevented him from doing so.

From this perspective, the course was not a success, and we wonder if this may be the case with many other distance courses at the Institute where time and space separate the instructors from the students and create an illusion of success reflected in conventional course grades.

Second, the construct of contradictions allowed an in-depth and meaningful analysis of a complex web of relationships starting from the level of student motives to external forces beyond the Institute. At present, the Institute seems to be overburdened with the pressures caused by the government and poor Internet services. Some contradictions lead to successful transformations and take the activity systems of the Institute to new cycles of growth. Yet many others seem to have a detrimental effect on the activity systems of the Institute as well as individual students and instructors. A major cause of this disruption at this point seems to be the forced restructuring of courses for the online mode of delivery. We see several possible scenarios where the Institute could break this contradiction and start a new cycle of growth. The Institute graduates are already accepted in some well-recognized accredited universities outside of Iran. However, if the Institute could find a system to validate their students' degrees such that they become recognized at the international level, it would enable the graduates not only to have more opportunities for work but also to continue in their academic careers more easily. This could give a more tangible motive, that is a use value orientation to students', faculty's, and administration's actions. Two other hypothetical resolutions could come from outside of the Institute: a dramatic change in the current governmental affairs of the country or a dramatic change in current technologies that could solve the many connection disturbances in Iran.

One final comment specific to the theoretical constructs and this particular case study concerns the nature of activity systems. Prior to starting the case study, we expected to be analyzing students' *course taking* activity systems. What transpired from the data is that none of the students had a course taking activity per se. Instead, the course acted as a favorable environment to sustain students' own activities. In Azita's case, those were improving English, learning critical thinking, and maintaining a good self-image. Theoretically, it makes sense. Boundaries between activity systems are defined by students' objects or motives. Being motivated by an object of taking a course does not quite make sense. Hence, we propose a concept of an *activity shell* to denote such a ready-made, prepackaged environment that includes all the elements of an activity system except for the subject and object. Most courses in modern school-going often represent such shells in that they have a predesigned structure, where students bring in their existing objects, develop new ones, or simply perform a number of isolated actions not oriented towards any object, much like Engeström (1987) suggests. Forcing students to conform to the structure of an activity system shell is somewhat opposite to the organic formation of human activity in that it is not constructed

by the subjects of the activity.

If schools and individual courses are activity shells where students get busy transforming their own objects, educators and school administrators may need to reflect on how to match those mediating elements in the activity systems (i.e., instruments, division of labor, community, and rules) to better transform the objects that their students bring to school.

This theoretically conceptualized insight has in fact found its manifestation in many distance courses and schools that have adopted more of an open education approach to their curriculum, content, and technology. The Institute in Iran has taken steps towards adopting this philosophy by opening its doors to all applicants and by removing many of the gatekeepers such as standardized tests, entrance exams, previous experience, and the like. It seems to us that the Institute could resolve many of the deadly contradictions in its activity systems if it moved more in the direction of open philosophy in terms of content, knowledge, and technology, as current literature suggests (e.g., Brown & Adler, 2008; Caswell, Henson, Jensen, & Wiley, 2008; Iiyoshi & Kumar, 2008). One particular example of such emerging developments is OpenClass, a learning management system produced by Pearson and Google, that aims to bring the open philosophy to blended and distance education. A distance school with an activity system shell that adheres to open philosophy may be more successful in mediating their students' objects towards the use value while at the same time withstanding the oppressive forces from the outside.

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The Relationship between Flexible and Self-Regulated Learning in Open and Distance Universities




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Abstract

Flexibility in learning provides a student room for volitional control and an array of strategies and encourages persistence in the face of difficulties. Autonomy in and control over one's learning process can be seen as a condition for self-regulated learning. There are a number of categories and dimensions for flexible learning; following professional publications, time, location, lesson content, pedagogy method, learning style, organization, and course requirements are all elements to consider. Using these categories and the dimensions of flexible learning, we developed and validated a questionnaire for an open and distance learning setting. This article reports on the results from a study investigating the relationship between flexible learning and self-regulated learning strategies. The results show the positive effects of flexible learning and its three factors, time management, teacher contact, and content, on self-regulated learning strategies (cognitive, metacognitive, and resource-based). Groups that have high flexibility in learning indicate that they use more learning strategies than groups with low flexibility.

Keywords*:* Self-regulated learning; flexible learning; autonomous learning; distance education

Introduction

Flexible learning is frequently lionized in arguments for individualization in the teaching and learning process (Collis & Moonen, 2001). It is also often linked with the use of media and new information and communication technologies (Chen, Kao, & Sheu, 2003; Sims, 2003). Another frequently mentioned claim proponents make in many universities is the improved ability to correctly deal with student heterogeneity in learning preconditions such as preknowledge, motivation, or learning skills (Cornelius & Gordon, 2008). This notion of flexible learning seems to assert that greater flexibility is a way to cope with the upcoming changes to the education system (Bates, 2001). In an early attempt to explain this approach, Van den Brande (1993) describes flexible learning as "enabling learners to learn when they want (frequency, timing, duration), how they want (modes of learning), and what they want (learners can define what constitutes learning to them)" (p. 2). But if we try to define more precisely what flexible learning constitutes from an educator's point of view, the description of the individual learning process becomes too imprecise. Together with Jakupec and Garrick (2000), we think that it is difficult to generally define flexible learning. Nevertheless, some characteristics that most definitions of flexible learning have in common are already listed here: students should be active and constructive learners, as opposed to passive recipients (Mason, 1994; Mayer, 1999); there should be more learner-centration instead of teacher-centration (Lea, Stephenson, & Troy, 2003; Moran & Myringer, 1999); and learning resources should meet the needs of the learner (Van den Brande, 1993; Bridgland & Blanchard, 2001). Based on this student-centered perspective, we argue that the adaptability of learning to learners' needs and circumstances (Bowles, 2004), and therefore the provision of choice, is a key element of flexible learning (Collis & Moonen, 2001; Jochems, Merriënboer, & Koper, 2004). This implies that flexible learning requires learners to already possess skills of autonomous and self-regulated learning in order to engage effectively in learning activities that are open in terms of time, pace, and content. It is, in other words, fundamental for educators to help learners develop the ability to be "self-directed" when offering flexible learning (Sadler-Smith & Smith, 2004).

Our aim in this article is to investigate the concept of flexible learning in open and distance learning (ODL) and to observe its relationship to learning strategies in the context of self-regulation. Our argument is based on the considerations mentioned above, the fact that flexible learning is a core issue for distance education (Bates, 2001) and also for the recently introduced ICT (Guri-Rosenblit, 2005) and mobile learning in schools (Peters, 2009). We expect to obtain a set of indicators that enable students to engage in flexible learning by using self-regulated learning strategies in ODL.

Flexible Learning

Some authors view the difficulty of defining flexible learning and the variety of its descriptions as an advantage because it allows them to use their own interpretation in specific practical contexts (Bridgland & Blanchard, 2001; Cornelius & Gordon, 2008). In contrast to this, however, Collis and Van der Wende (2002) point out that particularly when implementing flexible learning in practice vagueness of any kind is not desirable, and even counterproductive. In fact, it is evident that implementing flexible learning strategies in

specific lessons involves addressing many dimensions and presents diverse problems and challenges. It is exactly because flexible learning has manifold characteristics that we require articulate terms and measurable objectives for improving progress and success. In order to develop a relevant set of indicators, we must try to establish categories and dimensions of flexible learning. Among these, we identify the provision of choice as a key element of flexible learning (Collis & Moonen, 2001; Jochems et al., 2004). Collis, Vingerhoets, and Moonen (1997) provided one of the widely adopted flexible learning concepts in ODL. According to them, we should regard categories of flexible learning as grouped dimensions in order to study the flexible attributes of learning activities in comparison to those that are fixed. The dimensions themselves constitute subscales of the categories. Collis et al. (1997) grouped 19 dimensions of flexibility into five categories: (1) time, (2) content, (3) entry requirements, (4) instructional approach and resources, and (5) delivery and logistics. Van den Brande (1993) postulates only three categories based on enabling learner decisions: what, when, and how they want to learn. This simple comparison shows the diversity of flexibility concepts researchers have already developed. In more recent research, investigators focused less on learners' decisions (user perspective) and more on offering possibilities of choice with the support of information and communication technologies. These included participation, access, progression, assessment, learner control, learning technology, resources, learner support, and web technology (Zimitat, 2002). Investigators also offered flexibility in time and place, open entry, choice of learning style, pace and collaboration, alternative entry and exit points, and choices in content and assessment (Ling et al., 2001).

In this varied learning flexibility research, we found two studies that tried to clear the air with an empiric investigation. Arbaugh (2000) used eight items to record the perceived flexibility of the learning processes used by 97 MBA students. Based on an exploratory factor analysis, he postulates two factors: course flexibility and program flexibility. De Boer and Collis (2005) tried also to find factors of flexibility in instructor choices with an exploratory factor analysis based on the findings of Collis and Van der Wende (2002) when they postulated there were 12 aspects of instructor's choices. They derived these aspects from a questionnaire answered by 347 instructors in an international study that included nine countries. De Boer and Collis (2005) found only two factors of significance, one related to instructors' decisions in setting up a course, or "planning flexibility," and the other related to the learning setting, called "interpersonal flexibility." These findings confirm our belief that dimensions have several facets of flexible learning that can be combined into categories of theoretical assumptions. Looking at one of the key elements of flexible learning, that learners themselves make choices in self-regulated learning, we are convinced that an empiric investigation of this topic also must be done from the learners' perspective. Since, as Normand and Littlejohn (2006) remind us, "the literature contains little hard, empirical evidence concerning programmes that increase learner's choice" (p. 9), we decided to develop an instrument that included both their conclusion (that is, the need for more empirical evidence) and the learners' perspective when determining the flexibility of learning activities (Bishop, 2002; Willems, 2005). For the first step, we performed a comprehensive literature analysis for the concept of flexible learning. We found 22 dimensions that could be grouped into seven categories (Bergamin, Ziska, & Groner, 2009). Table 1 shows an

overview of the flexibility categories, their dimensions, and the relevant authors.

Table 1

Overview of Categories and Dimensions of Flexible Learning

Categories	Dimensions
Time (Van den Brande, 1993; Collis et al., 1997; Goodyear, 2008; Ling et al., 2001)	• Time of learning • Duration of learning • Teaching time • Pace of learning
Space (Goodyear, 2008; Ling et al., 2001)	• Delocalization
Methods (Collis et al., 1997; Ling et al., 2001)	• Learning place • Learning resources • Language
Learning styles (Van den Brande, 1993; Ling et al., 2001)	• Individual work vs. group work • On-campus study, online study, self study • Learning strategies
Content (Van den Brande, 1993; Collis et al., 1997; Ling et al., 2001)	• Individual work vs. group work • On-campus study, online study ,self study • Learning strategies
Organization and infrastructure (Arbaugh, 2000; Collis et al., 1997; Hart, 2000)	• Combination of study, work, family • Communication between student and teacher • Information and communication technology • Technical infrastructure • Logistics of learning material
Requirements (Collis et al., 1997; Hart, 2000; Ling et al., 2001)	• Entry requirements • Forms of examination • Time of examination

Based on the literature analysis, we generated 42 items relating to dimensions. Ten experts revised the comprehensibility of these items. Three hundred and nine students (from semester 1 and 3) studying in a traditional degree program (a BSc in Psychology) at a central European university filled in the questionnaire in December 2008. We used an exploratory factor analysis (PCA with varimax rotation) that led to a solution with three fixed factors: flexibility of time management, teacher contact, and content. The explained variance of this model was 49%, which we considered satisfactory. The following item analysis of the three factors showed Cronbach's alpha was .74 for the time management scale, .70 for teacher contact, and .57 for content.

Flexible and Self-Regulated Learning

Another concept describing the characteristics of learner choices within learning processes is self-regulated learning (SRL). Knowles made one of the first attempts to define SRL, calling it "a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating goals, identifying human and material resources, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (1975, p. 18). With this definition, Knowles clearly regarded SRL as a complex learning process that makes high demands on students for choices (Boekaerts, 1997; Winne & Perry, 2000). Moreover, several studies and articles point out that SRL in particular makes high demands on learning skills. For example, Dabbagh and Kitsantas (2004) found this was the case in web-based learning environments, Dillon and Greene (2003) found it in distance education, Evensen, Salisbury-Glennon, and Glenn (2001) found it in problem-based curricula, and Schunk (2005) found it in relation to motivational factors of learning. All these studies considered learning skills to be crucial to the application of learning strategies for tasks that must be mastered (Lind & Sandmann, 2003). Paris and Paris (2001) pointed out that the phrase "self-regulated learning" "emphasizes autonomy and control by the individual who monitors, directs, and regulates actions toward goals of information acquisition, expanding expertise and self-improvement" (p. 89).

Like these authors, we adopted the position of Zimmerman (2000), who maintained that self-regulation corresponds with independently generated thinking, feeling, and connecting to the adaptation of personal objectives. In this context, he postulated cyclical phases of self-regulation consisting of a forethought phase, performance or volitional control phase, and a self-reflection phase (Zimmerman, 1998). The forethought phase consists of two closely linked components: task analysis (setting goals and strategic planning) and self-motivation beliefs (self-efficacy, outcome expectations, intrinsic interest, and goal orientation). This phase of the self-regulatory learning process coincides closely with flexible learning categories for student decisions about what, when, and how to learn (Van den Brande, 1993) or different learning contents (e.g., media or material types) based on their own learning style preferences or situations (Collis et al., 1997). Relying on this, we postulate a relationship between flexible and self-regulated learning. Besides, there are more studies pointing in the same direction. Turner (1995), for example, declared that ODL environments give the learner increased volitional control, motivation to use learning strategies, and persistence when confronted with problems. Deci, Vallerand, Pelletier, and Ryan (1991) pointed out that SRL and flow (Csikszentmihalyi, 1991) supports the experience of autonomy and self-determination. More recent studies concerning flexible and self-regulated learning indicated that hypermedia and new information technology plays an important role in SRL (Chen, 2009; Heiß, Eckhardt, & Schnotz, 2003; Tergan, 2002). Other researchers also observed that online learning environments enable students to experience autonomy (Barnard, Lan, To, Paton, & Lai, 2009) by allowing them to decide when, where, and what they can learn (Cunningham & Billingsley, 2003).

Here we agree with Schraw (2007) that the experience of autonomous and flexible learning promotes self-regulation in students. In other words, flexible learning leads to a learning

situation where students set their own objectives and plan, regulate, and evaluate the learning process themselves (Narciss, Proske, & Koerndle, 2007). This finding and the awareness that flexible learning needs further empiric investigation from a learner's perspective led us to validate the questionnaire measuring it in the context of ODL and to observe its relationship to self-regulated learning.

To validate our questionnaire measuring flexibility in the open and distance education context, we conducted a survey in spring 2009. Out of 470 students, 179 (a 38% response rate) from the German-speaking Distance University of Applied Sciences participated. Participants' ages ranged from 20 to 50 years, with an average of 30 years; 53 (30%) were females. The questionnaire was adapted into an online survey for distance learning students. The perceived flexibility was estimated by means of a five-point Likert scale ranging from 1 = *not true at all* to 5 = *completely true*.

A confirmatory factor analysis with a maximum likelihood estimator, the same scale structure Bergamin et al. (2009) used in a prestudy, turned out to be unsuitable for our study on the grounds of certain fit indices (X^2/df = 1.88; NFI = .84; RFI= .80; CFI= .92; RMSEA= .070). We successively eliminated items to find a suitable and more economical structure. The X^2 of this model was not significant (X^2 = 27.31; df = 24). All fit indices were adequate (X^2/df = 1.14; NFI = .94; RFI = .91; CFI = .99; RMSEA = .028). We replicated the same analysis with the new sample (N = 412) and found a very similar result: all fit indices were adequate (X^2/df = 2.25; NFI = .93; RFI = .90; CFI = .96; RMSEA= .055). However, the X^2 was significant (X^2 = 53.89; df = 24). But in a model with more than 200 subjects, the significance of the X^2 can be disregarded if other indices indicate that the model is acceptable (Kenny, Kashy, & Cook, 2006; Schumacker & Lomax, 2004).

The present model with nine items is not considerably different from the original with 13 items, fits better with regard to the empirical data structure, and is more economical. Table 2 shows the scales with the corresponding items, means, standard deviations, and the internal consistency.

Table 2

Means, Standard Deviation, and Internal Consistency (Cronbach's alpha, Maximum Likelihood Method) of the Three Scales of Perceived Flexibility in Learning Environments (Confirmatory Factor Analysis, N =179; items and scales were translated from German to English by the authors)

Scale of flexibility	Item	Mean	*SD*
Flexibility of time	I can decide when I want to learn	4.02	0.98
management	I can define my own learning pace	3.75	1.16
	I can repeat the subject matter at will	3.60	1.13
	I can arrange the learning time (-)	3.83	1.13
	The learning pace is determined* (-)	2.52	1.06
Cronbach's α: .73	I can decide how long my learning time lasts (-)	4.08	1.10
Flexibility of teacher	I can contact the teacher at any time	3.75	1.10
contact	There are different ways of contacting the teacher	3.58	1.06
Cronbach's α: .76	Teachers are rarely available to answer questions*	3.62	1.11
Flexibility of content	I have a say regarding the focus of the topics of the class	2.20	0.98
	I can prioritize topics in my learning	2.80	1.30
	I can choose between different learning forms including on-campus study, online study, and self-study (-)	2.39	1.22
Cronbach's α: .63	I can study topics of special interest	3.25	1.15

*The polarity of the items has been reversed for the evaluation. (-) These items were omitted in the final questionnaire.

Method

Hypotheses

The three factors, flexibility of time management, teacher contact, and content, were evaluated in a traditional learning setting (prestudy) and in an open and distance education program. Researchers have frequently postulated that the realization of flexibility in distance learning, previously achieved only through organizational measures, is now possible with the use of hypermedia and new e-learning environments. This is what distinguishes modern distance learning from traditional on-campus tuition.

In this context, the self-regulation of learning is an important issue. Kaufmann (2004) asserted that students in an e-learning environment have to be highly self-regulated to be effective learners. Barnard et al. (2009) declared that self-regulation is a critical success factor for learners working in online learning environments. Chang (2007) demonstrated

that self-monitoring strategies are helpful for students when adapting approaches to their learning environment and improving learning, motivation, and self-regulation. This view related to Bandura's (1986, 1997) social cognitive perspective, which Zimmerman and Schunk (2001) also used to postulate that the ability to self-regulate develops in a cyclical nature through interactions of personal, behavioral, and environmental factors. After examining SRL strategies in an online learning environment, Ally (2004) posited a relationship between self-regulation ability and an individual's realization that the environment requires autonomous learning.

Zimmerman (1989, 1998) even argued that personal choice and subsequent control are defining conditions for SRL, and Hannum and McCombs (2008) designated them as key issues in the intrinsic motivation of distance learners. In addition, Zimmerman and Schunk (2001) ascertained that self-regulatory skills develop over time and that the source of influence appears to shift from environmental to personal factors. These observations led us to postulate a positive relationship between the flexibility of learning and the reported SRL strategies of students. We proceeded by examining the relation between perceived flexibility of learning and SRL by observing whether distance learners who perceive a comparatively high degree of flexibility for all the three factors also report a comparatively high degree of SRL.

Given that we have postulated a positive relationship between flexible learning and SRL-strategy, we formulated the hypotheses as follows: Perceiving high flexibility in learning of (H_1) time management, (H_2) teacher contact, (H_3) content, and (H_4) the overall score of flexibility in learning provides significant positive effects on the reported cognitive, metacognitive, and resource-based learning strategies.

Participants

We contacted 1,221 students from two central European distance universities and a university of applied sciences. Four hundred and twelve participated in the survey, a response rate of 34%. From these, 27.9% (115) and 28.9% (119) were studying at one of the faculties of the distance universities and 43.2% at one of the departments of the Distance University of Applied Sciences. Males made up 54% (221) and females 46% (191) of the sample. Participant ages ranged from 20 to 81 years, with an average of 35 years.

Measuring Instruments

As illustrated in this article and by Bergamin et al. (2009), flexibility in learning can be measured by three factors. For the current study, we used the nine-item version of our questionnaire (see Table 2), with acceptable reliabilities. The internal consistencies (Cronbach's alpha) of this sample (N = 412) were also acceptable, with α = .70 for flexibility of time management, α = .70 for teacher contact, and α = .60 for content. For researchers hoping to measure SRL strategies and get a general overview of learning habits, questionnaires are an economical option (Spörer & Brunstein, 2006; Veenmann, 2005). In Anglo-American studies, the *Motivated Strategies for Learning Questionnaire* (MSLQ) (Pintrich, Smith, Garcia, & Mckeachie, 1993) is often used. For German-speaking student samples, the MSLQ-based questionnaire *Lernstrategien im Studium* (LIST) is suitable (Wild & Schiefele, 1994). The

LIST questionnaire contains three dimensions of learning strategies: cognitive, metacognitive, and resource-based. The reliability of the scales ranges from acceptable to good. Wild and Schiefele (1994) reported the following indicators for (a) cognitive strategies: organizing (α = .82), elaboration (α = .72), critical inspection (α = .77), and repetition (α = .73); (b) metacognitive strategies: metacognitive strategies (α = .64), effort (α = .74), and attention (α = .90); and (c) resource-based strategies: time management (α=.83), learning environment (α = .71), learning with other students (α = .82), and literature (α = .72). In this study we used the three dimensions. The internal consistencies (N = 412) were α = .89 for cognitive strategies, α=.65 for meta-cognitive strategies, and α = .83 for resource-based strategies.

Procedure

For our investigation, we constructed an online version of the questionnaire by randomly mixing the items of the flexibility and LIST questionnaires. We used the software program Unipark 6.1 to develop and distribute the online version. In late spring 2009, we asked students from two central European universities and the University of Applied Sciences to fill out the questionnaire. Data were analyzed with PASW 18.

To perform an ANOVA, first the means of the relevant scales (cognitive, metacognitive, resource-based learning strategies; flexibility of time management, teacher contact, and content; and overall flexibility) were calculated. We used the classification criterion percentiles to divide the sample into three mostly equal groups (high, medium, and low flexibility) and calculated an ANOVA to analyze the differences. We performed a nonparametric Kruskal-Wallis one-way analysis of variance when a Levene's test indicated nonhomogenous variances across groups. To evaluate the direction of the differences, Tukey's HSD post hoc analysis was applied.

Results

Descriptive Statistics

Table 3 shows the distribution of groups for the flexibility scales, and Table 4 shows the interaction of flexibility groups with the reported learning strategies.

Table 3

Group Sizes, Means, and Standard Deviations of Flexibility Scores for Each Group, Given Learning Environment Flexibility Ratings of High, Medium, or Low

Scale of flexibility	Rating of flexibility	*N*	Mean	*SD*
Flexibility of time management	Low	161	2.95	.75
	Medium	64	4.00	.00
	High	187	4.66	.27
Flexibility of teacher contact	Low	104	2.46	.64
	Medium	117	3.49	.17
	High	191	4.44	.38
Flexibility of content	Low	88	1.63	.47
	Medium	139	2.53	.16
	High	185	3.46	.47
Overall score of flexibility	Low	131	2.68	.53
	Medium	157	3.49	.19
	High	124	4.18	.23

Table 4

Group Sizes, Means, and Standard Deviations of the Dimensions of Learning Strategy Scores for Each Group, Given Learning Environment Flexibility Ratings of High, Medium, or Low

Scale of flexibility	Rating of flexibility	Learning strategies	*N*	Mean	*SD*
Flexibility of time management	Low	Cognitive	161	2.88	.71
		Metacognitive		2.95	.67
		Resource-based		3.12	.78
	Medium	Cognitive	64	2.91	.69
		Metacognitive		2.97	.67
		Resource-based		3.24	.79
	High	Cognitive	187	3.15	.58
		Metacognitive		3.14	.48
		Resource-based		3.47	.65
Flexibility of teacher contact	Low	Cognitive	104	2.85	.85
		Metacognitive		2.84	.78
		Resource-based		3.11	.95
	Medium	Cognitive	117	2.97	.60

		Metacognitive		3.02	.58
		Resource-based		3.26	.68
	High	Cognitive	191	3.12	.57
		Metacognitive		3.15	.45
		Resource-based		3.42	.61
Flexibility of content	Low	Cognitive	88	2.84	.74
		Metacognitive		2.94	.73
		Resource-based		3.13	.85
	Medium	Cognitive	139	2.93	.68
		Metacognitive		2.98	.58
		Resource-based		3.19	.76
	High	Cognitive	185	3.15	.57
		Metacognitive		3.13	.52
		Resource-based		3.46	.63
Overall score of flexibility	Low	Cognitive	131	2.83	.72
		Metacognitive		2.92	.68
		Resource-based		3.08	.80
	Medium	Cognitive	157	2.99	.66
		Metacognitive		2.91	.63
		Resource-based		3.08	.75
	High	Cognitive	124	3.21	.53
		Metacognitive		3.18	.40
		Resource-based		3.52	.59

Analysis of Variance

As previously mentioned, the first step in the analysis of variance was to evaluate the variety of standard deviations for the relevant strategy variables within the flexibility scales. The data provided in Table 5 show significant effects concerning a violation of the homogeneity for all variables on the scale of flexibility for teacher contact and the variable resource-based strategies in all the scales. The other variables fulfill the homogeneity requirement.

Table 5

*Flexibility Scales, Learning Strategies, Levene Scores, and Significance Levels (*sign. < 0.05; ** sign. < 0.01)*

Scale of flexibility	Learning strategies	Levene statistics	*P*
Flexibility of time management	Cognitive	0.75	.473
	Metacognitive	0.67	.512
	Resource-based	1.94	.144
Flexibility of teacher contact	Cognitive	3.53	.030*
	Metacognitive	3.53	.030*
	Resource-based	6.32	.002**
Flexibility of content	Cognitive	1.34	.263
	Metacognitive	1.50	.224
	Resource-based	2.93	.054
Overall score of flexibility	Cognitive	0.80	.452
	Metacognitive	1.08	.342
	Resource-based	4.40	.013*

Regarding the flexibility of time management, findings from the ANOVA revealed significant effects for all three SRL strategies: cognitive, (F[2,409] = 8.38, p = .000), metacognitive, (F[2,409] = 9.86, p = .000), and resource-based (F[2,409] = 5.10, p = .007). In addition, the findings for flexibility of content show significant differences between groups for the relevant strategy types on the cognitive (F[2,409] = 8.40, p = .000), metacognitive (F[2,409] = 8.26, p < .000), and resource-based levels (F[2,409] = 4.18, p = .016). We found significant effects in the context of the overall flexibility score for the cognitive (F[2,409] = 10.67, p = .000) and metacognitive strategies (F[2, 409]=11.89, p = .000). A Tukey's HSD post hoc analysis shows that in groups with high perceived flexibility in learning, more cognitive (p < .010), metacognitive (p < .010), and resource-based strategies (p < .050) were reported than in the groups with low perceived flexibility. This implies that we can accept H_1 and H_3. To obtain high discrimination power, we have observed and will later discuss only the groups that rated high or low flexibility scores. However, it is also worth mentioning that from 16 possible comparisons of groups from medium-to-high flexibility respective of low flexibility, two were significant at a level of p < .010 and four at a level of p < .050.

With regard to H_4, the groups that perceived high overall flexibility reported more self-regulation for cognitive and metacognitive strategies. Owing to a violation of the homogeneity prerequisites, we could not confirm this finding for the resource-based strategies. More-

over, with regard to the flexibility of the teacher contact factor (H_2), the prerequisite of homogeneity was not met. Within the scope of the overall score of flexibility, Kruskal-Wallis tests provide evidence of a significant difference in resource-based strategies (X^2[2,412] = 12.35; p = .002) between high and low flexibility. In addition, significant effects were found in the flexibility of the teacher contact factor for cognitive (X^2 [2,412] = 7.26; p = .027), metacognitive (X^2 [2,412] = 9.16; p = .010), and resource-based strategies (X^2 [2,412] = 14.15; p = .000). To perform a further post hoc analysis of the three groups (high, medium, and low perceived flexibility), we applied a pairwise analysis for the relevant variables. Furthermore, the α-level was adjusted with a Bonferroni correction (Girden, 1992). This implies $\alpha_{cor} = \alpha/3$, $p > .017$, respectively. In the context of the overall score of flexibility, data from the resource-based strategies show significantly higher scores (p = .000) for the group perceiving high flexibility, as measured on a nonparametric level by the modified α-level. For the means of the group perceiving high flexibility in teacher contact, the data show the same significant differences compared to the group perceiving low flexibility in teacher contact for metacognitive strategies (p = .011) and resource-based strategies (p = .000). H_2 could be confirmed in this sample for all but the cognitive strategies (p = .038) in the scope of flexibility of teacher contact.

Discussion

The results indicate there is evidence supporting the efficacy of flexible learning in ODL settings. Flexibility, subdivided into factors of time, content, and teacher contact, has also been confirmed with a different sample (traditional and distance learning university students). The reliability indicators of the results can be classified from acceptable to good. Regarding economy in the use of items, we could shorten the questionnaire to nine questions. We were surprised not to find a flexibility factor for place or localization in two investigations with different samples (students from both a traditional university and the Distance University of Applied Sciences), even though geography has been determined relevant in several studies (Bridgland & Blanchard, 2001; Cornelius & Gordon, 2008; Jochems et al., 2004). Nonetheless, the two factors of content and time appear in different concepts of flexible learning (Van den Brande, 1993; Collis & Moonen, 2001; Collis et al., 1997; Ling et al., 2001). Other researchers like Moran and Myringer (1999) and Hill (2006) have rated the role of the teacher to be an important issue for flexibility. The key element of all these factors is what Collis and Moonen (2001) call the *provision of choice*. This provision is similar to the notion that learners have the ability to control their choices in relation to their learning. Hence, with this study, we tried to contribute an empirical investigation of this process. Being aware that flexible learning relates to context-specific processes (Collis & Moonen, 2001; Collis et al., 1997), in the first phase of our study we intended to examine the general context-independent dimensions of flexibility, that is the learning setting, which constitutes a precondition for fostering (instead of constraining) flexibility in university-level learning. We implied this perspective by combining our approach to the three factors of flexibility of learning environments with an approach to SRL.

Barry Zimmerman wrote a trend-setting article in this field in 1989. In his triadic analysis of

SRL, he described the interrelations between people, the environment, and self-regulated behavior from a social-cognitive perspective. Later studies (e.g., Barnard, Paton, & Lan, 2008; Pintrich & De Groot, 1990; Zimmerman & Schunk, 2001) confirm this analysis in the sense of the context-specificity of SRL. This context-specificity is confirmed in our study, which shows a positive relationship between the perceived flexibility of learning and SRL strategies in an ODL setting. Furthermore, significantly higher scores in the reported use of cognitive, metacognitive, and resource-based learning strategies in groups that perceive high flexibility in time, content, and teacher contact (see Figure 1) can be seen in nearly all cases.

In one exception, flexibility of teacher contact, we did not find a significant difference (p = .038, Bonferroni-corrected) between groups reporting a high use of cognitive strategies.

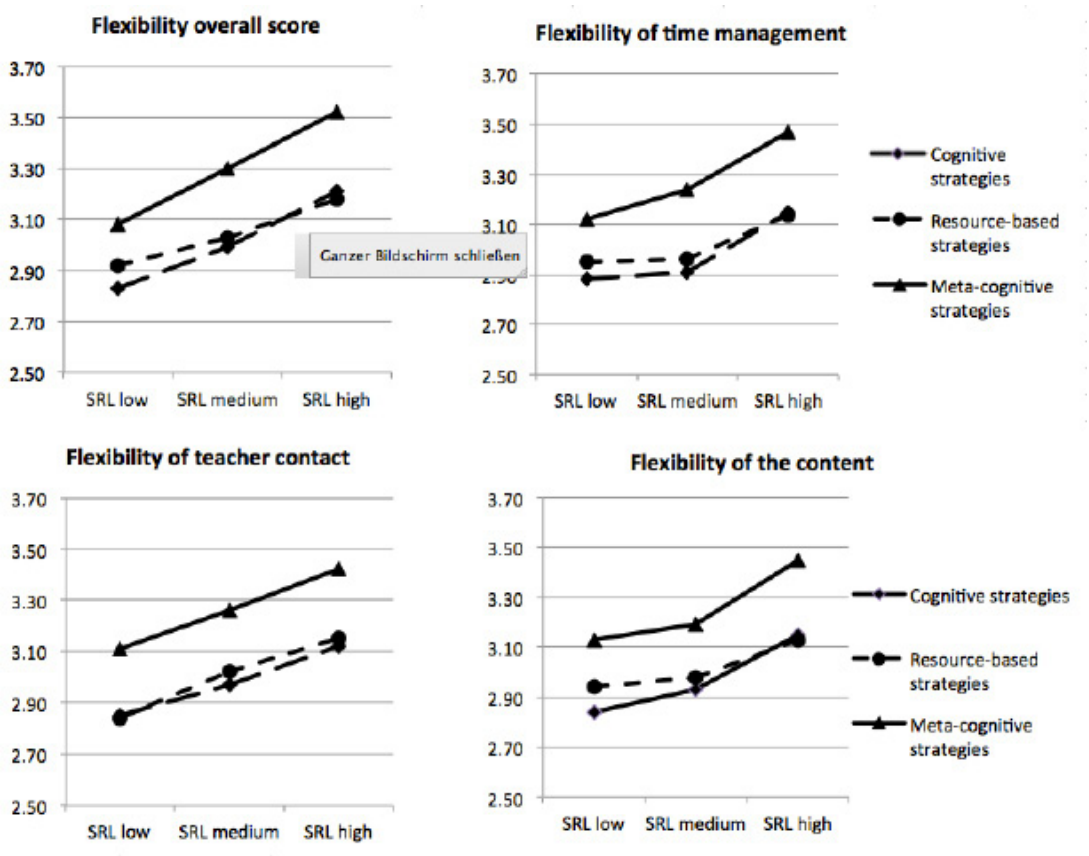

Figure 1. Differences between groups perceiving high, medium, and low flexibility of time management, teacher contact, and content.

We used rather conservative criteria (p < .017) by adjusting the significance level with the Bonferroni correction. But we did this to indicate that the results are currently limited to the investigated population. Therefore, the next steps in research should determine if similar results can be attained in other samples. In our study, the learning setting is a blended system of three components typical of the distance learning context: study at home with

literature, online support for exercises, and face-to-face meetings. The question, therefore, is whether other organized learning scenarios, for example more homogenous online learning scenarios or other mixes of study forms, lead to different relationships. This question implies two things. First, generalizing the results of this study will require further research into the relationship between different samples, respective individuals, and different learning environments. Second, the argument of the context specificity of SRL points to the problem of generalizing the results; for instance, Barnard et al. (2009) argue that instruments validated in some scenarios can be invalid in others. For example, it is not possible to measure learning strategies in online environments with the MSLQ (Pintrich et al., 1993).

Moreover, objections have often been raised that the standard questionnaires measuring SRL do not respect the individuality of learning processes and therefore cause problems in the prediction of learning behavior (Artelt, 2000; Baumert, 1993; Schiefele, Streblow, Ermgassen, & Moschner, 2003; Spörer & Brunstein, 2006; Zimmerman & Pons, 1986). On the one hand, researchers have raised the point that the items of questionnaires measuring learning strategies (also the LIST questionnaire) often have a weak relationship with real learning tasks because it is in the nature of students who have successful SRL to adapt the learning behavior to motivational and contextual conditions (Boekaerts, 1999). To this end, in a study of their pupils, Leopold and Leutner (2002) showed that it was possible to enhance the validity of items and scales of questionnaires with context-specific questions. On the other hand, it is also possible that subjects identify learning strategies as effective without using or having ever used them. Hasselhorn (1996) called this phenomenon "utilization deficit," implying that knowledge of an appropriate learning strategy is available, but not demonstrated spontaneously. To enhance the validity of questionnaires either for measuring the flexibility of learning or learning strategies, investigators can adopt a number of different arrangements for future research.

- Consideration of context specificity: It is useful to provide questions on SRL that apply to context-specific aspects of learning settings (Barnard et al., 2009; Zimmerman, 1998, 2008). In our study, this implies that adapted scales and items should be introduced for the three different learning environments involved (studying at home, online learning, and face-to-face meetings).

- Multimethod observation of learning activities: Introducing direct observations together with questionnaires, for example video monitoring in physical environments (Garner, 1988) or log file analysis of online environments (Heiß et al., 2003).

- Inclusion of other relevant factors: Observation of factors like preknowledge, motivation, and so on, using path analytic evaluation and considering the interaction effects.

Application of these arrangements may result in a nonharmonic picture (Spörer & Brunstein, 2006). However, the examination of such incongruity will help researchers to adapt and enhance the appropriate research methods and instruments. Therefore, the next step in our research, based on the findings of this study (especially the bidirectional relationship of flexibility and SR), will be an analysis of the relationship's direction, with the hypothesis

that a flexible learning environment is a condition for the learner showing SRL. We will ask a number of other research questions. Which dimensions of flexibility predict SRL? Which features of a flexible learning environment enhance SRL, and which reciprocally reinforcing functions exist, if any, between flexible and self-regulated learning?

Conclusion

In line with other investigations (Barnard-Brak, Paton, & Lan, 2010; Schunk, 2001; Steffens, 2006), our findings show that flexibility in learning has a bidirectional relationship with SRL. Moreover, we believe that the perceived flexibility of the learners' learning settings is an important factor in the encouragement (or discouragement) of self-regulation; as we have shown in our study, the increases in perceived flexibility lead to increases in reported SRL strategies.

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"Everybody is their own Island": Teacher Disconnection in a Virtual School



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Abstract

Virtual schooling is a recent phenomenon in K-12 online learning. As such, the roles of the online teachers are emerging and differ from those of the traditional classroom teacher. Using qualitative interviews of eight virtual high school teachers, this study explored teachers' perceptions of their online teaching role. Teachers expressed a sense of disconnection from their students, the profession, and their peers as a result of limited interactions due to significant institutional barriers. Researchers discuss the implications of this disconnection as well as future avenues for research.

Keywords: Virtual schooling; K-12 online learning; online teaching; teacher-student interaction; disconnection

Virtual schooling is a recent and growing form of distance education at the K-12 level. Since its inception in 1994 with Utah's Electronic High School (Center for Educational Leadership and Technology, 2008), U.S. online learning programs have spread to all but two states (Watson, Murin, Vashaw, Gemin, & Rapp, 2010). Several organizations, including states, universities, school districts, consortia, charters, and private enterprises, direct and manage virtual schools (Clark, 2001; Watson & Kalmon, 2005). However, the exact number is unknown as there is no central repository of programs and some states do not track programs by delivery model (Watson & Ryan, 2007). For example, Kansas (a state that does track K-12 online schooling in their state), saw the number of online programs grow from fewer than five in 2000-2001 to more than 25 in 2006-2007 (Watson & Ryan, 2007). While this example may not be indicative of all states, it does illustrate the potential rapid growth that has occurred in some jurisdictions.

The explosive growth of virtual schooling can be attributed to several factors. A major driving force is the educational promise of virtual schooling. Research on student achievement has indicated that online instruction is as effective as face-to-face instruction (Cavanaugh, 2001; Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004; Means, Toyama, Murphy, Bakia, & Jones, 2009). This "no significant difference" finding has helped educators and parents overcome the fear of a lack of quality in distance education and promoted greater adoption of online learning as a viable educational alternative. The expansion of virtual schooling has also been accompanied by an expansion of virtual school teachers' roles in an online environment. While the characteristics and behaviors of good face-to-face teachers are similar for virtual teachers (Davis et al., 2007), there are new teacher roles, responsibilities, and instructional strategies that need to be employed in an online environment to support student learning (Davis, 2007, November; Davis & Roblyer, 2005; Murphy & Manzanares, 2008; Murphy & Rodriguez-Manzanares, 2009b). However, due to the nascency of K-12 online learning, research has only begun to explore teacher roles in these distributed environments.

The purpose of this study was to explore how teachers perceived their role in a supplemental, asynchronous, self-paced, statewide virtual high school. We begin by examining teacher roles in K-12 online learning. Next, using interview data from eight virtual high school teachers, we explore how the limited interactions teachers had with their students resulted in teachers feeling isolated and a disconnection from their traditional view of their role as a teacher. Finally, we conclude by discussing the three changes institutions can make to improve teachers' perceptions of their role through enhanced interactions, along with three avenues of potential research.

Literature Review

Teaching online is a relatively new phenomenon for most virtual school teachers. A survey of 178 virtual school teachers found that 93% had five years or less teaching experience online. In contrast only 37% of respondents had five years or less teaching experience face-to-face and a larger percentage (43%) had between 5 years and 15 years of teaching experi-

ence (Rice & Dawley, 2007). Another, more recent survey of 595 virtual school teachers found that over 77% were female and 23% were males. Ninety-two percent of teachers had bachelor's degrees and 62% indicated they had earned a master's degree (Archambault & Barnett, 2010). While we have some understanding of who is teaching at virtual schools, we know less about how the teaching occurs and, more specifically, how teachers and students interact in online environments. A useful way to examine teacher interaction and the role of the teacher in a K-12 online environment is the community of inquiry (COI) framework (Garrison & Arbaugh, 2007).

COI is a conceptual framework that emphasizes the interplay of three key constructs to create deep, meaningful learning experiences in distance education. These constructs work together to create a community that facilitates critical thinking and learning. According to the framework, the absence or imbalance of any one construct impacts both the learning and sense of community as a whole. The three interplaying constructs (see Figure 1) include teacher presence, cognitive presence, and social presence.

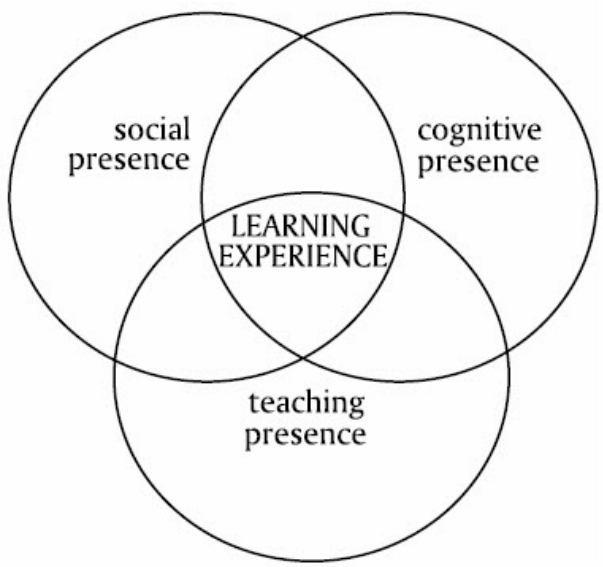

Figure 1. Community of inquiry constructs.

1. *Teacher presence* is the "design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (Anderson, Rourke, Garrison, & Archer, 2001). Indicators of teaching presence are teachers who clearly communicate course objectives and instructions, facilitate student progress and learning, and provide meaningful feedback.

2. *Cognitive presence* is the ability of participants "to construct and confirm meaning through sustained reflection and discourse" (Garrison & Arbaugh, 2007, p. 161). Indicators of cognitive presence include events that trigger exploration of the subject, integration where meaning is constructed, and resolution where learners apply their new knowledge in contexts outside of the classroom.

3. *Social presence* is the ability for participants to project their personality and conversely feel a sense that others in the community are real people. Participants identify with the community and develop relationships (Garrison, Anderson, & Archer, 1999). Social presence is not a property of the medium but the individuals' ability to move past the medium and establish a sense of immediacy, connection, and co-presences between participants (Nippard & Murphy, 2007). Indicators of social presence include humor, self-disclosure, and the use of informal language to show affection.

The role of interaction is found in the social presence and teacher presence constructs, emphasizing the importance of teacher-student interaction through clear expectations, group collaboration, productive discourse, and meaningful feedback. Typically, social presence emphasizes more student-student interactions and community building, while teacher presence emphasizes teacher-student interaction. However, in rolling enrollment models where there is little, if any, student-to-student interaction the teacher often assumes the role of facilitating the social presence as well (DiPietro, Ferdig, Black, & Preston, 2008; Roblyer, 2006). Bransford, Brown, and Cocking (1999) aptly described these interactions as the glue around the content that creates a sense of community in any learning environment. These constructs of social, cognitive, and teacher presence translate to core behaviors many virtual school teachers exemplify in the online classroom.

Teacher Roles in Virtual Schools

Many of the same characteristics that make teachers successful in the physical classroom make them successful in the virtual classroom (Davis & Roblyer, 2005; Davis et al., 2007). However, teacher roles have expanded (Ferdig, Cavanaugh, DiPietro, Black, & Dawson, 2009) and require modification for an online environment (Davis & Roblyer, 2005; Murphy & Manzanares, 2008; Murphy & Rodriguez-Manzanares, 2009b). Davis et al. (2007) described three roles teachers undertake in a virtual school environment, while Ferdig et al. (2009) extracted eight potential roles based on published standards and research of online teaching (see Table 1).

Table 1

Taxonomies of Teacher Roles and Responsibilities in Virtual School Environments

Davis (2007, November) taxonomy		Ferdig et al.'s (2009) taxonomy	
Roles	Responsibilities	Roles	Responsibilities
Teacher	Presents activities, manages pacing, rigor, etc. Interacts with students and their facilitators Undertakes assessment, grading, etc.	Teacher	Teach students within the online context including interacting with, teaching content, classroom management, and course management.
		Course facilitator	Provides support for the student within the virtual school program.
Designer	Designs instructional materials Collaborates with team of teachers to construct online course(s)	Instructional designer	Create the course online using effective learning and design strategies.
Site facilitator	Local mentor and advocate for students(s) Proctors & records grades, etc.	Local key contact	Assists student in registering and accessing virtual courses
		Mentor	Provides academic tutoring and assistance to students
		Technology coordinator	Facilitates technical support for both educators and students
		Guidance counselor	Acts as an academic advisor to students enrolled
		Administrator	Provides the instructional leadership

Focusing upon the role of the teacher (Davis, 2007) or teacher and course facilitator (Ferdig et al., 2009), we examine this literature through the lens of the three COI constructs.

Teacher Presence

The vast majority of literature related to the role of virtual school teachers is focused on

teacher presence (see Ferdig et al., 2009). Davis and Roblyer (2005) identified course planning/organization, verbal and non-presentation skills, collaborative course design, effective question strategies, and involving and coordinating student activities among different sites as roles that online teachers have to assume and modify for an online environment.

DiPietro et al.'s (2008) study of best practices found that teachers demonstrated managerial and communication skills that helped them establish a sense of presence in the online environment. Interviewing 16 Michigan Virtual School (MVS) teachers, DiPietro et al. found teachers in distance education had to assume a greater managerial or technical role in online learning environments than in traditional classrooms to prevent students from getting lost or forgotten. Additionally she found that feedback and teacher presence were central to student motivation. Analysis of the interviews indicated that successful teachers established a strong presence in the course by logging in regularly, providing prompt feedback, engaging in the discussion board, and monitoring students' progress. However, DiPietro et al.'s study did not verify if these reported behaviors were actually implemented or if students consequently perceived a greater sense of community.

Roblyer (2006) echoes DiPietro et al.'s findings. Interviewing administrators from three successful virtual high schools, she identified specific policies regarding feedback and regular student-teacher interaction. At Florida Virtual School teachers were required to respond to student inquiries within a 24-hour period and contact, by phone, every student and parent in their class once a month. Similarly Idaho Digital Learning Academy required that teachers telephone inactive students. Thus, teacher presence was established through student communication. This study constituted interviews from three administrators at three virtual high schools and thus may be limited to their specific institutions.

Cognitive Presence

Of the three COI constructs, cognitive presence is the one that has the least amount of literature. A false assumption that some online teachers make is that students want to be left alone to do their work. Drawing on the American Psychology Association's framework for learner-centered principles for online teaching, McCombs and Vakili (2005) found it critical that teachers "avoid the assumption that online learners are those who prefer less personal contact with instructors, are independent learners, have high motivation to learn, are self-disciplined and have high personal self-efficacy" (p. 1592). This advice was directed to online teachers teaching adult learners and may be even more applicable to adolescent learners.

Murphy and Rodriguez-Manzanares (2009a) suggested that motivation is not self-generated or intrinsic; but rather, teachers play a pivotal role in motivating young adults who are even less likely to be autonomous. This was supported by the research that indicated that while adult may be autonomous, self-regulated learners, younger adults often lack the ability to regulate their own learning through self-discipline and intrinsic motivation (Barbour & Reeves, 2009; Cavanaugh et al., 2004; Cavanaugh, Barbour, & Clark, 2009; Rice, 2006). Thus these students may need more support. Finally, it should be noted that the line between designing, facilitating, and directing instruction (i.e., teacher presence) and

sustaining reflection and discourse on that instruction/content (i.e., cognitive presence) is a fine distinction.

Social Presence

There is also a significant amount of literature on social presence in mediated environments. Ferdig et al. (2009) identified multiple studies on best practices and standards promoting social presence via teachers providing multiple channels and opportunities for communication and providing prompt feedback, two activities supported by DiPietro et al.'s (2008) research on best practices of successful online teachers.

However, some virtual teachers struggle to create meaningful interactions with students in a mediated environment. Harms, Niederhouser, Davis, Roblyer, and Gilbert (2006) argued that teachers received "little or no foundation for effectively communicating with students at a distance" (p. 2). Yet, communicating and teaching in an online environment was distinctly different from that of a physical classroom environment (Murphy & Rodriguez-Manzanares, 2009a). Off-the-cuff interactions that were casual and informal in nature and spontaneously happened inside and outside of the physical classroom had to be "premediated" and "consciously promoted" in an online environment (Murphy & Manzanares, 2008 p. 1068). Murphy and Rodriguez-Manzanares (2009a), based on 42 teacher interviews, identified that the absence of visual presence and cues required that virtual teachers find new ways of interacting and building rapport. However, teachers struggled to find meaningful ways to do this. Analyzing the same interview data, Murphy and Rodriguez-Manzanares (2009b) found that virtual teachers did not yet view the online classroom as a community with "familiar faces, spontaneous interactions, and automatic social presence" (p. 13). While this study was limited to the experiences of Canadian teachers and their perceptions may not be universal, they do illustrate the importance of helping teachers develop communication strategies to establish both social and teacher presence in order to build a sense of community online.

Since teacher, social, and cognitive presences are important to the learning ecosystem, teachers need more formal opportunities to develop these skills. Too often, teachers first learn critical online teaching behaviors on the job. Rice and Dawley (2007) found that 62% of virtual school teachers reported receiving no training in advance of their first online teaching experience. However, 90% indicated that they engaged in ongoing professional development provided by their online institution. When exploring the type of training teachers received, the focus was on foundational knowledge, tools, and instructional design. Despite this training, based on the 536 open-ended responses, Rice and Dawley found that a sense of isolation from both students and teachers was one of the top three themes cited. Due to the study's quantitative design, the authors did not explore the "why" behind teachers' sense of isolation in the virtual environment.

Methodology

The purpose of this study was to explore how teachers viewed their position, purpose, and

place in a supplemental, asynchronous, self-paced, virtual high school. This led to the following research question: How do teachers perceive their role as online teachers? To answer this research question we used case study methodology. According to Stake (1995) the use of case study is appropriate when the goal is to understand and concentrate on a singular, unique phenomenon. Utah's Electronic High School (EHS) was the case for this particular study.

We conducted eight semistructured telephone interviews with EHS teachers over a three-month period in 2009. Semistructured interviews allowed researchers to explore perceptions, feelings, and attitudes of participants and explore a broader range of topics than more structured interviews (Fontana & Frey, 2000). All interviews were digitally recorded and transcribed verbatim. We used Ruona's (2005) method to organize and code the data. Specifically, we used a constant comparative method of coding to identify themes (Ezzy, 2002), which highlighted similarities and differences among participants.

The Case

There are nine virtual schools operating in Utah (Watson et al., 2010). EHS, the only state-led program, is the largest in Utah and one of the largest in the United States with almost 50,000 course enrollments (i.e., a single student could be enrolled in multiple courses and counted each time in this enrollment figure). EHS serves a diverse student body. Fifty percent of students enrolled for credit acceleration, 30% for credit recovery, and 20% for both purposes. Students can enroll in any of 66 unique courses across 11 different disciplines. Course offerings range from the typical (i.e., algebra, chemistry, English) to the advanced (i.e., calculus, history) to the more unique (i.e., astronomy, Navajo language). EHS teachers developed the curriculum using Utah's *State Core Curriculum Standards*.

At the time of the study, EHS employed four administrative staff, one part-time counselor, and 76 licensed teachers. A large majority of the teachers worked part-time and were contracted between one to five hours a day (Webb, 2008). Data from February 1, 2008 to January 31, 2009 indicated a student-to-teacher ratio of 233:1 and a student load ranging from 2 to 1,726 students over 198 sections. Seventy-two percent of teachers taught a single class consisting of two to four quarter-credit units.

There are several policies that make EHS unique. The program model is open entry/exit, allowing students to enroll at any time. Consequently, students proceed through the course at their own pace with little, if any, student-to-student interaction. Enrollment and courses are free to Utah high-school aged students. Beginning October 2007, students had to complete the course within a six-month timeframe and remain active (i.e., submit an assignment within a thirty-day period) or be dropped from the course. Lastly, EHS grants credits to the student rather than deferring to the student's residential high school. However, they do not award failing grades (i.e., a student who fails a course, withdraws, or is removed due to inactivity suffers no consequences).

Participant and Class Characteristics

Eight teachers were selected for the study. The teachers were selected using purposive sampling (Patton, 1990). We used pseudonyms, date ranges, and, in some instances, generic course titles to protect the anonymity of participants. Examining class completion data from February 1, 2008 to January 31, 2009, four teacher/class case pairs were identified in the top and bottom 30% of class completion rates.

Table 2

Study Participants and Class Characteristics

	Discipline							
Teacher / class characteristics	English		Mathematics		Science		Social science	
High/low completion	H	L	H	L	H	L	H	L
Quarter 1 course/ grade	Eng. 12	Eng. 9	Lower-division	Upper-division	Elective	Elective	U.S. Hist.	U.S. Hist.
Quarter 1 completion rate	20.8%	5.1%	15.2%	0.0%	30.2%	18.5%	21.0%	20.6%
Course completion rate*	39.2%	7.5%	22.6%	0.0%	45.1%	47.4%	37.4%	33.8%
Quarter 1 course size	106	985	197	108	116	135	62	155
Course size (quarter units combined)	183	1821	388	138	161	197	126	417
Face-to-face teaching (*n* = years)	14	14	15	14	32	18	22	18
EHS teaching (*n*= years range)	3-5	10-15	3-5	10-15	3-5	10-15	10-15	3-5

Note: H = high completion class; L = low completion class; Classes constitute two to four quarter units.

All participants were highly qualified teachers in their subject matter according to *No Child Left Behind*. Six of the eight teachers worked part-time for EHS and full-time in brick-and-mortar schools during the day. One teacher worked full-time for EHS and another worked part-time for EHS and nowhere else. The English 9 teacher had significantly higher student numbers as she worked full-time at EHS compared to the other part-time teachers. Participants averaged 18 years face-to-face teaching experience compared to only 6.9 years teaching in an online environment.

In terms of professional development, participants received limited, structured training for online teaching through EHS prior to teaching their initial course(s) at EHS. New teachers receive an hour and a half face-to-face meeting or phone call depending on the teacher's geographical location with the director of EHS. Here teachers receive an overview of how EHS works and go over their contract expectations. New teachers learn about the school and online teaching by accessing resources/handouts posted in the virtual faculty room, reaching out to EHS' lead teacher, and follow-up phone calls as needed. Existing EHS teachers have access to professional development in the form of an annual face-to-face faculty meeting; multiple two-day face-to-face workshops throughout the year; regular email communications to all teachers on general teaching topics; phone calls and emails to individual teachers for specific needs; hour-long, synchronous (recorded and archived) webinars every other month; and monthly hour-long question and answer sessions.

Six of the eight participants had experienced online learning as student themselves. Exposure to online learning as a student ranged from one college class to an entire master's degree. The influence this experience had on teachers varied. One teacher expressed more empathy for students with busy lives as he struggled to discipline himself to complete the course with competing home life demands. Another articulated frustration with lack of feedback from professors. This teacher identified prompt feedback as a key skill that teachers need to demonstrate fully, something which she felt strongly about because of the absence she experienced in her own online education. The remaining teachers did not delve into how their experiences as students influenced their teaching role.

Results and Discussion

The major theme that emerged from the interview data was teachers' sense of disconnection. Exploring this theme further, we uncovered three types of disconnection: disconnection from their students, from their traditional notions of what it meant to be a teacher, and from their fellow teachers. While teachers wanted to have a sense of connection with their students, profession, and peers, structural barriers made it difficult. In the following section, we describe these three disconnections and discuss the implications for teacher attitudes, behaviors, and community.

Disconnection from the Students

Teachers felt disconnected from their students for a variety of reasons. One reason was the absence of the physical cues students gave in a traditional classroom setting. In this online environment, teachers were never certain if students understood the subject matter, and they missed the instantaneous feedback in the form of visual cues. As Mark stated,

> One of the reasons I love education is I like the interchange. You know, the instant feedback, the look in the face, the look around the room to see if somebody got it. And that's kind of difficult with an online class. And sometimes students will send me an email afterwards

> saying, "Thanks for this help" or "Thanks for explaining of what you [the student] wanted." You know, something like that. But it's not like it's immediate feedback that you get in the classroom. So I do miss the interchange with the students.

This absence and need for the cues of students' grasping the material ties back to a sense of teacher presence. Similarly, teachers in studies by Lai and Pratt (2009) and Murphy and Rodriguez-Manzanares (2008) struggled to navigate with the absence of students' physical cues, which could help them interpret silence and student understanding.

Tamara felt the lack of responsiveness was a challenge since she never felt she knew why students were disengaged.

> There are a lot of those voiceless students. Sometimes they think to enroll into it and they never, you know, you send them an email, "Are you interested?" You may or may not hear back from them. You don't know if the email is even right. I don't get a response back. Sometimes I get an undeliverable. Sometimes I don't. You know, I'm not very good at saying, "Stick with it. You'll do fine." Because if I don't hear back from them and they don't respond back, I don't even know if they are there anymore.

Not knowing why students were struggling contributed to her feeling disconnected from them. Traditional methods teachers could employ to investigate why students are struggling such as walking down the classroom row, catching the student in the hallway, or talking with another teacher in the teacher's lounge are not options for teachers in an online environment (Murphy & Manzanares, 2008; Murphy & Rodriguez-Manzanares, 2009b). Moreover, beyond emailing the student, teachers expressed that they did not know what else to do to reach out and engage.

One teacher viewed social interactions as something the students did not want in an online environment: "My feeling is that the reason they are taking this is because they want to get through it and not chit chat with the teacher, and so I try to keep it more of a professional and business approach to their online education." Another teacher did not want to get "too absorbed" and another felt that the "return on investment" for social interactions would not "justify the time spent." Teachers considered these forms of interaction as inconsequential with minimal benefit to the student. In a similar vein, Nippard and Murphy's (2007) qualitative analysis of twelve synchronous courses found that social interactions often drew attention away from the content delivery. Though not expressed overtly, compounded with the time factor, the distraction caused by social interactions may be one reason why EHS teachers tended to limit them.

Paradoxically, the absence of these very exchanges made it difficult for teachers to feel like

they knew their students. As Molly stated,

> There are times when I feel like I don't know the students. So unless they are good writers or they email me a lot, or you know, it is hard for me to, they're just kind of a name, and I don't like that. But the kids who are consistent in turning in the assignments, you get to know pretty well.

Students and teachers were able to establish a "co-presence" as Harms et al. (2006) described it through frequent interaction over the subject matter.

However, not all teachers felt like they could establish a connection with their students, "see their personalities," and have a "personal relationship" with them. Teachers struggled to find meaningful ways to build rapport with their students frequently contrasting the process of doing this online with how it generally occurred in the physical classroom. Brian articulated it well contrasting how physical and virtual relationships were established:

> Well the difference with them again is: I see them; I interact with them; I shake their hands; I know their name; I know their face. A lot of them I know their sad story behind some this. At EHS you just can't do any of that. It's nameless. It's faceless. Even though you can feel some of that in the interactions and the other end of that are the kids that are just really very, very bright moving forward in positive ways. And you kind of feel like I'm glad that there's this opportunity for you to get these credits and you can move on and do some of those things. I know very well there is a percentage of my EHS kids that are that type of kid just at a high-school level. But I don't have any way of creating that rapport or interaction with them at that level. I try to be sympathetic to the fact that some of these kids. I can tell by the way they write and the way that they express themselves that they probably academically struggled. I'm trying to save that.

Murphy and Rodriguez-Manzanares (2008) argued that online teachers need new strategies for building rapport and social presence in an online environment in the absence of the physical and visual cues. Furthermore, these interactions need to be intentionally planned and integrated into the learning. Murphy and Rodriguez-Manzanares (2008) assert that the contradictions teachers face in the online and physical classrooms can drive change and spark innovation in teacher practices. For EHS teachers, they felt the contradictions but continued to grapple with identifying and applying these new strategies to connect with their students.

There were several possible consequences resulting from the absence of a relationship be-

tween the student and teacher. For example, it may be easier for the student to disengage from the course if they do not feel connected to their teacher. Kristine expressed this consequence:

> I think it's way easier for a kid to fail out of a class if the teacher, if they haven't got a relationship with the teacher. They're like, "I don't know this person. It doesn't matter. I don't care if I fail." There's not this personal, like, "I don't want to hurt their feelings. I don't want to look bad." If they don't know the teacher, then they don't care about those things. So sometimes when you have that personal relationship with them it helps push them forward because they just have those internal motivations that they don't want to let them look bad or let someone down.

Similar to DiPietro et al.'s (2008) findings, a relationship that includes deadlines, encouragement, and continual teacher communication may be enough to keep students motivated.

The disconnection between students and teachers not only affects students' commitment to the course but may also strain the teachers' commitment to the course and to students as well. Brian hinted at this struggle:

> I don't know exactly how to word this. I care if they are passing. I care if they are understanding. But I don't know *them* to care. So it's not a personal caring. It's a generalized, "I hope you do well." And once in a while a student will, by the way they word things, you can just tell they struggle in general in school. And I kind of feel hopeful that they make it through and survive and accomplish those goals, but I don't actually put a face to anybody. They don't know me, and I don't know them. We're just connecting through a cyber space here.

Essentially, Brian indicated that EHS teachers cared for their students at an aggregate level but not at an individual level as they struggled to form these personal relationships. Similarly, teachers in Lai and Pratt's (2009) study also struggled to connect at an individual level with their students and at times felt they were "talking to a blank wall" (p. 14). This was the case even though these courses were taught synchronously using video-conferencing technologies.

Disconnection from the Traditional Notion of Teaching

In addition to feeling disconnected from the students, teachers felt disconnected from their role as a teacher. They felt "very removed" from the teaching experience as they traditionally viewed it. Some teachers viewed themselves primarily as graders since the "curriculum

is already set up." As one teacher stated, "I evaluate their work more than teach them. You know they are kind of on their own for learning and I just evaluate their learning, I guess." In contrast to the traditional classroom where teachers play all of the roles Ferdig et al. (2009) and Davis (2007, November) articulated, teachers felt fragmented and at a loss playing just the teacher or course facilitator role as opposed to the additional roles they played in the brick-and-mortar classroom. Consequently, they did not feel like a teacher in the sense that they were familiar with in their face-to-face classrooms. Carl articulated this difference in roles well:

> It is probably different than face-to-face because you are displaying the information right there with the student. And with EHS, it's already done on the computer system, and so a lot of the times the role you just get to grade the papers. And then just answer questions. But as far as like being, I almost want to say a mentor because you can see that student you can talk to them right then, it is definitely different that way. Almost like, here's professor's assistant. Here is a bunch of papers, and you just kind of grade it.

Brian felt that his teaching role was even more narrowly confined to that of a grader in contrast to the more holistic role of teacher, course facilitator, instructional designer, local key contact, mentor, technology coordinator, and guidance counselor that he played in his walled classroom (Ferdig et al., 2009). Again, looking to Ferdig et al.'s (2009) work on role definition, in a face-to-face classroom the teacher would play all eight roles whereas in an online classroom the teacher may only play one. This created a sense of role fragmentation for the teachers causing them to feel disconnected from their own profession as they knew it.

Another role teachers expressed was that of a navigational mentor "herding them along towards the finish line." Again teachers indicated that this role made them feel less like a teacher in the traditional sense. As Molly stated,

> It is hard because your first instinct is that I want to say I'm a teacher. But a lot of times I don't think I teach because of the curriculum is set up. And you know in face-to-face teaching you are on stage all the time and you are doing everything you can to get them to pay attention and you can see their faces and know what is happening. And you just don't get that online. It is hard to get a sense of the person behind the assignment unless they are good writers. There are a lot of kids, you know. If they are good writers you get a sense of their personality, and it is easier. But if they are not great writers, you don't get that voice in their writing and so it is hard to [pause]. You

> know, I don't feel like I am teaching them. I feel like I put it out there, and they have to be willing to put the time and effort into it and learn the material. And you know, I'm kind of removed from it. And I do think I try to mentor them, and I try to guide them through it, and if they have questions I can answer their questions.

Feeling removed from the act of stand-up teaching, the design of the instruction, and the physical presence of the students resulted in this teacher feeling less like a teacher and more like someone standing on the sidelines ready to offer support when asked. These indicators speak to the imbalance in teacher presence and social presence.

The constructs of teacher presence, social presence, and cognitive presence must be balanced for a community to develop and thrive (Garrison & Arbaugh, 2007). However, at EHS teachers felt like teaching was "just not the same" or "different" because community was lacking. Not only did teachers miss playing the more holistic role that they did in the traditional classroom, they recognized that the role of a teacher was much greater than the singular role they were experiencing as online teachers. As one teacher expressed,

> But I love teaching in the classroom. I love that one on one with students and there's something about seeing their face and their facial expression and being able to tell if they're having a bad day as well. Teaching isn't just teaching a subject, but it's teaching the students and helping them through their stress of daily life and teaching them compassion and I don't get to do that on EHS and that's something I miss a lot.

This teacher expressed that teaching was more than just connecting over content, but also included connecting with the student on issues outside of the classroom. Simply put, EHS teachers were frustrated by their inability to fulfill the traditional role of teacher as they had identified it in their brick-and-mortar environment.

Disconnection from Fellow Virtual Teachers

In addition to feeling disconnected from the students and the traditional role of teaching, teachers felt disconnected from other virtual teachers. At times, not only did the teachers feel the students were "on their own", but they felt that they were too. As Brian expressed, "At EHS, it's pretty much everybody is their own island." Despite monthly synchronous professional development training and an annual faculty meeting drawing in faculty from across the state, many teachers felt isolated and disconnected from their peers and practices. While some teachers felt that they could email their peers for help and assistance, others expressed feeling "alone" and that colleagues were less "accessible." The traditional forms of gathering best practices at a traditional school were more challenging in the online setting. Teachers experienced isolation as they struggled to learn from one another and to understand how their performance compared in relation to others.

As Molly said,

> Well the problem is we don't know how we are doing sometimes. I mean, you get a little thing from students or parents every once in a while. But I don't really know compared to other teachers what they are doing better than I am, or what they are not doing. And so you're kind of isolated in that you're not knowing sometimes how it is going.

Again, the absence of feedback from students, parents, and peers contributed to a sense of isolation and uncertainty in their performance as professionals. Teachers lacked a sense of community established by a balance of social presence, teacher presence, and cognitive presence.

Beyond not knowing how one was doing in relation to one's peers, some teachers felt like they did not have a way to gather best practices for online teaching. As Mark put it,

> One thing that I like about teaching in the classroom is I get to know faculty, and you get to bounce off a lot of ideas and things on them. And I don't notice that with EHS. I don't feel like I am necessarily a part. I just feel like this little individual who is doing their little thing. And we do have a faculty meeting once a year, but it is never really a time when you really get to know the faculty.

Again, the traditional means for sharing best practices as a profession did not work in the online setting. Consequently some teachers at EHS struggled to find thought partners to contribute to their professional development in meaningful ways. Similarly, in their report on professional development for virtual schools, Davis and Rose (2007) articulated that teachers cannot work in isolation but need ongoing support structures in the area of professional development and educational support.

Just as students were expected to initiate contact to receive attention and responsiveness (Hawkins, Barbour, & Graham, 2011), teachers were also supposed to initiate interactions with one another. The onus of engagement for teacher-to-teacher interaction was on the inquirer just as it was for the students. When asked what her expectations were for interaction with other virtual teachers, Kristine stated the following:

> I don't expect that we can be this face-to-face, touchy-feely-huggy group. [chuckle] It's not like we have lunch together like you would in a high school. You can't have that kind of an interaction. So given the constraints, I feel that we're very connected in terms that I don't have a problem emailing some of the other teachers and asking

> them how they're doing certain things. I don't feel like I can't do that. I just feel like, yeah, we're definitely on our own just as our students are. But anybody is only an email or phone call away.

What Kristine articulated was that the degree of interaction and its sufficiency was relative to the expectations one had for the community or group. Thus, if you joined a group with expectations that you would function as an independent body with interaction only when you initiated it, then teaching and studying at EHS worked well. However, if you expected your interactions to be initiated from both directions then EHS would feel like an "island."

Conclusions and Implications

This study relied on the framework of COI to investigate teacher roles in K-12 online learning. Until now, researched based on this framework has focused on adult learners. This study extends our knowledge of the COI framework exploring the lived experiences of teachers with adolescent learners in a virtual schooling environment. This research led to identification of the following issues. Absent or limited interaction, particularly social, contributed to teachers' sense of disconnection from their students. Teachers did not have the same sense of being professionals because of the limited role they played in the online classroom compared to the roles they assumed as classroom teachers. Just as teachers felt isolated from their students, the majority felt isolated from each other due to their perceived inability to establish a collaborative relationship with their colleagues. From the COI lens, teachers' limited interaction with their students and colleagues resulted in an imbalance of social and teacher presence. This limited interaction, coupled with teachers' limited sense of cognitive presence due to their limited role in the content creation, resulted in feelings of disconnection and a limited sense of community.

There are three main implications that EHS and its teachers should consider to address these issues. It is possible that the formal and perceived academic nature of EHS' LMS prevented or hindered social interactions between students and teachers and amongst students themselves. Barbour and Plough (2009) described one online program that used a closed social network to create a nonacademic space where students could socialize with each other and with their teachers. EHS should consider potential avenues to establish such a space either as an extension of the LMS or outside of it completely. Second, while the virtual school environment created a fragmentation of roles for the teacher, the EHS instructional model further limits the ability of their teachers to perform even the duties normally undertaken by virtual school teachers and course facilitators (Ferdig et al., 2009). EHS teachers should make a conscious effort to increase the quantity and frequency of content-based interactions with their students. This would allow teachers to have a greater instructional role (or both teacher and cognitive presence). Finally, EHS could create a space for a virtual staff room in the LMS where teachers could interact, share best practices, and discuss student issues.

There are four primary areas that researchers should consider for future investigation into the sense of disconnection in a virtual school environment. First, given the teachers' beliefs that the lack of interaction with their students had a detrimental effect on student performance and engagement, it would be worthwhile to determine if the students themselves shared this sentiment. This is an important avenue for future research because if students do not share these concerns, efforts toward instructional change should be focused elsewhere. Second, teacher roles in the online environment have become fragmented, and because of this fragmentation, teachers do not feel the same sense of professional identity as they do in the classroom. A potential line of inquiry would be to examine the student role in the online environment. This examination should focus upon both the potential and perceived changes students sense with being an online student, and whether those perceived changes have similar negative effects on their role in the instructional environment. Third, while the majority of teachers interviewed indicated that they felt disconnected from their online teaching colleagues, there was one teacher, Kristine, who felt otherwise. It would be interesting to determine which of these was the prevalent attitude with a larger sample of EHS teachers. This would allow EHS to undertake corrective measures if the majority opinion stayed consistent or focus their efforts elsewhere. Finally, while the EHS model has changed little since its original conception, EHS could consider adopting social media strategies to reduce the sense of isolation and increase engagement, connectivity, and community between students and teachers. Though not an immediate solution due to structural issues such as large class sizes, rolling enrollment, and the independent-study model EHS has adopted, it may be worthwhile to adopt and research if administrators are willing to make significant adjustments.

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Building an Inclusive Definition of E-Learning: An Approach to the Conceptual Framework



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Abstract

E-learning is part of the new dynamic that characterises educational systems at the start of the 21st century. Like society, the concept of e-learning is subject to constant change. In addition, it is difficult to come up with a single definition of e-learning that would be accepted by the majority of the scientific community. The different understandings of e-learning are conditioned by particular professional approaches and interests.

An international project, based on the participation of experts around the world, was undertaken to agree on a definition of e-learning. To this end, two main research activities were carried out. First, an extensive review was conducted of the literature on the concept of e-learning, drawing from peer-reviewed journals, specialised web pages, and books. Second, a Delphi survey was sent out to gather the opinions of recognised experts in the field of education and technology regarding the concept of e-learning with a view to reaching a final consensus.

This paper presents the outcomes of the project, which has resulted in an inclusive definition of e-learning subject to a high degree of consensus that will provide a useful conceptual framework to further identify the different models in which e-learning is developed and practiced.

Keywords: E-learning; definition; distance education; technology-enhanced education

Introduction

In recent decades, the use of information and communication technologies (ICT) for educational purposes has increased, and the spread of network technologies has caused e-learning practices to evolve significantly (Kahiigi et al., 2008). However, any definition of e-learning must settle the issue of what is and what is not e-learning (Guri-Rosenbilt, 2005). The multiplicity of perspectives surrounding e-learning causes confusion and, sometimes, even contradictions (Mason & Rennie, 2006). Not only have different concepts been attributed to e-learning, but the term has also been substituted by others, such as *computer-based learning*, *technology-based training,* and *computer-based training*, which actually predate the first mention of e-learning in the mid-1990s (Friesen, 2009) or the more recent *online learning*. Moreover, some people confuse the concept of e-learning with the concepts of a virtual campus or online courses, which can be part of the e-learning universe but do not sufficiently define it.

The evolution of distance education, as a result of new technologies and the contributions of computer scientists to the field of education along with the conceptualisation of education as a lifelong process, poses a major challenge for educational institutions: how to integrate these technologies into their organisation and, especially, into their teaching. From simple occasional use of ICT to reinforce face-to-face teaching and learning to the use of virtual environments for courses conducted completely online according to a variety of educational models, the incorporation of ICT into the learning process is being achieved from very different perspectives and through an extensive range of formulas, albeit with one common denominator: the use of practices whose origin and pedagogical foundations lie in distance education.

The discussion of the definition and practices of e-learning focuses on the intersection of education, teaching, and learning with ICT (Friesen, 2009). It is undoubtedly preceded by two other disciplines: educational technology and distance education. Both have significantly contributed to the intensive use of ICT for educational purposes, but neither can be strictly equated with e-learning.

E-learning could also be considered a natural evolution of distance learning, which has always taken advantage of the latest tools to emerge in the context of technologies for structuring education. In fact, some authors consider e-learning to be a new generation of distance education, even as they point to significant differences between the two and highlight a key starting point: "E-learning does not represent more of the same (…) [It is] about doing things differently" (Garrison & Anderson, 2003, p. 7).

However, the suspicion that different meanings or definitions of e-learning are conditioned by particular professional approaches and, more importantly, by particular individual or corporate interests underscores the need to analyse this field of knowledge.

Studies attempting to provide inclusive, or umbrella, definitions of concepts are quite common in the social sciences and psychology (Castle, 2000; Eagly & Chaiken, 2007; Jones,

1999; Waddington, Badge, & Bull, 2005). In the educational sciences, studies from different knowledge areas can also be found that aim to define concepts used with different meanings by the scientific community (Allen, 2004; Baker, 1979; Garavan, 1997; Stanovich, 1998; Wright, 2002). Finally, it is worth noting that in the field of distance education, important studies have been conducted with a view to defining similar concepts to e-learning (Keegan, 1980, 1988; Garrison & Shale, 1987). These studies offer proof that there has, since the very emergence of distance education, been a need to create a common frame of reference for it.

An agreement on how to define e-learning could help research and researchers go forward in identifying models and practices for applying e-learning and in determining the key factors for better and more effective use of this type of teaching and learning: "There is a pressing requirement to understand better the nature of e-learning, as an educational innovation, and to evolve contextually derived frameworks for change which align with organisational culture and practice" (Rossiter, 2007, p. 93). The challenge of finding a single, inclusive definition of e-learning is the starting point for this study. As Renold and Barter (2003, p. 91) stated, an inclusive definition is "a broader definition that encompasses a wider spectrum of the concept and can cope with the complexity of its representation/characteristics."

Research Design

The main aim of this study was to create an inclusive definition of e-learning that would be accepted by the majority of the scientific community and would also define the boundaries for future activity in this sector. Two main research activities were carried out to achieve this aim.

1. An extensive literature review: Indexed and peer-reviewed journals, government reports, web pages, and books were considered and analysed. The main objective of this activity was to collect the available definitions of e-learning in order to compare and categorise them according to their main perspective and focus.

2. A Delphi survey: Online questionnaires were sent to recognised experts in the field of education and ICT in order to determine their perceptions of and beliefs regarding e-learning with a view to reaching a final consensus and creating an inclusive definition. The entirety of this second research activity was monitored and evaluated by educational research methodology experts from the Netherlands, Spain, and Canada.

Literature Review

A literature review is understood as a description of the relevant literature on a particular field or topic (University of Canberra, 2006). The topics used for this review were *e-learning* and *definition*, and the search was performed in the field of education and ICT.

The search was limited to literature published in or after 2005 as for a new concept such as e-learning that is characterised by constant change, it was considered preferable to work with papers published in the last five years. However, definitions of e-learning dating from before 2005 were considered when designing the research as some of these definitions have

provided the basis for newer ones.

Three main sources of literature were used for the review:

1. academic and scientific journals indexed in the *Social Sciences Citation Index* (ISI Web of Knowledge) in or after 2005;

2. books and book chapters, government reports, and doctoral dissertations related to education and ICT and e-learning, published in or after 2005; and

3. open virtual spaces (e.g., blogs, institutional web pages, glossaries) by recognised authors, where education and ICT and e-learning are analysed and discussed.

The definitions gathered from the literature review focus on different elements of e-learning. Specifically, four general categories of definitions were identified: 1) technology-driven, 2) delivery-system-oriented, 3) communication-oriented, and 4) educational-paradigm-oriented.

Technology-Driven Definitions

This category mostly includes definitions from private companies and a few academics that emphasise the technological aspects of e-learning, while presenting the rest of its characteristics as secondary. The definitions in this category portray e-learning as the use of technology for learning. Representative samples of this category include the following.

- "E-learning is the use of electronic media for a variety of learning purposes that range from add-on functions in conventional classrooms to full substitution for the face-to-face meetings by online encounters" (Guri-Rosenblit, 2005).

- "E-learning is to take a course online using a modem, wireless, or cable connection to access academic course material from a computer, phone, or handheld device" (Governors State University, 2008).

- "E-learning is distance education through remote resources" (Marquès, 2006).

- "E-learning is the use of technology to deliver learning and training programs" (E-learning portal, 2009).

Delivery-System-Oriented Definitions

This category presents e-learning as a means of accessing knowledge (through learning, teaching, or training). In other words, the focus of these definitions is the accessibility of resources and not the results of any achievements. Representative samples from this category include the following.

- "E-learning is the delivery of education (all activities relevant to instructing, teaching, and learning) through various electronic media" (Koohang & Harman, 2005).

- "E-learning is an on-line education defined as the self-paced or real-time delivery of training and education over the internet to an end-user device" (Lee & Lee, 2006).

- "E-learning is the delivery of a learning, training or education program by electronic means" (Li, Lau & Dharmendran, 2009).

- "E-learning is defined as education delivered, or learning conducted, by Web techniques" (Liao & Lu, 2008).

Communication-Oriented Definitions

This category considers e-learning to be a communication, interaction, and collaboration tool and assigns secondary roles to its other aspects and characteristics. Representative examples of these definitions, which come mostly from the academic and communication sectors, include the following.

- "E-learning is education that uses computerised communication systems as an environment for communication, the exchange of information and interaction between students and instructors" (Bermejo, 2005).

- "E-learning is learning based on information and communication technologies with pedagogical interaction between students and the content, students and the instructors or among students through the web" (González-Videgaray, 2007).

- "E-learning is defined as learning facilitated by the use of digital tools and content that involves some form of interactivity, which may include online interaction between the learner and their teacher or peers" (Ministry of Communication and Technology of New Zealand, 2008).

Educational-Paradigm-Oriented Definitions

This category defines e-learning as a new way of learning or as an improvement on an existing educational paradigm. The majority of the authors falling into this category work in the education sector. Some of the most representative examples of these definitions include the following.

- "E-learning is the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services, as well as remote exchange and collaboration" (Alonso et al., 2005).

- "E-learning is a broad combination of processes, content, and infrastructure to use computers and networks to scale and/or improve one or more significant parts of a learning value chain, including management and delivery" (Aldrich, 2005).

- "E-learning is defined as information and communication technologies used to support students to improve their learning" (Ellis, Ginns & Piggott, 2009).

- "E-learning refers to educational processes that utilise information and communica-

tions technology to mediate synchronous as well as asynchronous learning and teaching activities" (Jereb & Šmitek, 2006).

Survey of Expert Opinions

A Delphi survey was used to determine experts' perceptions and knowledge with a view to reaching a final consensus. This method makes it possible to deal with complex problems (Linstone & Turoff, 1975), such as the creation of an inclusive definition of e-learning.

Delphi studies are considered particularly useful in the field of pedagogy (Yousuf, 2007). Rieger (1986) reported that 83% of the PhD theses completed between 1981 and 1984 used the Delphi technique and concluded that "it seems reasonable to claim that Delphi is continuing to be a much used tool in the search for answers to normative questions, especially in education areas" (p. 198). The Delphi technique, it should be noted, is also widely used in the field of emerging education technologies. Some of the most important studies in this field based on leveraging established expertise to provide the input for and inform such analyses include the *NMC Horizon Report* series by the New Media Consortium and the Educause Learning Initiative (Johnson, Smith, Willis, Levine, & Haywood, 2011), the *Future of the Internet Report* series by the Pew Internet & American Life Project and Elon University (Anderson & Rainie, 2008) and the *Top Teaching and Learning Challenges 2009* project by Educause (Little & Page, 2009).

Online questionnaires were sent to recognised experts in the field of education and ICT. *Experts* was understood to refer to people who are partially or fully devoted to conducting research in this field and have published their findings in journal articles, books, government reports, theses, and dissertations. The main purpose of the survey was to determine their perceptions of the e-learning concept. They were asked to define the e-learning concept, to name its main components, and to categorise it among the scientific fields.

Following a pilot Delphi round, two more rounds were carried out. The surveys contained open and closed questions, and respondents were asked to give spontaneous but reasoned answers. The pilot round was used to validate the questionnaire with the participation of experts in the fields of educational research methodology and education and ICT from the Netherlands, Spain, and Canada. Some minor modifications were made based on their recommendations.

The first survey round contained a total of 15 questions and was divided into two main parts. The first part consisted of 10 demographic questions related to the experts' age, place of residence, sex, studies, academic profile, professional experience in e-learning, and contact details. The second part included a brief summary of the review of the literature on the e-learning concept, including a description of the four general definition categories mentioned above. Following this introduction, five questions asked the experts for their opinion about the conceptual framework of e-learning in relation to the different categories identified in the literature review. A Likert scale from 1 to 5 (1 = *does not represent the e-learning concept*; *5 = represents the e-learning concept exactly*) was provided to answer the first

question.

The second question complemented the first since the experts were asked to justify their previous evaluation and to explain whether they believed that there was a single category able to offer an inclusive definition of e-learning. The third and fourth questions asked whether they believed there was any other category of e-learning definitions that had not been mentioned in the survey. If so, they were asked to name it and to describe its main characteristics. Finally, the last question offered the participating experts an open space for comments.

Based on the above definition of expert and with a view to including participants from all continents, an initial list of a total of 103 experts was drawn up. During the first round, 33 experts answered the survey (32% of the initial population), a number considered satisfactory for an anonymous study conducted online. Table 1 shows the geographical distribution of the experts.

Table 1

Geographical Distribution of the Participating Experts

Spain (7)	Greece (1)	France (1)	Puerto Rico (1)
Norway (1)	Switzerland (1)	USA (2)	Japan (1)
Germany (1)	United Kingdom (1)	Canada (4)	Australia (1)
Italy (1)	Netherlands (1)	Brazil (1)	New Zealand (1)
Total: 33 experts (14 women; 19 men)			

The majority of the experts (85%) were over the age of 45. While they had different educational backgrounds, most had an educational profile. With regard to their current occupation, 85% of the participants work as academics or research staff at higher education institutions, while the remaining 15% come from the corporate sector. As for the four definition categories, most respondents (85%) felt that the educational paradigm category best represents the conceptual framework of e-learning. Figure 1 shows the average scores they assigned.

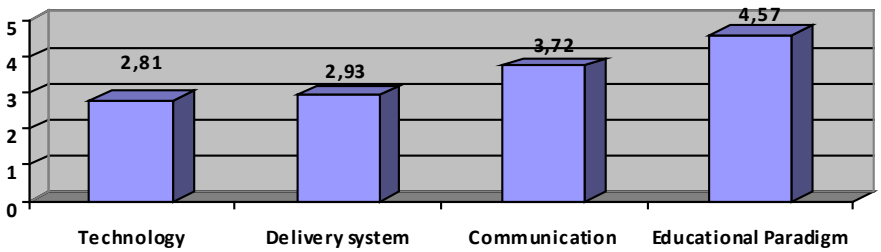

Figure 1. Evaluation of the four definition categories by the participating experts (1 = *does not represent the e-learning concept*; 5 = *represents the e-learning concept exactly*).

In addition to their evaluations, the experts provided some very useful comments regarding how e-learning should be defined and offered important arguments to be considered with regard to the construction of an inclusive definition. Their contribution can be summarised in four main points.

1. The quickly changing nature of the uses of technology for teaching and learning must be taken into consideration when preparing a definition of e-learning.

2. E-learning can be used not only for collaborative learning, but also for autonomous, individual learning.

3. E-learning is a means of facilitating the achievement of (formal or informal) learning goals.

4. E-learning is a new learning/training model, a new way to learn.

In the second round, the experts were encouraged to revise their earlier answers in light of the responses of the other members of the panel. Over the course of this process, the degree of disagreement was expected to decrease and the group was expected to converge towards an agreed statement.

Nevertheless, they were encouraged to change their opinions only if they agreed with the most popular answer and were convinced that it was the most suitable one. Since no major differences were found among the experts' arguments and comments regarding the creation of an inclusive definition of e-learning, it was considered that one more round would be enough to reach a final consensus.

In this context and after taking into consideration all their comments and arguments, a preliminary definition of e-learning was prepared, containing aspects of all four general categories. The experts were asked to evaluate it in the final Delphi round. The preliminary definition was as follows:

> E-learning is an approach to teaching and learning, representing all or part of the educational model applied, that is based on the use of electronic media and devices as tools for improving access to training, communication and interaction and that facilitates the adoption of new ways of understanding and developing learning.

In the final round, experts were asked to use a Likert scale from 1 to 4 (1 = *the definition does not represent the e-learning concept*; 2 = *the definition hardly represents the e-learning concept*; 3 = *the definition represents the e-learning concept fairly well*; 4 = *the definition fully represents the e-learning concept*) to express either agreement (3/4) or disagreement (1/2) and to check whether their comments had been successfully incorporated into the final inclusive definition. The level of acceptance of the definition turned out to be quite high, with 31 of the 33 participants evaluating it positively (3/4), for an average score

of 3.40. Figure 2 shows the breakdown of the scores.

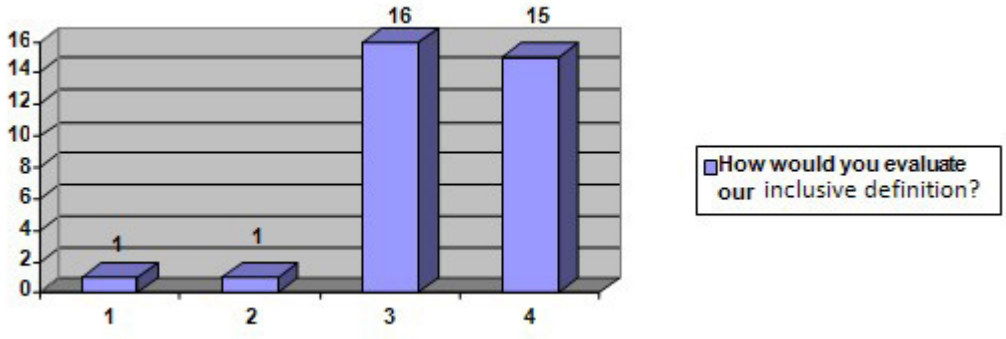

Figure 2. Evaluation of the inclusive definition by the participating experts.

Although the consensus regarding this definition was quite strong, the participating experts insisted on two basic aspects that should be revisited:

1. The evolution of the technologies used for learning and teaching should be taken into consideration;

2. The e-learning concept is also based on certain socioeconomic factors that may not need to be explicitly included in the definition but should nevertheless be taken into account.

Limitations of the Study

Although this study was carried out according to the methodology recommended by experts in educational research, certain limitations should be pointed out.

In spite of the fact that the ISI Web of Knowledge database is considered one of the most prestigious databases in the world, it does not include all the most important publications on e-learning, probably due to the newness of the concept and an existing policy against open access journals, which are increasingly used to distribute research on e-learning (Anderson & McConkey, 2009). Thus, some interesting definitions of the e-learning concept published in other relevant journals may have been overlooked.

Additionally, despite the satisfactory number of participating experts, the sample of experts from Asia and Africa was not as large as expected, perhaps due to the strict time constraints of the research.

Conclusions and Further Research

The results of this study confirm its main research hypothesis about the difficulty of devising a single, inclusive definition of e-learning that would be accepted by the majority of the scientific community due to the existence of different perspectives on this concept based on authors' professional and academic profiles. It was found that the most important reasons for this situation are that both the concept of e-learning and society are in a state of con-

stant flux and the term is understood from many angles and used with different meanings (Stein, Shephard, & Harris, 2011).

After the analysis of the contributions of the participating experts, the research arrived at the general conclusion that e-learning is part of the new dynamic that characterises educational systems at the start of the 21st century, resulting from the merge of different disciplines, such as computer science, communication technology, and pedagogy, since all the collected definitions contained characteristics of more than one discipline. Consequently, the concept of e-learning can be expected to continue to evolve for a long time. In today's world, learning needs change very quickly and the concept and functions of e-learning must continuously be adapted to these needs.

Moreover, the difficulty to include all the main features of the e-learning concept in a single definition was identified since not all authors made the same use of the concept and they considered different aspects as fundamental. In this context, and in order to take advantage of all the definitions created, the need to be flexible and generic enough to include the majority of these uses and features is considered compulsory. More analytically, this study resulted in an inclusive definition that takes into consideration the four main categories in which authors conceptualise e-learning: technology, delivery systems, communication, and educational paradigms.

It is true that there is a risk in adopting an inclusive definition of e-learning because this definition connects its different elements and features, which can obstruct the understanding of the concept. But the commonality that unites the concepts is also important, and this can be shown only through an inclusive definition which presents the different interrelated features (Waddington, Badger, & Bull, 2005).

As far as the different tendencies of the created definitions of e-learning are concerned, it was found that authors with a more technological profile geared their definitions towards technology or access systems, while authors with an educational profile focused on the new educational paradigm and communication. The participation of e-learning experts from different approaches that agreed on this inclusive definition will help enormously to make easier its acceptance. On the other hand, the new definition is not threatening any practices. It wants to be a common framework for enhancing theory development and empirical research in a community of scientists (Eagly & Chaiken, 2007) and, in this case, developing further research in identifying e-learning application models.

Another conclusion derived from the findings of this study is that e-learning goes far beyond technology, even though the concept did not appear until after computers began to be used in education. The literature review and the Delphi method applied to the participating experts showed that e-learning also refers to the actual learning that takes place when these resources are used. In this regard, the experts mainly characterised e-learning as a "way of teaching and learning" moving towards a "new educational paradigm."

In addition, the framework provided by Jones (1999) is confirmed since this study em-

braced a broad and inclusive definition of e-learning in the belief that e-learning is an important – indeed, a key – issue for all academics and professionals who work and do research in the field of education and ICT. As a result, an inclusive definition of this concept enables multiple points of entry into the discussion of e-learning, from its basic components to its application and models. In other words, a greater number of individuals will see the relevance of, and their personal connection to, the concept and will thus be able to access different points of the discussion and implementation. Since e-learning is often perceived as being too abstract for people to understand, an inclusive definition can be used to provide the basis, and language, for understanding one's own connection to the field. It is believed that this new definition of the concept could serve as the first step to establishing a new framework of reference for e-learning able to boost research activity by providing a common starting point.

Furthermore, the purpose of the new definition is to consider e-learning as a more comprehensive concept, in which bias due to the four identified categories leads to identifying different models of application but does not extend to the concept itself. The most important advantage is to avoid discussions about the extent to which some practice is e-learning or is not. The core question will explain which kind of e-learning model is being applied and what its aims and potential benefits are in a particular context. This should help give the e-learning concept more consistency, which will enable working on the establishment of a pattern for analysing e-learning models that should result in more arguments in favour of the potential achievements of e-learning.

Finally, the contribution of an inclusive definition to the evolution of terminology shouldn't be ignored. The importance of updating different concepts was underlined many years ago (Allport, 1935) since it helps to reach a convergent point to start a new journey on the concept.

As Bates and Poole (2003) suggested, it would also be worth considering that there are different types or forms of e-learning and even different models of applying it. Further research should also focus on both the specific and common characteristics of these e-learning models and on the contexts in which they might work best.

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Determining the Feasibility of an E-Portfolio Application in a Distance Education Teaching Practice Course

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Abstract

In this study we aim to conduct a complete evaluation of the e-portfolio application in the distance teaching practice course that is part of the Distance English Language Teacher (DELT) program at Anadolu University from the perspective of three groups: university supervisors, preservice teachers, and cooperating teachers. Using a survey on the needs of preservice teachers and how well these were met according to the three groups' perspectives, we gathered qualitative and quantitative data on the feasibility of the e-portfolio application. Our analysis of the findings revealed that all three groups agreed about the needs of preservice teachers. And despite some minor variance in the perspectives of each group, we determined that e-portfolio applications can meet the majority of the planning, teaching, and reflection needs in the teaching process. We offer suggestions to improve e-portfolio applications so they will better meet preservice teachers' needs.

Keywords: Distance education; interactive learning environments; adult learning; teaching practice

Introduction

Teaching practice is an important phase of teacher education that provides opportunities for preservice teachers to reflect on their developing teaching philosophies and put them into action. This process helps preservice teachers to bridge the gap between theory and practice, to step into the professional teaching environment by sharing, cooperating, and collaborating with their more experienced peers, and to observe seasoned teachers in the classroom (McIntyre, Byrd, & Foxx, 1996; Darling-Hammond & Baratz-Snowden, 2007; Simpson, 2006).

This process includes three groups, preservice teachers, cooperating teachers, and university supervisors, who each have unique roles: Preservice teachers take the role of student teachers, the cooperating teachers act as models and mentors in the classroom, and university supervisors provide the necessary guidance and direction for preservice teachers (Goldsberry, 1998; Jonson, 2002; Wang & Odell, 2002). The significance of such supervision in this process has been explained by Darling-Hammond and Baratz-Snowden (2007). They argued that when preservice teachers are well supervised, they are better able to connect theory to practice, more readily develop teaching skills, and are more confident.

A pioneering project developed by the Massachusetts Institute of Technology, which provides freely available teaching materials on a Web site, is one example of the opportunities online education systems offer. These systems have received considerable attention because they enhance interactivity and connectedness (Perraton, 2010). As a result, teacher education programs have begun embracing various web-based distance learning models to allow teachers to pursue additional education and professional growth experiences (Frey, 2008; Aldridge, Fraser, & Ntuli, 2009; Ludlow & Brannan, 1999; Beattie, Spooner, Jordan, Algozzine, & Spooner, 2002). These models have provided new instructional tools, such as asynchronous web support through emails or discussion lists and forums and synchronous teleconferencing or videoconferencing, especially in circumstances where students have a greater need for guidance and supervision.

The importance of communication between the three groups involved in teacher education is evident at the School of Education at Seattle University (Roddy, 1999) and the University of Houston (Pierson & McNeil, 2000), which used networked learning communities of lecturers, associate teachers, and students to enrich the field experience of student teachers. Likewise, an Australian study (Ballantyne & Mylonas, 2001) pinpointed the three-way partnership between the associate teacher, lecturer, and student, showing how the use of online material and discussion set within a mentor model might help bridge the gap between the institution and remote field experience sites by involving mentor teachers, lecturers, and students in online discussion. In another study, Jung, Galyon-Keramidas, Collins, and Ludlow (2006) investigated the effectiveness of online or interactive video delivery on preservice teachers' professional development. Their findings showed that the observation and feedback provided through online video conferences satisfied the preservice teachers and contributed to their professional development. Likewise, Young and Lewis (2008) approved of the satisfaction and positive attitudes preservice teachers showed when their

placements in distance education were supported with online programs.

Integrating a number of web-based and computer-based applications, electronic portfolios (e-portfolios) can serve as an instructional tool in the field of distance teacher education. Many believe e-portfolio applications have the potential to document each individual student's learning history, and thus they are accepted as a valuable tool for self-regulated learning, planning, self-directed learning, and setting learning goals (Imhof & Picard, 2009; Gibson & Barrett, 2003). As Barrett (2011) emphasized, the real value of e-portfolios is found in the student's reflection and learning, not just the collection of his or her work. E-portfolios offer opportunities for reflection on the self-regulated mode of individualized learning, as proponents of constructivist theories have posited (Gibson & Barrett, 2003; Baumgartner, 2005). Further, e-portfolios encourage competencies and standard orientation in teacher education and help new teachers convey their personality and professionalism (Campbell, Cignetti, Melenyzer, Nettles, & Wyman, 2004; Imhof & Picard, 2009). They provide a context for discussion, review, and feedback from instructors, teachers, and colleagues. Hence, e-portfolios enable students' personal and professional growth and lifelong learning in distance education (Genç-Kumtepe, 2009; Lin, 2008; Frey, 2008).

E-portfolios help university instructors, cooperating teachers, and preservice teachers (the three groups of teacher education) to both engage in the process and move beyond the borders of traditional distance education (Simpson, 2006; Lin, 2008; Genç-Kumtepe, 2009). Further, Frey (2008) underlined that by using an online e-portfolio application, three main sources of support that are crucial for the development of students' teaching competencies, peer, instructor, and local school support, can be integrated into the teaching practice process. Collaborative resonance, which Cochran-Smith (as cited in Özköse-Bıyık, 2008) claimed was the most effective school–university relationship, can be established with an e-portfolio application. Such a relationship produces a richer environment, integrating all three groups. For preservice teachers, university supervisors can provide connections to cooperating teachers in schools through different applications such as discussions, seminars, and joint planning (Özköse-Bıyık, 2008). Moseley and Ramsay (2005) stated that both experienced and preservice teachers need to experience the joy of collaborative discussion, dialogue, critique, and research since such peer collaboration and mentoring can add value to the e-portfolio process. The e-portfolio is a tool for facilitating collaboration to bridge the interaction gap among the three groups, which is a crucial problem in teacher training via distance education (Beck, Livne, & Bear, 2005; Knapczyk, Hew, & Frey, 2005).

In order to catch up with these innovations in technology and distance education, the e-portfolio has been recently applied in Turkey, particularly to teacher distance education programs. Although there is a paucity of research about this application, there are some pioneering studies exploring its use and impact. For instance, Koçoglu (2008) conducted a descriptive study on the views of preservice teachers of English as a Foreign Language (EFL) about the role of e-portfolios in their professional growth. In a similar vein, Koçoglu, Akyel, and Ercetin (2008) studied the improving effect of portfolio development on the reflective thinking ability of Turkish preservice teachers. Moreover, Genç-Kumtepe (2009) explored the strength of the e-portfolio as an assessment tool and looked at its motivational

and cognitive benefits for preservice teachers in an early childhood distance teacher education program. Consistent with studies in the literature (Lin, 2008; Herner-Patnode & Lee, 2009), Genç-Kumtepe (2009) found that the e-portfolio application provided students with an opportunity to revisit and revise their performance based on multiple feedback sources from certain points in time and expand their skills and knowledge. Further, Caner's (2009) PhD study of preservice teachers in a Turkish university English language teaching program revealed that including web support and interactive discussion boards enhanced the effectiveness of teaching practices. He claimed that through the interactive context, preservice teachers could receive helpful feedback on their lesson plans and teaching performance from both their supervisors and peers. Furthermore, Caner stated that the use of discussion boards in such circumstances might help participants to develop the capacity to think reflectively about their performance.

Overall, the studies to date have agreed on the promise of applying e-portfolio applications in teacher education since they can enhance the interactions between the three groups involved and help student teachers develop reflective practices. Based on these findings, an increasing number of colleges and universities all over the world now endeavor to develop both undergraduate and alternative online teacher preparation programs (Huss, 2007).

In a similar vein, Anadolu University, an institution conducting pioneering research for distance education in Turkey, has started to embed the online e-portfolio program into teaching practice courses in the Distance English Language Teacher Education (DELT) program. Gradually enriching the online component with new technologies, course planners hope to provide preservice teachers in different cities all over the country with interactive supervision.

Since the e-portfolio program in teacher education is a growing trend all over the world, examining how these applications are used in different cultures and different modes and a thorough evaluation of them will contribute to the literature about the integration of online technology in teacher education. Moreover, researchers recognize that understanding the voices of the three groups involved in the process leads to greater program efficiency and improved practices. Some researchers have expressed concern that most e-portfolio implementation does not consider the needs and views of the student users (Butler, 2010). Addressing their needs and including their perspectives is necessary to enhance their engagement with the e-portfolio (Tosh, Light, Fleming, & Haywood, 2005). Thus, in our study we aim to describe the e-portfolio application for the teaching practice course in the DELT program and to evaluate its feasibility according to the perceptions of the three groups involved.

In line with the aims of the study, we first explain the e-portfolio application in the DELT program and then pose the following research questions.

1. At the beginning of the program, what were the needs of the preservice teachers during teaching practice from their own perspective and those of the cooperating teachers and university supervisors?

2. From the perspectives of preservice teachers, cooperating teachers, and university supervisors, to what extent did the e-portfolio program meet these needs?

3. Were there any differences between perceived needs and those actually met for each participating group?

The E-Portfolio Application in the DELT Program

The DELT program is a four-year undergraduate degree; the university provides face-to-face courses during the first two years in eight different city centers and in the third and fourth years delivers courses through distance education facilities.

The Teaching Practice course is one of the skill-based courses offered in the fourth year of the DELT program. The course has a 25-week syllabus, with 10 weeks devoted to micro teaching and 15 to macro teaching. During their fourth year, preservice teachers in the DELT program are given the chance to complete their teaching practice in any Turkish city. For the micro teaching component, they are required to observe cooperating teachers and the class they have chosen for a period of time then they must prepare a lesson plan for a 15–20-minute activity and teach it in the classroom environment. For the macro teaching component, preservice teachers prepare a plan for a whole lesson (40–45 minutes in duration) and teach this as well.

Instructors in the DELT program began using the e-portfolio application to facilitate the teaching practice process at the beginning of the 2009–2010 academic year. With this application, students can interact with their university supervisors and cooperating teachers. As a result, a network is established among all participants, thereby reducing preservice teacher isolation and increasing academic support.

The preservice teachers enrolled in the teaching practice course can access the e-portfolio application Web page (see http://eportfolio.iolp.anadolu.edu.tr) using a password-protected interface that was developed by staff at Anadolu University. The Web site includes the e-portfolios of preservice teachers with their lesson plans; instructor feedback; self-reflection reports; a forum where all three groups can discuss course-related subjects; and sections for announcements, technical questions, guidelines, the teaching practice handbook in e-book format (PDF), sample lesson videos, grading rubrics, and useful links. Figure 1 shows the home page of the e-portfolio application.

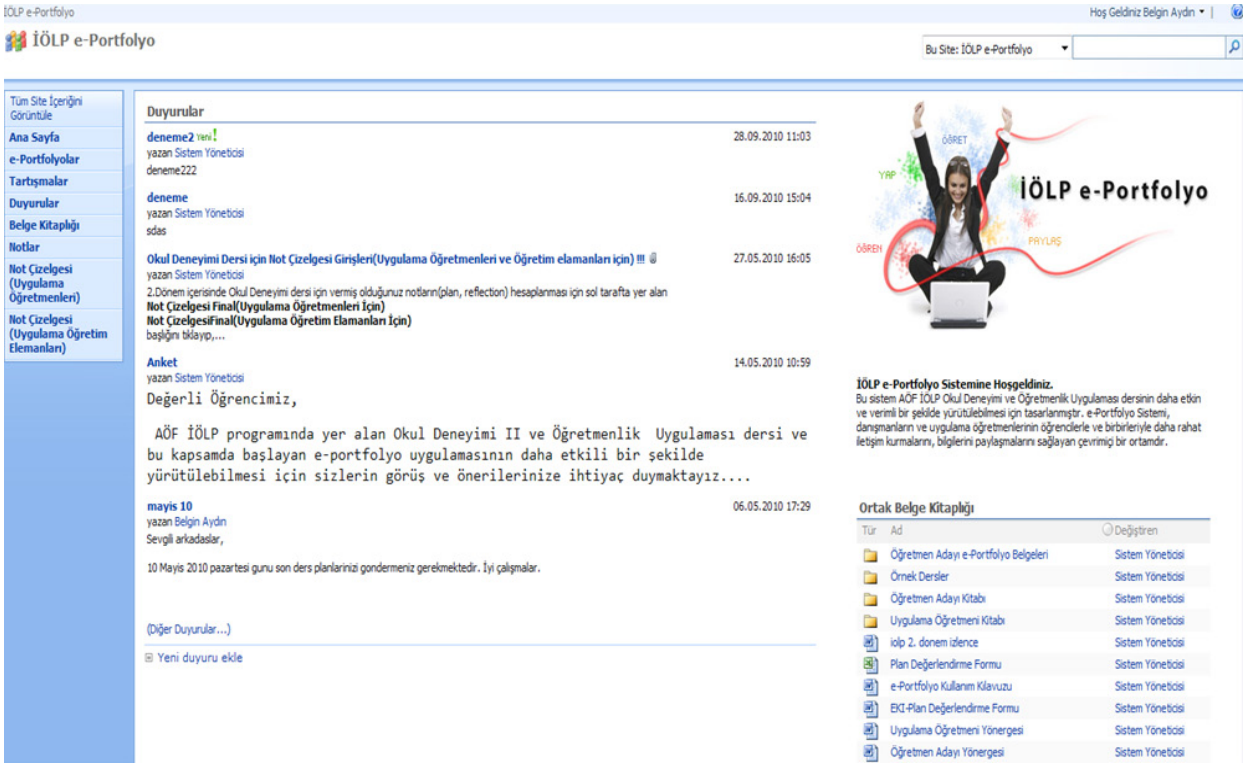

Figure 1. Home page of e-portfolio application used in the DELT Program.

Before the faculty implemented the e-portfolio application, a sample video on how to use it was prepared and uploaded to the Web site for all three groups to access. A discussion board reserved for any technical problems was inserted and the users were encouraged to ask for help to solve any issues they had while using the system. With these two components, the information technology skills of the participants were addressed.

On the e-portfolio Web page, preservice teachers were given personal space for their portfolios. Every six to eight preservice teachers were clustered to form a "mini discourse community" (Freidus, 2002, p. 75) in which university supervisors, cooperating teachers, and other peers could interact and provide feedback. To facilitate the lesson preparation process for preservice teachers and allow the university supervisors to effectively review the teaching practice process, the preservice teachers in the DELT program are asked to prepare their lesson plans prior to their teaching performance and upload them to their personal portfolios within the system. Both cooperating teachers and university supervisors give feedback on these plans, and the other preservice teachers within the same discourse community are able to see both the lesson plans and the feedback. After considering the feedback received from both cooperating teachers and supervisors and making the necessary changes, preservice teachers implement their final lesson plans in the real classroom and then write reflections on their experience soon after. Figure 2 shows a sample lesson plan, with feedback from the university supervisors.

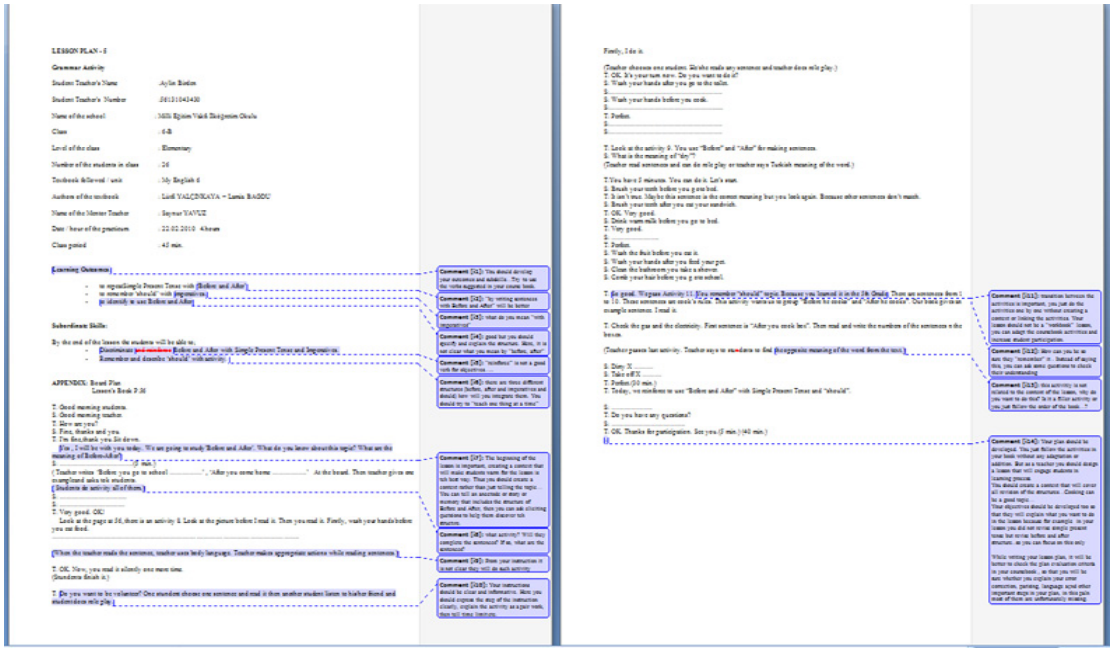

Figure 2. A sample lesson plan that was given feedback by university supervisors.

Incorporating the advice from cooperating teachers (onsite) and university supervisors (online), the preservice teachers in the DELT program have the chance to get feedback about their teaching plan and performance through the e-portfolio application. Moreover, the application offers an interactive platform for all group members to discuss and share important issues regarding teaching practice.

Working from the premise that a comprehensive evaluation of the application provides a greater chance to improve and enhance its benefits, for this study we evaluated the feasibility of an e-portfolio application from the perspectives of the active participants within the system.

In the following section, we present the research design of the study and our findings, with the support of related literature.

Evaluation of the E-Portfolio Application in the DELT Program

In line with the second aim of our study, we have conducted a summative evaluation of the distance education teaching course supported with the e-portfolio application at the DELT program. As Gibson and Barret (2003) stated, e-portfolios used as part of a program evaluation provide the opportunity to collect data about both program objectives and learners. Thus we examined the perspectives the three groups involved in the teaching practice had about the e-portfolio application to evaluate its feasibility.

Method

We designed the present study using a survey that integrates both qualitative and quanti-

tative methods. Qualitative data served to provide a broader impression of the e-portfolio application, and quantitative data gave an in-depth analysis of the perspectives the three groups had of the application.

Participants

Study participants consisted of the preservice teachers (n = 914), university supervisors (n = 125), and cooperating teachers (n = 259) who used the e-portfolio application from the teaching practice course in the DELT program for the 2009–2010 academic year. Everyone in the three groups was asked to complete an online survey available on the home page. Out of 914 preservice teachers enrolled in the distance education teaching practice course, 59 voluntarily completed the survey. In a similar vein, so did 198 out of 259 cooperating teachers, and 94 out of 125 university supervisors. Thus, using a convenience sampling technique, 350 participants' perspectives on the e-portfolio system were included in the study.

Instrument

We developed an e-portfolio application survey as the data collection instrument to identify the needs of the preservice teachers during their teaching practice process and to determine whether these needs were met by the application from the perspectives of the three groups.

While developing the survey, we created a question pool reviewing the related literature and referring to the teaching practice evaluation rubric (Kecik, 2010; Kecik & Aydın, 2009) used in the DELT program. The first draft of the survey included 80 items and was then examined by an expert committee for content and construct validity. After taking the expert committee's comments into account, the final version of the survey was prepared. The final *Survey on E-Portfolio Application* consisted of 48 items in two parts. The first part included items focusing on the preservice teachers' perceived needs during the teaching practice process and to what extent these needs were met with the e-portfolio application's support. These needs and how well they were met were measured on a 5-point Likert scale, ranging from 1 (*Always*), to 5 (*Never*). They were grouped into three main categories: planning (1–20), teaching (21–40), and reflection (41–48), divided according to the requirements of each teaching stage as explained in the teaching practice course textbook (Kecik & Aydın, 2009). Open-ended questions were also included, allowing participants to provide more detailed opinions on the e-portfolio application.

Data Collection and Analysis

After the data were collected online, the quantitative data obtained from the first part of the survey (the needs assessment part) were analyzed using descriptive statistics and presented as means, standard deviation values, and frequencies. While evaluating the means, an (n - 1)/n formula was applied to determine the standard opinion ranges, which were 1 – 1.79 (always); 1.80 – 2.59 (mostly); 2.60 – 3.39 (neutral); 3.40 – 4.19 (sometimes); and 4.20 – 5.00 (never). Additionally, t-tests and one-way ANOVA tests were employed for both between- and within-group comparisons. Conversely, the qualitative data collected from the open-ended questions in the second part of the survey were analyzed using content analysis; two independent researchers first assigned codes after examining the whole data

set, and then the codes were compared and the themes encompassing them defined.

Results and Discussion

The way e-portfolios are used within teacher education varies. For the processes of critical reflection and collaborative discussion to be authentically integrated into e-portfolio use, the application should be carefully planned in alignment with teacher education program philosophies, conceptual frameworks, and learning outcomes (Lamount, 2007). The perspectives of the three groups within the teacher education program are valuable resources to evaluate whether e-portfolio applications could satisfy user needs. In this study, we evaluated the perspectives of the three groups regarding the e-portfolio application based on this premise. In the following sections, we present the findings of the survey with reference to each research question.

The Perceived Needs of the Three Groups Using the E-Portfolio

For the first research question, "What are the needs of preservice teachers using the e-portfolio during practice teaching from the perspectives of the preservice teachers, cooperating teachers, and supervisors?" we analyzed the first part of the survey, and the results are shown in Table 1.

Table 1

Perceived Needs of the Three Groups Using the E-Portfolio

Perceived needs	Preservice *n* = 58		Supervisor *n* = 94		Cooperating teacher *n* = 198	
	Mean	*SD*	Mean	*SD*	Mean	*SD*
Planning	2.2345	.91934	2.0718	1.01249	2.3194	.77061
Teaching	2.1836	.99769	2.1489	1.01682	2.3331	.81259
Reflection	2.0690	1.00114	2.0359	1.08255	2.2955	.89944

As Table 1 shows, in spite of the slight differences, all participants expressed very similar perceptions of preservice teachers' needs. The mean scores of all three groups ranged from 2.03, the lowest, to 2.33, the highest belonging to the "mostly" category for all the stages of teaching. That is, the participants agreed that the items listed in the survey were mostly needed by preservice teachers.

When we consider the teaching stages separately, we can see that although there were no obvious differences among the mean values of the three groups, the needs at the planning stage were emphasized by the supervisors (mean 2.07) more than the other two groups. In addition, regarding the teaching and reflection stages, both university supervisors and preservice teachers stated that there were more needs than the cooperating teachers did. We applied a one-way ANOVA test to identify whether the differences in the mean values of the participants were significant or not, and our findings are shown in Table 2.

Table 2

The Differences in Perceptions of Needs during Teaching Practice Supported with an E-Portfolio Application

	Planning			Teaching			Reflection		
	Mean	*F*	*Sig.*	Mean	*F*	*Sig.*	Mean	*F*	*Sig.*
Preservice	2.2345			2.1836			2.0690		
Supervisor	2.0718	2.604	.075	2.1489	1.566	.210	2.0380	2.825	.061
Cooperating	2.3194			2.3331			2.2973		

Table 2 shows that the ANOVA test results revealed no statistically significant differences in the needs of preservice teachers perceived by each group. That is, all three groups thought that preservice teachers had similar levels of need for the e-portfolio in the planning, teaching, and reflection stages of the teaching process. This finding suggests that the teaching experience process and its needs were perceived in similar ways by the three groups.

When the qualitative data were analyzed, "getting effective feedback from the cooperating teachers while planning" was identified as the most needed aspect of planning for preservice and cooperating teachers. Conversely, "writing the goal and sub-skills of the lesson accurately and clearly on the lesson plans" was thought to be the greatest need by the university supervisors. For instance, one of the university supervisors stated, "I could not teach two of my students how to write learning outcomes and sub-skills. I corrected them each time, gave feedback patiently . . . they continued to write almost similar outcomes without any improvement" (US-10). Another supervisor made a similar point: "the biggest problem is writing the outcomes and sub-skill[s]. While their book has explanations about these, pre-service teachers cannot state them efficiently." (US-8)

Regarding needs during the teaching stage, "using time effectively during teaching practice" (item 39) was the most commonly perceived need among preservice teachers. On the contrary, "enabling students' active participation while checking the activity" (item 28) was emphasized the most by supervisors and "encouraging students' active participation during the activity" (item 27) by the cooperating teachers. One of the preservice teachers (S1) stated, "I cannot be sure whether my lesson plan is too long or short for 40 minutes," focusing on his need to manage time effectively. For the reflection stage, the preservice and cooperating teachers agreed that the most important need was "getting effective post-session feedback from cooperating teacher" (item 45). However, according to the supervisors, preservice teachers required "reflecting on the students' learning difficulties in the class" the most (item 43) while reflecting on their teaching. In addition to these needs, all three groups agreed that the preservice teachers need "writing self-reflection on all teaching stages" (item 41).

To conclude, all three groups of participants agreed that preservice teachers had similar needs while planning, teaching, and reflecting on their teaching. Nevertheless, their perceptions differed in some of the subcategories. The reason for these differences in emphasis might be due to the different expectations of the groups. For example, while university supervisors focused on the importance of determining the outcomes of a lesson during the planning stage or involving students in the lesson while teaching, for preservice teachers, getting feedback about their lesson plans or their application was more important. The strength of e-portfolios within a teacher education program is their ability to place more responsibility for learning and personal growth in the hands of the student. In particular, e-portfolios offer more opportunity for students to highlight their strengths and growth over time. They also offer the potential for the student teacher to document a broader range of attributes, rather than simply meeting learning outcomes or professional standards.

How Well Perceived Needs Were Met by Using the E-Portfolio

The second research question asked how well the perceived needs were met according to the three groups. The findings are presented in Table 3.

Table 3

The Differences in Perceptions about How Well Perceived Needs Were Met during a Teaching Practice Course Supported with an E-Portfolio Application

Accomplishment levels	Preservice		Supervisor		Cooperating teacher	
	Mean	*SD*	Mean	*SD*	Mean	*SD*
Planning	2.5198	1.01298	2.6378	.78084	2.3376	.68151
Teaching	2.5086	1.05884	2.7814	.71022	2.3053	.66728
Reflection	2.3750	1.02384	3.0598	.73774	2.1711	.76019

Table 3 indicates that all the mentioned needs at all teaching stages were mostly accomplished, according to the preservice and cooperating teachers.

The university supervisors, however, thought that while preservice teachers' needs at the planning and teaching stages were mostly met, their needs at the reflection stage were not met as well as the other two stages by the e-portfolio application. In order to examine whether the differences in the mean values were significant or not, we applied a one-way ANOVA test. The results of the comparisons are illustrated in Table 4.

Table 4

Comparing Perceptions of Accomplishment Levels

	Planning			Teaching			Reflection		
	Mean	*F*	Sig.	Mean	*F*	Sig.	Mean	*F*	Sig.
Preservice	2.5198			2.5086			2.3750		
Supervisors	2.6378	5.117	.006*	2.7814	12.731	.000*	3.0620	39.236	.000*
Cooperating	2.3376			2.3053			2.1731		

*significant at .05 level

As Table 4 indicates, the obtained *P* values for each teaching stage were smaller than the significance level of .05, which revealed significant differences among the groups in terms of the met needs. That is, preservice teachers, cooperating teachers, and university supervisors indicated different opinions about all three stages of the teaching process.

In order to identify which group indicated these different responses we applied Tukey's

HSD test, and the results indicated the university supervisors and cooperating teachers were the source. The mean values suggested that university supervisors were in the negative pool while cooperating teachers were in the positive. University supervisors were pessimistic and thought that the e-portfolio application could not meet the needs of students within the teaching practice process satisfactorily. The underlying reason for this might be their ambitious goals and higher expectations for teacher education. Some of the university supervisors could not adapt to the asynchronous e-portfolio use, so they were not satisfied with using only the written medium because they believed that face-to-face interaction should be included to enhance the effectiveness of the whole teaching practice process. In addition, their unfamiliarity with the secondary and primary school context, where the actual teaching practice takes place, might have triggered this pessimistic stance.

When the findings were revisited on the basis of each item, we detected that for the planning stage, "getting feedback from cooperating teachers while planning" (item 19), the most commonly perceived need, was also the one most commonly met according to preservice teachers. These examples from the preservice teachers indicate their opinions about how well their needs were met and their satisfaction with the feedback received through e-portfolio application.

> Getting feedback both from the cooperating teachers and the supervisors helps me to see my weaknesses and strengths. As the time passes, I like this application more. (S-20)

> I could prepare my future plans more easily with the help of feedback I got. (S-50)

These findings and the preservice teachers' ideas are consistent with the literature. Knapcyzk et al. (2005) emphasized the value of consistent, task-oriented, and timely feedback provided by online mentors (in this case, supervisors or cooperating teachers). With the advance of computer technology, the interaction between the three groups in the teaching practice process moves beyond geographical locations and into a/synchronous interactions. The feedback exchange at the heart of teaching practice, as emphasized by the findings of this study, is now feasible. Study participants also underlined the value of feedback and its contribution to their professional growth.

Regarding how well perceived needs were met, for preservice teachers the need "drawing students' attention in the class" (item 22) was the most well met, for cooperating teachers it was the need of "having effective interaction with the students in the class" (item 26), and for the university supervisors, the need for "giving clear instructions" (item 23) was best met.

It should be emphasized that these findings also point to the advantage of e-portfolio applications informing the preservice teachers' teaching performance in an actual class in

harmony with their needs and accomplishment levels. The e-portfolio application is an interactive platform where cooperating teachers can upload the preservice teachers' performance evaluations frequently and give feedback about their performance if necessary. The university supervisors can also review these evaluations and interact with the cooperating teachers or preservice teachers on such teaching practice issues.

For the reflection stage, "getting effective feedback from cooperating teachers on the actual teaching" (item 45) was the most well-met need according to preservice and cooperating teachers. We expected this finding since cooperating teachers are available and onsite for face-to-face reflection about student performances during the process. Thus, the preservice teachers considered their need for feedback from cooperating teachers to have been met. This feedback provided them with other reflections on their performance. This finding also implies the preservice teachers' need for university supervisors' feedback on their actual teaching. Although university supervisors are included in the process actively with the e-portfolio, there is still a need to involve them in the postsession feedback about preservice teachers' teaching performance. We suggest uploading the video records of the preservice teachers' teaching practice into the system and enabling the university supervisors to give feedback as well. Enriching the feedback on teaching practice in this way would help the preservice teachers improve their teaching skills and foster their interaction with class supervisors.

For the university supervisors, "writing a rationale" (item 48) was the most well-met need at the reflection stage. To write rationales, preservice teachers must think about their goals and how to accomplish them in the lesson. Thus they start to reflect on their teaching and evaluate their approaches. In the e-portfolio application, preservice teachers write their rationales for a larger audience—cooperative teachers, university supervisors, and peers. They also have the chance to revise other rationales and they can be motivated to develop their rationales by reflecting on past experiences. On this point, the e-portfolio engages the students in self-reflection, reviewing goals periodically (Lin, 2008).

However, the three groups' perceptions about how well the preservice teacher needs were met for "writing self-reflection on all teaching stages" (item 41) differed: While the preservice teachers and cooperating teachers believed that this need was mostly met by the e-portfolio application, the supervisors remained neutral. In the e-portfolio application, the preservice teachers were asked to write a critical reflection after each teaching practice, and supervisors and cooperating teachers were to evaluate these reflective papers. While the preservice teachers and cooperating teachers seemed to be satisfied with the opportunity for self-reflection that the e-portfolio application offers, the university supervisors expected more from both the preservice teachers and the application. The supervisors neutral stance could be interpreted as their expectation for better reflections.

The findings on how well the reflection needs of the preservice teachers were met complied with the literature. That is, other researchers commonly agree that e-portfolios have the potential to enhance reflective thinking (Kocaoglu et al., 2008). Using e-portfolios, preservice teachers are stimulated to engage in reflective practice, to develop effective learning

strategies, and to gain and review technology skills (Lin, 2008; Bataneih, Al-Karashneh, & Al-Barakat, 2007).

In contrast, when we look at the unmet needs, we see that cooperating teachers felt preservice teachers were not very successful "reflecting on the students' learning difficulties in the class" (item 43). For the preservice teachers and university supervisors, "getting peer feedback on the actual teaching" (item 41) was not met as well as other needs by the application. By identifying such unmet needs, we consider how the e-portfolio application can be improved and developed as a more reflective tool.

The Comparison of the Three Groups' Perceptions about Needs and How Well the Needs Were Actually Met

To address the last research question, "Were there any differences between perceived needs and those actually met for each participating group?" we employed a *t*-test to the findings about the three groups' perceptions.

Table 5

The Comparison of Perceived and Met Needs in Terms of All Three Groups' Perspectives

		Preservice Teachers				**Cooperating teachers**				**University supervisors**			
		Mean	*t*	*df*	*Sig.*	Mean	*t*	*df*	*Sig.*	Mean	*t*	*df*	*Sig.*
Planning	Perceived needs	2.2345	-1.948	57	.056	2.3194	-.279	197	.780	2.0718	-4.626	93	.000*
	Accomplishment	2.5198				2.3376				2.6378			
Teaching	Perceived needs	2.1836	-2.207	57	.031*	2.3331	.407	197	.684	2.1489	-5.273	93	.000*
	Accomplishment	2.5086				2.3053				2.7814			
Reflection	Perceived needs	2.0690	-2.134	57	.037*	2.2955	1864	197	.064	2.0359	-7.897	93	.000*
	Accomplishment	2.3750				2.1711				3.0598			

*significant at .05 level

There was no difference between the perceived needs at the planning stage and how well they were met, while there was a significant difference between the perceived and met needs at the teaching and reflection stages. In other words, these findings indicated that the preservice teachers' needs at the planning stage were mostly met by the e-portfolio system. The preservice teachers thought that the e-portfolio application addressed their planning needs before they started the teaching process. However, their needs at the teaching and reflection stages were not met as well as they were for the planning stage. These findings also point to the necessity of including the university supervisors in the postobservational feedback sessions.

Moreover, the findings indicate that for the cooperating teachers, there was no difference between the perceived and met needs for all the stages of the teaching process. According to cooperating teachers, all the needs of preservice teachers were met by the e-portfolio

system.

In contrast, for the university supervisors there were significant differences for all teaching stages. The university supervisors believed the e-portfolio application did not successfully meet the preservice teachers' needs during the planning, teaching, and reflection stages as much as it should have. They might have had higher expectations both for the preservice teachers and the e-portfolio application.

Conclusion

The main reason to use the e-portfolio application is to develop the effectiveness of teaching practice by including the third group, university supervisors, during the process, increasing the interaction opportunities among all the participants and providing immediate feedback to preservice teachers by creating a flexible learning environment. The aim of our study was to examine the feasibility of the e-portfolio system by reviewing the perceptions of the participants on the needs of the preservice teachers and how well these were met. The results indicated that the perceptions of the preservice teachers, cooperating teachers, and supervisors concerning the needs of preservice teachers using an e-portfolio were not different from one another. This similarity might suggest that all the participants perceived the process of teaching in terms of planning, teaching, and reflection stages similarly.

When these needs and how well they were met were considered, the university supervisors differed from the other groups, stating that the needs of the preservice teachers weren't satisfactorily met and further that students at the reflection stage of teaching require more guidance. Analysis of the data also revealed that while preservice teachers' needs (as they defined them) during the planning stage were mostly met by the e-portfolio system, the teaching and reflection needs were not met as well as needed. These results suggest the necessity of revising the application of the e-portfolio system in order to better address these perceived needs. Focusing on identifying and stating the objectives of lessons and making reflections for preservice teachers; giving more detailed and explicit feedback for the cooperating teachers; and helping the cooperating teachers, supervisors, and preservice teachers develop their skills in reflecting and giving feedback seem to be the essential aspects that need improvement.

Nevertheless, the results of this study are similar to those found by Ballantyne and Mylonas (2001), Caner (2009), Kocoglu, Akyel, and Ercetin (2008), and Lin (2008). Having the opportunity to interact with cooperating teachers and supervisors and get feedback for what the preservice teachers do facilitates their professional development, and the e-portfolio application provides a valuable medium that leads to collaboration, self-development both as a teacher and a social partner, construction or reconstruction of knowledge, and development of autonomy.

Our findings indicate that the e-portfolio system enabled university supervisors to be actively involved in the distance teaching practice process from the beginning.

Users appreciated the e-portfolio and perceived it as advantageous because it provided

- an interactive platform for all the participants,
- the opportunity for instructors to provide immediate feedback for the preservice teachers, and
- the ability to store and review the feedback without any time limitations.

However, our study also revealed a need to improve the e-portfolio system. The three groups' perceptions of which needs that were not met shed light on aspects that must be improved. These results indicate

- the necessity of in-service education for the three groups, particularly on how to effectively use the e-portfolio application; and
- the necessity of further guidance for preservice teachers about the reflection stage of the teaching process.

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Developing and Deploying OERs in sub-Saharan Africa: Building on the Present


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Abstract

Open educational resources (OERs) have the potential to reduce costs, improve quality, and increase access to educational opportunities. OER development and deployment is one path that could contribute to achieving education for all. This article builds on existing information and communication technology (ICT) implementation plans in Africa and on the experiences of organizations and initiatives such as the African Virtual University (AVU), OER Africa, the South African Institute of Distance Education (SAIDE), and the Teacher Education in Sub-Saharan Africa (TESSA) Project, to present one view of the benefits, challenges, and steps that could be taken to realize the potential of OERs in sub-Saharan Africa. Thus, the article focuses on the factors necessary for creating and sustaining a vision for OER development and deployment; developing and distributing resources with an open license; improving technology infrastructure and reducing the cost of Internet access; establishing communities of educational collaborators; sustaining involvement in the OER initiative; producing resources in interoperable and open formats; establishing and maintaining the quality of OERs; providing local context to address national and regional needs and conditions; informing the public about OERs; and taking the initiative to build on the knowledge, skills, and experiences of others. In order to assist educators and decision makers, links to a variety of resources are provided.

Keywords: Open educational resources; OER; ICT; ODL, distance education; online learning; self-learning; copyright; education; education for all; educational collaborators; open source; Africa; sub-Saharan Africa

The Potential of OERs in sub-Saharan Africa

This article provides a rationale for the use of open educational resources (OERs) as well as the potential and challenges associated with their development and deployment in sub-Saharan Africa. Examples of how OERs are developed and used are presented in conjunction with links to resources that may assist educators and government leaders in countries with developing or weak economies.

What do the people below have in common?

- Grace Mukami is an upper-primary school teacher in Kenya. She feels she works best with older children, though she would like to teach at the secondary level. In order to do so, Grace must update her teaching credentials and learn more about secondary-school subjects and pedagogy, especially about competency-based learning.

- Bethel Msiska was born and raised at the edge of Lilongwe, Malawi. She excels in most subjects, but her mathematical skills are weak. If Bethel could improve her grades in mathematics, she might be able to obtain a college scholarship. If she succeeded, she would be the first person in her extended family to go to college. Unfortunately, her parents only completed primary school and are unable to help her with mathematics. In addition, they cannot afford a tutor.

- Sunday Adebanjo is a Nigerian farmer who grows vegetables to feed his family. He also raises poultry and goats, which he sells in the market. In order to support his growing family, Sunday is considering raising and selling pigs. Should he instead find ways to raise his poultry more efficiently? Information about raising pigs and poultry efficiently would be useful, but a decision-making tool that would help him decide whether to diversify would be extremely valuable.

- Rebecca Kutuso is a nurse in a small town in Botswana on the main trucking route from South Africa to Zimbabwe and Zambia. She deals mostly with cuts and bruises and reminds people to use their mosquito nets. Malaria isn't as prevalent here as it is in The Gambia, where she worked previously. Instead, Rebecca has met a number of people with HIV and AIDS. She knows about the basic prevention and transmission of HIV. She has heard about new developments in treatment and wonders if generic drugs taken on a strict schedule could help her patients.

- Harry Benya is a community leader in a village near Freetown, Sierra Leone. There are a number of young people living with physical disabilities in his community. Harry wants to add a classroom to the school and build a ramp so the building is more accessible for these adults. If he knew more about government assistance programs or could improve his advocacy, community organization, and leadership skills, perhaps he could convince the government to provide the funds needed for the construction.

What these individuals have in common is that they could all benefit from using open educational resources (OERs) in formal, informal, and self-learning settings. They are also for-

tunate to be living in a time when there seems to be a convergence surrounding the importance of education to the cultural, social, and economic development of Africa. In addition, digital technology has opened up unlimited possibilities in communication and education. A greater number of learners now have options regarding what, when, where, and how they learn—circumstances that were inconceivable when most sub-Saharan African countries gained their independence decades ago.

Although the statement "Everyone has the right to an education" (United Nations, Article 26, 1948) was enshrined in the Universal Declaration of Human Rights just over 60 years ago, only recently has there been a concerted effort to ensure that all people have the *opportunity* to be educated. Education for All (EFA) and the Millennium Development Goals (MDG) have both placed an emphasis on education. EFA, for example, "comprises six interrelated goals that together reflect a holistic concept of educational development" (UNESCO, 2006, p. 1). It acknowledges that education is vital for health and development, particularly for those who are geographically disadvantaged and for women. For example, "every year of secondary education a girl or woman can attain will greatly increase her future income—sometimes by as much as 15%" (Lake, 2010). If a woman can obtain some postsecondary education, she and her children will be healthier and live longer. Educated women will contribute significantly to the development of their country, thereby helping Africa to climb out of poverty (Bloom, Canning, & Chan, 2006). Thus, "education is widely accepted as a leading instrument for promoting economic growth" (Bloom et al., 2006, p.1) and good health.

Due to the substantial efforts being made to achieve EFA and MDG goals, there has been a significant increase in the number of children attending primary and secondary schools in developing countries. "Some of the poorest countries have made the greatest strides in education. Burundi, Madagascar, Rwanda…and the United Republic of Tanzania have achieved or are nearing the goal of universal primary education" (United Nations, 2011, p. 5). However, "the population of sub-Saharan Africa's 5- to 14-year-olds is expected to grow by more than 34% over the next 20 years, and the region will need to respond to the demands of 77 million new students" (Provost, 2011, April 27). Currently, only 36% of those who want to enroll in secondary education in sub-Saharan Africa can find seats in schools (UNESCO, 2011). In South Africa, for example, 85,000 potential learners applied for one of the 11,000 seats available at the University of Johannesburg (Polgreen, 2012). "Globally, of those 20 or younger, 30 million are qualified to attend university, but there are no places for them. This number increases to 100 million by 2020" (Allen, 2010). "In order to serve the number of youths qualified to enter university in 2020, a major university would need to be opened every week" (Atkins, Brown, & Hammond, 2007). Thus, the demand for education, especially in sub-Saharan Africa, is much greater than the existing and planned academic institutions can accommodate. In addition, "based on 2004 data, UNESCO estimates that in sub-Saharan Africa alone, 3.8 million teachers will have to be recruited by 2015 if the goal of universal primary education is to be achieved" (United Nations, 2009, p. 16). African governments do not have the financial resources to hire that number of teachers. In fact, between 1991 and 2006, the number of students registered in African higher

education rose by 16%, but the expenditures to education rose by only 6% (World Bank, 2010). The demand for educational services is outstripping what countries are allocating to education. In an attempt to rein in the cost of education, several countries, such as Niger, hired "volunteer" teachers (Lambert, 2004) who had no teaching experience and often lacked knowledge of the subject matter they were teaching. In the Republic of Congo, some teachers were not paid for several years (Prozonic, 2011). It does not seem feasible that governments in sub-Saharan Africa will be able to build, staff, and resource schools, universities, and teacher-training facilities to meet the demand over the next 5, 10, or 20 years. The concepts of education for all and equitable access to educational opportunities may not be fully realized. Other educational options, such as the increased use of distance education, information and communication technologies (ICTs), and OERs must be explored for use in traditional and distance educational settings. A combination of different approaches, including the implementation of OERs, can lead to increased accessibility and quality in educational systems within Africa.

OERs are defined 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). Some conditions may be placed on the use of OERs, such as the provision of attribution, but all OERs are accessible to anyone. These untapped resources have the potential to reduce costs, improve quality, and increase access to educational opportunities (Daniel, 2011; Plotkin, 2010). Benefits of OERs are outlined below. As these benefits are interrelated, some of the items placed under one heading could easily be placed under another.

Reducing Costs

A vast number of existing OERs can be accessed, adapted, and used by one or millions of learners, thereby minimizing the costs associated with the acquisition and development of educational resources. Often overlooked is the cost savings accrued to learners who would be able to access free learning materials rather than paying for copyright-protected resources. The high cost of academic texts and learning materials can be a barrier to those in sub-Saharan Africa who want to pursue an education. Thus, students at the University of Nairobi and the Open University of Tanzania have reduced their textbook costs by using AVU OERs that are freely available online.

If existing OERs are used, funds allocated for resource acquisition and development can be reduced. However, there may not be an appropriate OER that matches the needs of a particular education system. An OER may need to be developed or adapted, but it only has to be developed once since it can be distributed to everyone in the system. Duplication of effort is minimized. Resources and efforts can be focused on other endeavours, including making OERs for other subject areas. For example, the Teacher Education in Sub-Saharan Africa (see TESSA, http://www.tessafrica.net/) Project has led to the development of teacher-training materials that can be used and adapted by anyone. Thus, other educators do not have to spend their effort developing the same teacher-training materials from scratch. If they have the expertise, they could develop training materials in other subjects

and share them with the global community.

Initially, the development of OERs will require financial resources, but over the long term, for the initiative to be viable, it must "meet provider objectives for scale, quality, production cost, margins, and return on investment" (Walker, 2005). The funds used to "prime the pump" might initially come from external sources, such as the African Development Bank (see AfDB, http://www.afdb.org/) or be reallocated from existing funds. Since all educators must keep their material current and update the curricula, funds for these activities can be directed at the development of OERs that are congruent with the new curricula. When OERs are used, the ultimate payoff for the government is that more citizens are educated and able to advance the social, cultural, and economic development of the country. As noted earlier, the more educated the populace, the more income they are able to earn and the healthier they are. The standard of living rises, which is the government's payback for its investment in OERs.

The availability of OERs in the form of textbooks allows institutions and learners to divert funds from the purchase of copyrighted textbooks. If the open textbooks are printed, there will be printing costs, but this amount would be significantly less than if copyrighted material was purchased from a publisher. Even if the textbook was purchased in a digital form from the publisher, royalty fees would still need to be paid. Various organizations, such as the South African Institute of Distance Education (see SAIDE, http://www.saide.org.za/) Open Educational Resources Project and the Community College Open Textbook Collaborative (http://collegeopentextbooks.org/), make available texts that can be edited and customized by instructors. These customized products can be distributed to learners in digital or print form without incurring royalty fees. If bulk printing is required, it can be done locally, thereby supporting local printing companies (West, 2011).

If instructors want to use any copyrighted material in their class or distance education course, they must obtain permission from the owner of the material. This can take time and money. If OERs are used, permission does not need to be obtained; time and money are saved. Funds can also be saved if the cost of transporting materials is minimized. Digital forms of educational materials can be sent anywhere in an instant without incurring the high transportation costs normally associated with the purchase of textbooks or other bulky learning and instructional resources.

Some of the funds that would normally be allocated to the purchase of educational materials could be reallocated. In the higher-education system, funds could be reallocated to provide additional learner support, professional development, and research. In the primary- and secondary-school systems, more teachers could be hired and paid better, thereby addressing the problem of poorly paid teachers who tend to have high absenteeism and diverted attention because they take on second jobs to support their families. In Africa, there is an "inverse correlation between enrollment rate and teachers' salary" (Lambert, 2004, p. 3); as enrollment increased, governments tried to compensate by paying teachers less and hiring volunteer teachers. Thus, the experienced teachers departed and students were taught by less capable individuals. Reallocating resources could assist in alleviating this problem.

Improving Quality: Promoting a Culture of Sharing

The quality of education improves when OERs are developed and used because instructors and learners then have access to resources that they were unable to access previously as these resources were copyright protected and/or costly to obtain. They also have access to up-to-date, quality materials and no longer have to rely on decades-old books, some of which were donated to sub-Saharan African schools by charity organizations after the books were no longer useful elsewhere.

OERs can be used by anyone. They are of great benefit both to instructors who lack the time to develop quality resources and to teachers who lack teaching credentials and the knowledge of the subject matter that they are teaching. The resources would be extremely helpful for the large number of voluntary, inexperienced, and unqualified teachers in sub-Saharan Africa. OERs can also have an impact on the quality of teaching and learning in traditional classes and distance education courses simply by being available. The freely available OERs can be used directly in class, but just their presence exposes teachers to new information and different ways of approaching a subject. By "looking over the garden wall," instructors can reflect on what they do and be inspired to change their instructional methods and the content they present. They can improve what they are doing by seeing what others are doing.

OERs are often developed in a collaborative manner and peer reviewed by international experts. Thus, various people are involved in constructing OERs within the quality framework set by the institutions and organizations for which they work. This process involves people reviewing the curriculum, searching for suitable material, deciding what needs to be built, then contributing their expertise to the development and refinement of the finished product. The resulting product, formed through a diverse intellectual exchange, is usually substantially better than one produced by a single individual. This collaborative production model for OER development restores "the core values of building and sharing knowledge that underpin good education and systematically encouraging us to work with and learn from one another" (Butcher, 2011, p. 45). The successful collaborative processes used during the development of courses and programs offered by the African Virtual University (see AVU, http://www.avu.org/) and the University of Mauritius (see UoM, http://vcampus.uom.ac.mu/) could be employed by other African educators and institutions.

Since OERs are published for all to see, viewers worldwide, including students and employers, can comment on the quality of the items and provide feedback. The extensive feedback can be used to improve the educational resources and promote educational excellence.

Multiple representations of concepts can be presented to and be used by learners. If learners have difficulty understanding a particular topic, they can seek an OER that explains the concept in a different manner. If learners adapt an OER to meet their needs, they become more actively engaged in learning. Furthermore, their revised OER can be made available to others who may have encountered similar difficulties, thereby perpetuating a culture of sharing, which lies at the foundation of the OER movement. OERs can be adapted to ad-

dress local needs and the cultural context in which they will be used.

If students have access to OERs, then face-to-face instructional time can be focused on discussion, debate, and practical applications. These types of engaging activities promote the development of 21st-century skills such as critical thinking, creativity, and problem solving. Learners could also use OERs for self-learning. OERs have

> the potential to change the practice of learners, educators, and organizations in a profound way. The learner is given choice by OER of ways to learn, either as existing courses make use of the resources or much less formally through individual or group learning around and with the open sources. (McAndrew, 2010, p. 125)

Increasing Access

OERs are based on the premise that knowledge is created by society and should be shared for the benefit of society. Thus, knowledge should be freely available to help people learn and to facilitate lifelong learning. In practical terms, educational resources produced by public funds should be made available to everyone so that all may benefit.

OERs can be used by anyone, at any age and at any time. They can be used by those who are registered in an academic course or program and by those who just want to improve their knowledge and skills to solve a problem or learn for the pleasure of learning. Some will use OERs to help them attain entrance into an academic institution or to obtain credible postsecondary credentials from recognized educational institutions through the OER University (see OERu, http://wikieducator.org/OER_university/Home). This latter institution aims to provide a viable and sustainable alternative for learners who are unable to attend traditional courses or programs. Some individuals will use OERs to help them learn a skill they need for their work or to address problems in their personal lives. OERs can be used to help people build their own learning paths.

A number of people can access digital OERs simultaneously. Thus, one resource can serve many, including those within and outside of the classroom. OERs can be used in traditional, open and distance learning, and self-learning situations. Learners and instructors who lack core or supplementary learning or instructional material can find, adapt, remix, and use OERs that are congruent with their learning or instructional objectives.

OERs can serve those who may be geographically or financially disadvantaged. However, it must be acknowledged that given the current lack of ICT infrastructure in Africa, the disparity between the haves and have-nots may be highlighted. To the have-nots, OERs may not be open and free. Learners and instructors who want to use digital OERs need access to a computer and compact discs or the Internet, but they do not have to personally own a computer. They can access both a computer and the Internet at a friend's home, at computer learning centres being established by communities and institutions, or at the increasing number of Internet cafés. In time, some OERs will be accessible via mobile phones,

which are ubiquitous in sub-Saharan Africa. Although it may be a challenge for some people in Africa to access online OERs, the resources are still freely available online and could be distributed in print and compact disc formats that are accessible to many.

If individuals have access to a computer and the Internet, they can gain access to global resources that were previously out of reach and thus increase their chances of finding materials that meet their specific needs. Most countries in the region have a national ICT plan that will lead to more equitable access to the Internet and global resources. At the Connect Africa Summit: Bridging the Digital Divide (2007), 43 African governments agreed to "connect villages to broadband by 2015, adopt key regulatory measures that promote affordable, widespread access to ICT services, (and) support the development of a critical mass of ICT skills" (UN Economic Commission for Africa, 2007). "The introduction and use of appropriate ICT solutions can and does contribute to socio-economic development and helps to create opportunities for people to shape their own individual future and that of society around them" (International Institute for Communication and Development, October 24, 2011, p. 3).

If OERs were available and accessible, the individuals mentioned at the beginning of this section—Grace, Bethel, Sunday, Rebecca, and Harry—would have access to the information they require in formal, informal, and self-learning settings. They would be better able to develop skills and make decisions that will benefit themselves and those around them. Grace, for example, would benefit from accessing teaching materials from TESSA. Bethel, the secondary-school student, could improve her mathematical skills if she had access to the free videos from the Khan Academy (see http://www.khanacademy.org/). The resources available from the OER Africa (see http://www.oerafrica.org/) AgShare Project might be useful to Sunday, the farmer, and Rebecca could learn more about HIV/AIDs from the resources offered by the OER Africa Health Network. Harry, the community leader, could gain access to leadership materials from OpenLearn (see http://openlearn.open.ac.uk/) at the Open University in the United Kingdom, but it would be most helpful to Harry if the government provided online access to its assistance programs.

The successful development, distribution, and use of OERs in sub-Saharan Africa will require government and education leaders to face a number of challenges. The challenges below are discussed in greater detail later in this article.

- Creating and sustaining an institutional, national, and/or regional vision for OER development and deployment that embraces a culture of sharing
- Developing and distributing resources with an open license and ascertaining the effect this will have on current intellectual property policies and procedures
- Improving the technology infrastructure and reducing the cost of Internet access in order to achieve equity of access
- Establishing communities of educational collaborators to develop and use OERs
- Sustaining involvement in the OER initiative so that it can be continued once initial ex-

ternal funding is reduced or eliminated

- Producing resources in interoperable and open formats that are freely available or easy to obtain
- Establishing and maintaining the quality of the resources by setting standards and allowing for mass peer review
- Providing local context so that the materials address national and regional needs and conditions
- Informing the public about OERs and educating the users about how to locate, evaluate, and utilize OERs so that they may be empowered to make decisions about their lives
- Taking the initiative to build on the knowledge, skills, and experiences of others, thereby minimizing the duplication of effort and reducing the learning curve

The Next Step

In order to pursue the goal of education for all and provide learning opportunities for all Africans, including the five individuals described at the beginning of this section, government and educational leaders must have the collective will and commitment to innovate and take the opportunity to grasp the potential of OERs. They can build on OER success stories achieved by AVU, OER Africa, SAIDE, the Virtual University for Small States of the Commonwealth (see VUSSC, http://www.vussc.info/), and other African and global OER initiatives. But in order to do so, they must address the challenges listed above. The next section of this document provides an in-depth discussion about the challenges associated with the development and use of OERs and what should be considered in advancing the OER movement in sub-Saharan Africa.

Looking Forward

As can be discerned from this document and others in the academic media, OERs have the potential to increase accessibility to quality educational materials at a lower cost to the user, thereby allowing governments and institutions to divert funds to other critical areas, such as learner support, faculty professional development, research, and teacher recruitment and retention. OERs enable individuals to freely access information they can use to make decisions that affect their lives and ultimately the progress of societies. OERs also have the potential to allow for flexible, quality education through distance learning and to assist most African countries to meet the increased demand for secondary and higher education. But can this potential be realized in sub-Saharan Africa? Looking forward, what are the challenges that must be overcome to fulfill the potential of OERs in sub-Saharan Africa? A number of challenges that face the OER movement in Africa are discussed below; many of them may also apply to the development and use of OERs in other areas of the world that have weak economies. Although the items below are listed as discrete entities, many are

interrelated and affect one another—the decisions made about one entity may affect the decisions regarding a second entity. Note also that statements made in this article may not reflect the full spectrum of educational development within Africa; thus, some suggestions may not be applicable to some regions of sub-Saharan Africa.

Creating and Sustaining a Vision for OER Development and Deployment in sub-Saharan Africa

Governments and educators in sub-Saharan Africa are faced with an increased demand for education, yet their countries' weak economies make it difficult to support their educational endeavours.

> In most sub-Saharan African countries, enrollment in higher education has grown faster than financing capabilities, reaching a critical stage where the lack of resources has led to a severe decline in the quality of instruction and in the capacity to reorient focus and to innovate. (World Bank, 2010, p. xiv)

However, governments are fully cognizant of the impact education can have on social and economic development. For example, "educated girls are less likely to marry or have children early; they are better able to protect themselves from HIV and AIDS and from sexual exploitation and abuse" (Lake, 2010). "Education and health (can) increase human productivity, raise life expectancy, and facilitate community life. They have a major impact on economic growth and increase individual and collective well-being" (Diagne, 2006, pp. 3–5). Thus, education is paramount if countries with weak economies are to get stronger.

But how can the quality of and access to education be improved with minimal financial resources? As Sir John Daniel (2010) asked when he introduced his concept of the iron triangle, is it possible to increase access, improve quality, and cut costs all at the same time? One possible way to achieve this is through the development and deployment of OERs because they are freely available and can be accessed for formal and informal purposes and because the collaborative approach to their development and deployment decreases the cost per student and improves quality.

If the only focus for employing OERs is the reduction of cost per student then the true potential of OERs to contribute to the improvement of education will not be realized (Butcher, 2011). The current approach to OER development and distribution involves collaboration among the creators and users, who work together to develop and revise educational material. For this approach to work effectively, all must believe that the sharing of knowledge and experience lies at the core of academic activity (Lerman, Miyagawa, & Margulies, 2008). It is during this sharing and curriculum-mapping process that educators ascertain the priorities of other instructors and learn about the content they are teaching and the approaches they are using. Consequently, educators learn from this experience and can apply it to their own situation. The education system will improve incrementally at first. As the collabora-

tion proceeds, there is greater potential for the education system to change dramatically and to provide the knowledge and skills students need for the 21st century. The open, creative, collaborative process "enables continuous rapid improvements in the quality of both teaching and learning" (Plotkin, 2010, p. 1).

Government decision makers and leading educators can set out a powerful vision for their educational system by emphasizing the importance of education to social and economic development and the key role that education and OERs can play. The use of OERs can reduce educational costs, promote collaboration, increase access to up-to-date, quality educational materials, and cause educators to reflect on and improve their current practices. Governments can set the policies and priorities for OER development by

- actively advocating for the use of OERs, addressing the various myths and barriers to OER use, such as the "not-invented-here syndrome," and providing case studies of successful OER development and deployment in Africa;
- promoting a culture of sharing and stressing the need for institutions and educators to work together; thus, future funding initiatives should involve two or more institutions;
- including OERs in national ICT policies and plans;
- mandating that all resources produced by public funding be accessible to all;
- encouraging the use of open formats and open license;
- facilitating a review of curricula offered by institutions in the country in an effort to determine common areas that could benefit from the development of OERs;
- making it easier for educators to know what resources are available;
- encouraging educators and governing bodies at institutions to discuss OER development and deployment at the same time that they discuss financial, technical infrastructure, and personnel requirements; and
- keeping informed of the global OER movement through linkages with international organizations.

Additional suggestions for the role of government in OER development and utilization can be found in the UNESCO-COL (2011) publication *Guidelines for Open Educational Resources (OER) in Higher Education*. Note that suggestions for the development and implementation of OERs may differ between public schools and postsecondary institutions. Governments may dictate how OERs are developed and used in public-school systems but often are able only to provide guidance at the postsecondary level as tertiary institutions tend to govern themselves and professors tend to have more freedom to select and develop resources than teachers do.

If the vision for OER development and deployment in Africa is to be sustained and achieved, it will be necessary to

- establish achievable goals that address the needs of the institution, educators, learners, and the community;
- conduct an analysis of strengths, weaknesses, opportunities, and threats (SWOT analysis) associated with the use of OERs and build on the work of AVU, TESSA, OER Africa, and similar OER initiatives;
- ascertain the benefits of the use of OERs and question what would occur if OERs were not employed, for example whether the cost of education would increase at the same rate and whether informal and formal access to education would increase;
- obtain the support of educators for the use of OERs and address their concerns, especially those related to intellectual property;
- convince educational stakeholders such as instructors, learners, parents, and employers about the merits of the vision; clearly indicate to institutional personnel what is gained and what may be lost by using OERs; build consensus on the way forward;
- identify educational leaders and institutions who could advance the vision; consider those who are currently involved with OERs and assess whether their expertise is recognized by others so they can take on a leadership role; identify those who are committed to innovation and are politically astute;
- consider employing the consortium program model (Diallo, Wangeci, & Wright, 2012), which highlights collaborative planning, decision making, and OER development across educational institutions that may have different political, geographical, cultural, and language backgrounds, but all share a vision to address the needs of their learners;
- develop action plans that specify the criteria of success and timelines to be followed; start small by having a razor-sharp focus on one portion of the curriculum at a time rather than using a "scatter" approach to please as many stakeholders as possible, but in the end pleasing no one with the quantity and quality produced; allow sufficient time for collaboration as this can seem slow at first but with experience can become efficient and lead to a better product;
- assign tasks, state accountabilities and deliverables, and specify resources to be provided;
- ascertain barriers that need to be overcome and address them;
- provide support and training;
- monitor the implementation of the vision and make adjustments as required;

- publish the progress of the implementation so that all stakeholders can be informed and be acknowledged for their efforts, thereby sustaining their participation;

- assess the outcomes of the initiative and note any unexpected outcomes that should be taken into account during future stages of OER development and deployment; and

- provide effective leadership that sets high standards, takes into account the attributes of the participating organizations/institutions, is open to suggestions, and is flexible yet decisive (although authoritarian approaches to leadership may be effective elsewhere, educational collaboration requires a more flexible leadership style that focuses on team rather than individual effort).

In order to accomplish the above, it may be helpful if African education and government leaders participated in an OER workshop and completed modules about the benefits and challenges of OERs as well as about their effective implementation—a workshop and module format similar to the successful Academy of ICT Essentials for Government Leaders developed by the United Nations Asian and Pacific Training Centre for Information and Communication Technology for Development (see APCICT, http://www.unapcict.org/). This APCICT initiative was designed to harness ICTs for socioeconomic development. In the future, it is expected that OERs will be discussed along with ICTs.

By creating an achievable vision, assigning those with a passion for OERs and their potential to the OER initiative, allocating or reallocating resources, and establishing institutional, national, and pan-African leadership linked to the global OER movement, it will be possible to improve African education at a minimum cost over a period of time.

Developing and Distributing Resources with an Open License, thereby Increasing Access and Lowering the Cost of Obtaining Educational Resources

The world is overflowing with an abundance of educational material. Nevertheless, many African educators and learners do not have access to it and may have limited access even to resources produced within their own country. The resources are likely to be inaccessible due to the cost of the material, shipping charges, and copyright restrictions. It can be a challenge for the following people to obtain learning resources: a primary-school teacher in the Republic of Congo earning US$40 per month, an upper-primary school teacher in The Gambia taking home US$85/month, a high-school instructor in Sierra Leone making US$175/month, and a lecturer at Makerere University in Uganda earning US$390/month (Kavuma, 2011). If teachers are unable to afford learning resources, it is even less likely that students will be able to obtain them.

Copyright is one of the main reasons that educational resources are inaccessible to and/or expensive for learners and teachers in Africa. Even if instructors can obtain the material, there are often restrictions on its use. For example, instructors may not be permitted to make copies for their students, modify the material to suit their pedagogical approaches, or place the resources online so that more people would be able to access them. In most coun-

tries, the original author, producer, publisher, and/or distributor retain full copyright of the materials they produce. Consequently, individuals who want to use the work must seek permission from the author or producer. This process takes time and costs money. If the resources are produced with an open copyright license or if the creator clearly states that the material is freely available for use in any form, then users can access the resources without seeking permission or paying royalty fees. Only in a few countries, such as Canada and the United States (which have "fair use" or "educational use" provisions in their copyright laws), can educators use a portion of the material without seeking permission.

Open copyright licenses enable others to use, replicate, adapt, and remix resources without seeking permission or paying a royalty fee. Creative Commons is an organization that provides a legal licensing framework that enables creators to retain the copyright for their work yet allows others to copy and distribute it. The creator may also dictate how the material can be used, modified, or remixed, whether the creator of the material must be identified, and whether the material can be used for commercial purposes. OERs have open copyright licenses, and many OERs have a Creative Commons license that operates within the copyright laws of the country in which copyright is granted.

If educational institutions were encouraged to use resources with an open copyright license and if resources produced by the government and by government-sponsored or supported entities, such as educational institutions, were released under an open copyright license, then institutions could reduce the time and the funds they spend on obtaining resources. Obviously, users of these resources would need to set aside funds to print the resources or to have them duplicated on a compact disc (CD) or digital video disc (DVD). If the resources were available in a digital form and could be accessed online, funds for printing and conversion to a disc would not be required.

Since OERs have open copyright licenses, they can be used, copied, and distributed by citizens everywhere. As noted above, there may be restrictions regarding use, modification, and/or remixing, but many OERs have no restrictions of any kind. If African institutions used OERs, the cost of instructional and learning resources would be significantly reduced. If educational institutions were required to release material under an open copyright license, then public institutions could easily share the resources they produce. As there are a number of for-profit organizations and private educational institutions in Africa that are not publicly funded, a decision must be made as to whether these institutions can use OER materials. Ideally, all institutions should be able to use OER materials, and private institutions should be encouraged to participate in the production of OERs. As the use of OERs by private institutions can be a lightning rod, this situation must be dealt with quickly and decisively.

In order to accrue the benefits associated with OERs, African nations should seriously consider developing and distributing educational and government material with an open copyright license. Perhaps open copyright licenses should be applied by default to any materials produced by public funds (UNESCO-COL, 2011). Thus, publicly funded material could be studied in relevant courses, and the activities of the government would be more transpar-

ent. However, guidelines would need to be established for determining why some publicly funded resources should be exempt from open copyright provisions. Also, contracts and job descriptions of those paid by public funds would need to include a provision specifying that a person's work product could be released under an open copyright license.

Educational institutions could be encouraged or required to share their instructional and learning resources. It is a duplication of effort if each institution makes, for example, the same drawing of a four-chambered human heart. But it is acknowledged that the detail and labelling of a heart diagram to be used in a junior secondary school will be different from one used in a postsecondary institution. Regardless of which institution makes the diagram, it should be released under an open copyright license so others can use it without cost. The heart diagram could be combined with other diagrams of the human body to make one integrated OER. If the diagrams are obtained from different sources with different restrictions regarding their attribution or use, institutions need to track these restrictions and inform users of them.

Requiring personnel at educational institutions to release their learning and instructional materials with an open copyright license can be a challenge to implement in countries where teachers are paid poorly. In these countries, teachers may sell compulsory handouts or their lecture notes to students in order to earn extra income, thereby significantly increasing the cost of education to learners. By publishing materials openly, instructors may be unable to sell their lecture notes. But is it right for instructors to sell information that they should be delivering during class time to students registered in their course? Is it right to charge students additional fees when many experience difficulties with paying basic educational fees? Furthermore, shouldn't the duties of instructors include providing students with up-to-date information?

Instructors may also resist the implementation of the open copyright provision because the quality of their work will be exposed for all to see. Those who use incorrect information, outdated content, and plagiarized material will be uncovered. Issues regarding the quality of OERs will be discussed later in this document.

Improving the Technology Infrastructure and Reducing the Cost of Internet Access

The successful development, distribution, and utilization of OERs depend on access to reliable electrical power, reasonably priced Internet services, and appropriate hardware and software. These conditions apply not only to OER development and deployment, but also to educational systems of the 21st century.

In Kenya, only 65% of the secondary schools are connected to the power grid (Ngare, 2007), and only 3% of the 6,566 secondary schools have Internet connectivity (Kiptalam & Rodrigues, 2010). However, all higher-education institutions in Kenya have electrical power and Internet connectivity. This level of access to electricity and the Internet can be seen throughout most of sub-Saharan Africa.

As access to uninterrupted power is limited in sub-Saharan Africa, institutions and individuals often rely on relatively expensive diesel- or gas-powered generators to produce electricity. SchoolNet Namibia has achieved some success with the use of solar and wind power, and it is expected that other educational jurisdictions may embrace these forms of alternative energy. Until electrical power is more widely available at a reasonable price, users will need to obtain ICTs that consume little energy or have built-in electrical generating devices. For example, the Intel Classmate PC computer uses low-powered electronic processing chips, the Samsung NC215S laptop has a solar panel built into the laptop cover, and models of the One Laptop Per Child (OLPC) computer have auxiliary power-generating devices, including solar panels.

Although OERs can be distributed via CDs, DVDs, and print to allow for offline access, they are more commonly accessed online. Only 11.4% of Africans have Internet access compared to a world average of 30.2% (Internet World Stats, 2011). Internet penetration in sub-Saharan Africa is limited because of cost and lack of access. The cost of obtaining mobile and Internet services in Africa varies widely, relative to the cost of staples such as tea and sugar (Calandro, 2011).

> In about half the countries in Africa, one year of Internet supply will cost more than the average annual income… In only five countries—South Africa, Botswana, Tunisia, Mauritius, and Libya—is the annual cost less than 10% of the average income. (Hesselmark, 2010)

In an effort to provide increased global connectivity for the African continent and address the lack of Internet supply, several undersea cables, such as the South Atlantic 3/West African Submarine Cable (SAT-3/WASC) system, have been planned or recently deployed (see http://manypossibilities.net/african-undersea-cables/). As the number of submarine optical cables connecting Africa to the rest of the world increases, Internet costs will decrease and bandwidth will increase. Thus, Internet subscriptions will increase. Note that Chad, the Democratic Republic of Congo, Eritrea, Guinea, Liberia, Seychelles, and Sierra Leone do not have a fibre-optic connection and rely on expensive satellite links (Craddock, 2011). Landlocked countries lack easy and inexpensive access to submarine cables. Even if African countries had access to optical cables, Internet prices may not decline due to the lack of local hosting and interconnection within Africa. Most Internet traffic is routed through Europe and the United States. There is a need to interconnect African countries efficiently, to establish mirror servers containing educational content that can be downloaded locally, to reduce the cost of connectivity by compressing data before it is sent (Trucano, 2011), and to establish a healthy competitive environment for the telecommunications industry (Thornton, 2008). In several African countries, only one or two companies are permitted to provide Internet access to local service providers. Normally, three or more companies are needed to ensure a competitive marketplace for Internet services (Gross, 2006; Hesselmark, 2010). Initially, governments may decide to establish public–private ventures to address the digital divide, but the private sector, through various “carrot and stick” ap-

proaches, should ultimately assume primary responsibility for developing the infrastructure. The government should not be the sole provider of Internet services.

Computers are the usual means by which educators and learners connect to the Internet. Access to computers "is a major challenge facing most African countries, with a ratio of one computer to 150 students against the ratio of 1:15 students in developed countries" (Kiptalam & Rodrigues, 2010, p. 50). In Africa, these devices are still expensive relative to income. In Kenya,

> a country with a GDP of $1,600, the majority of the individuals and schools cannot afford to buy a computer and consider it as a luxury item, more expensive than a TV. While second-hand computers cost as little as $150 and brand-new computers (are) being sold at $500 or higher. (Mungai, 2011)

An inexpensive computer such as India's subsidized $35 Aakash tablet, which "is adequate for most applications including HD-quality video, reading books, and basic office applications" (Ribeiro, 2011), may be appropriate for use in sub-Saharan Africa provided it is reliable and capable of performing the tasks desired by African educators at a speed that does not frustrate users. African educators could also make greater use of second-hand computers refurbished by organizations such as Computers for Schools Africa (see http://www.cfsk.org/). Whatever technology is used, it must be affordable to the population who will use it, it must be supported and maintained, and people must learn how to use it. These conditions exist whether or not OERs are deployed in an educational system.

> A consensus seems to have formed that the introduction and use of ICT in education can help promote and enable educational reform, and that ICT is a useful tool to both motivate learning and promote greater efficiencies in education systems and practices. (Trucano, 2007)

The development and deployment of OERs via ICTs will also lead to efficient and effective educational systems and practices.

Mobile phones seem to be ubiquitous in Africa as mobile coverage reaches 90% of the population in many developing countries (World Bank, 2006). By 2015, more people in sub-Saharan Africa will have mobile phone network access than electrical access in their homes (Ali, 2011). In time, perhaps mobile phones will be the solution to expensive Internet connectivity and will provide economical access to digital material. Currently, the BridgeIt initiative in Tanzania enables teachers at 150 schools to use mobile phones to download short videos from a central server to a local television set (Kasumuni, 2011). However, most phones used in Africa are not smartphones, so they are unable to download content from or upload content to the Internet and lack features such as the Siri voice-activated personal assistant found on the iPhone. Furthermore, the bandwidth available for each mobile phone

is often limited. But current mobile phones can be used by learners to access prerecorded educational audio messages and audio-based OERs and to communicate via voice or text with other learners and instructors.

Due to the challenges associated with limited bandwidth, Internet connectivity, and the cost of hardware and software in sub-Saharan Africa, OERs are likely to be designed to fit within a small digital file and be distributed in paper form. Hence, the full potential of interactive, engaging OERs may not be realized until an increasing number of educators and learners gain access to reliable Internet services at reasonable prices. Furthermore, digitized forms of OERs may be more accessible to only a portion of the population, thus increasing the gap between the haves and the have-nots—a situation that should be minimized if the goal of education for all is to be achieved.

AVU has attempted to alleviate concerns regarding access to ICTs by establishing 10 Open, Distance, and eLearning (ODeL) Centres in countries such as Ethiopia, Kenya, Senegal, Zambia, and Zimbabwe. These centres "act as physical hubs for the creation, organization, and sharing of knowledge, as well as the development, delivery, and management of ODeL programs at AVU Partner Institutions" (African Virtual University, 2011a). The centres enable educators and students to access, develop, modify, and remix OERs. Each centre functions as

- a training facility for Partner Institution staff in the use of ICT in the development, delivery, and management of open, distance, and e-learning (ODeL);
- a delivery point for current and future ODeL programs (e.g., the Teacher Education Program);
- a physical location where staff are able to conduct research and participate in collaborative work in ODeL; and
- a revenue-generating facility with the goal of guaranteeing long-term sustainability (African Virtual University, 2011a).

Similar learning centres are being established by African governments and other organizations such as the Southern Africa Development Community (see SADC, http://www.sadc.int/), which has established centres in Malawi and Tanzania. The Rwandan government has established 12 telecentres and 2 mobile ICT buses to help those in rural communities develop, adapt, and share information online as well as to facilitate skill development, create employment opportunities, and enable individuals to market their products online. But there are not enough centres to meet the needs of those who lack access to ICTs, and few centres are located in rural areas. If OERs are to be more widely used, this situation must change. Whether OERs are developed or not, access to ICTs is an essential ingredient of modern educational systems.

Many countries, such as Kenya, Botswana, and Zimbabwe, have national plans and policies for ICT implementation. Kenya, for example, plans to provide an ICT infrastructure

for all of its 6,000 secondary schools (Sunday, 2012). However, these ICT implementation plans have often been carried out slowly due to lack of resources and/or competing priorities. People will benefit from clean drinking water, improved sanitary conditions, improved health services, and increased agricultural production, but they will also benefit from having access to ICTs that will help them obtain clean drinking water, increase agricultural production, and so forth (Wright, 2010). Government, education, and community leaders need to act on the ICT plans they have already developed. When the plans are being updated, OERs should be included.

Establishing Communities of Educational Collaborators to Develop and Use OERs

OERs are new to many people in Africa. They must be convinced of the benefits of sharing OERs. But they should also be aware of the myths and fears associated with OER use. According to Anderson (2009), some of the myths that must be dispelled include those below.

- My job is to create original course content, so I can't use materials produced by others. (Isn't sharing knowledge at the core of academic activities?)
- My course/content/context is so different that I can't use external resources. (As mentioned previously, is it necessary to duplicate effort by producing another diagram of a four-chambered heart?)
- It is harder to contextualize materials made by others; it's easier to create my own. (Does it really take longer to adapt someone else's textbook than to write your own?)
- If I put my course materials online, someone will steal them (But of course, *I* never borrow from someone else).

Instructors must be convinced that sharing and collaboration have the potential to reduce workload over the long term, as everything will not need to be developed from scratch.

Some people may fear the use of OERs and the application of ICTs in education. A few of these fears are outlined below, and each must be addressed.

- *Fear of the unknown*. This is common to any situation that causes a change to an individual's routine. Educational leaders may be concerned about making decisions involving technology that they know little about and may not want to admit to others that they don't know anything about OERs and ICTs. Knowledge and skills about the production and use of OERs seem to be inversely proportional to rank (Plotkin, 2010, p. 4).
- *Fear of losing their jobs*. Instructors may feel that they will be replaced by OERs and ICTs. Often, to sell the cost of implementing OERs and technologies, politicians may say that by introducing ICTs, fewer instructional staff will be required. These types of statements were made during the eLearning Africa Conference in Nairobi in 2007. The addition of technologies should not lead to the elimination of teaching staff, but should

simply lead to a change in their roles.

- *Fear of being made irrelevant*. Instructors want to be seen as the authority or "know-it-alls," so anything that may lead others to think that they are not is not supported (Mungai, 2011).

- *Fear of being found out*. This fear is related to the one above. If instructors are required to release their materials under an open copyright license, then others will be able to see the quality or lack of quality therein. Any lack of knowledge will be exposed. All educators need to come to grips with the fact that they don't know everything about a particular subject. In order to learn, they, like their students, must be challenged to learn.

- *Fear of a level playing field*. If instructors at all institutions can access and use the same OERs, then everyone will be at the same level. How can institutions differentiate themselves? There is more to obtaining an education than having access to the same content. Many institutions use the same textbooks, but they differentiate themselves and gain competitive advantage by how they help learners gain and apply knowledge and skills to solve current and future problems.

Instead of dwelling on these myths and fears, educators need to ask different questions, such as how can I use my time and expertise more effectively? They also need to be surrounded by like-minded professionals who discuss similar questions and are focused on improving the education offered to their learners. Rather than try to convince everyone to use OERs or to impose OERs across an institution, educational leaders should focus on those who are willing to develop and use OERs, especially those within a particular program. This approach is recommended for introducing any technology in higher education (Bates & Sangrà, 2011) and has merit when implementing any change—go with the willing. As the benefits and success stories about OERs become more widespread, others will join the OER movement. The inertia of resistance to change will be overcome.

Like-minded individuals who want to embrace positive improvements to the current educational system could establish communities of practice to support the development and deployment of OERs. Perhaps an OER community of practice could be based on the model used by AVU to help its Partner Institutions design, develop, deliver, and manage their own open e-learning programs. The AVU Capacity Enhancement Program (ACEP) has led to a community of practice for open and distance learning (ODL) development in 10 countries. The objectives of the program include

- working effectively in multidisciplinary teams on issues related to open and distance e-learning (ODeL) program development, delivery, and management;

- developing ODeL projects integrated within their respective culture and institutional context; and

- participating in a community of practice focused on the respective roles and responsi-

bilities in three streams: governance, technology development and support, and materials development and instructional design (African Virtual University, 2011b).

AVU has a formal basis for its community of practice as those registered in the program must participate in workshops, complete 13 modules, and prepare project proposals for ODeL. All participants must be willing to train other academics at their respective institutions.

AVU and the African Development Bank have also launched the Teacher Education Virtual Consortium (TEVC), which provides a collaborative approach toward developing content for four bachelor of education programs. The consortium has several objectives, including

- developing African-based teacher education content that could be in an OER format;
- building a teacher education community of practice that cuts across language barriers and national boundaries;
- strengthening quality assurance mechanisms; and
- facilitating staff mobility and the capability for students to transfer credit amongst members of the consortium (African Virtual University, 2011c).

Similar consortiums could be established for the development of materials in other subject areas. For example, the Commonwealth of Learning (see COL, http://www.col.org/) and the William and Flora Hewlett Foundation (see http://www.hewlett.org/) have recently completed the development of OERs in a self-study format for 20 selected subjects at the secondary-school level. These resources were developed by educators from Botswana, Lesotho, Namibia, Seychelles, Trinidad and Tobago, and Zambia. The OERs produced by the more than 100 educators are available for others to use.

Ideally, sub-Saharan governments and educational leaders could agree on a broad curriculum framework that would encourage the acquisition and development of OERs for different educational levels, such as primary, senior primary, junior secondary, secondary, graduate, and post-graduate. The goal of this initiative would be to identify and develop OERs that could be used at specific levels within educational systems in Africa. As each country has different expectations for the different levels of their education system, the goal of this initiative would not be to dictate what curricula should be taught in each country. Rather, the goal would be to identify, locate, and/or develop common resources that are needed by all countries. Then, educators in individual countries could use a program such as OERGlue (see http://www.oerglue.com/) to gather resources, add interaction, and build courses for a local audience. Educators could also adopt the five-step development process often used by those involved in VUSSC development projects: find, compose, adapt/repurpose, use, and share. However, prior to conducting a search for OERs, educators should carefully consider their instructional/learning intent as well as the pedagogical and/or andragogical needs of their potential learners.

Sustaining Involvement

Once the OER initiative has gained momentum, how does one sustain it over the long term? "Sustainability points to the need to ensure that OER initiatives become embedded in policies, structures, and programmes to extend learning opportunities and knowledge sharing" (D'Antoni, 2009, p. 7). Sustainability also depends on a number of interrelated factors such as funding, technical considerations, content, and staffing (Downes, 2007). In addition, one must consider the cost of covering communication and travel expenses, producing new OERs, updating existing ones, and providing training to those who produce and use them.

Ultimately, any initiative can be sustained if the reason for its existence is well understood, it has a significant impact on people's lives, and participants are willing to contribute their time, expertise, resources, and/or funds to maintain it. Wikipedia is an example of a project that has been sustained primarily by voluntary help but the organization also needs some baseline funding. Obviously, a large infusion of funds can help to sustain any initiative. But as is the case for a number of exciting projects in Africa, once the initial funding from an overseas organization ceases, the local projects are likely to wither away. At the inception of any project, the sustainability of the project must be discussed, and locals must have a stake in the project so that once external funding is reduced or terminated, there is still interest in seeing the continued growth of the initiative. People usually value and monitor what they have a stake in and what they pay for.

Stephen Downes (2007) suggested a number of financial models that could be used to sustain OER initiatives. Each model is very briefly outlined below.

- Endowment – Funding is sustained by interest earned on a base fund.
- Membership – Members contribute a specified sum of money and receive services.
- Donations – Donations received are managed by a nonprofit foundation.
- Conversion – Something is given away. Then users are convinced or converted to paying for additional features or something else.
- Contributor pay – Contributors pay the cost for maintaining the program.
- Sponsorship – Companies support the initiative in return for advertising or public relations.
- Institutional – An institution assumes responsibility for the initiative.
- Government – Direct funding is received from the government.
- Partnerships and exchanges – Items are exchanged between partners.

Combinations of all of the above models could be employed in sub-Saharan Africa, but some will meet with greater success than others. For example, the sponsorship model could

work if the focus is on public relations. If the focus is on advertising, the challenge would be to ascertain the value of the true market size and to determine whether there should be commercial advertising within institutions. Any financial model that requires the collection of a fee from individual users, such as learners, can be expensive to maintain even when mobile phones and microfinancing software are used. Furthermore, can individuals afford to pay for the resources, especially those seeking an informal education, as they need to update their skills in order to seek employment? Whatever price may be set to access OERs must be small and affordable to the users and take into account the different lengths and complexities of the downloaded material. If funding is received from governments, then it should be allocated over an extended period of time so that those involved in OER development and deployment can plan effectively.

Below are some suggestions that governments and institutions could use to sustain the development and deployment of OERs in Africa.

- Assign leaders to the OER initiative who have a passion for improving education and actually know about OERs, ICTs, and ODL.

- Revise or develop institutional policies that reward collaboration, OER sharing, and OER development. OER development could be recognized at the same level as research or the submission of an article to a referred journal. To receive this level of recognition, the OER must be peer reviewed, have a significant impact on learning, provide a new approach to the subject matter, and/or attract attention or funding from other educators.

- Assign copyright of resources produced by individuals working at public institutions to the institutions, or have the resources assigned with an open copyright license. If this action is taken, this condition of employment must be clearly stated in employment contracts.

- When a particular curriculum is reviewed, educators should be required to identify OERs that would support the course or program. If suitable material is available, funding to develop new resources would not be provided.

- Place a priority on projects that involve two or more individuals within an institution and two or more institutions within a country or region.

- Make cascading training standard operating procedure so that when an individual receives training about the development and use of OERs, he or she is contractually obligated to train at least two other people. Training or professional development about OERs must be built into any OER initiative.

- Build OER development and use into existing ICT integration initiatives such as the Flexible Skills Development Community Learning Network (see http://flexibleskills-development.ning.com/), which focuses on using technology to facilitate flexible and quality teaching and learning in technical and vocational programs at 10 polytechnics

in Africa.

Compared to the salaries of similar professionals, instructor salaries at many African institutions are low (Wolfenden, 2008). Thus, the above suggestions may need to be supported with other measures. If instructors need to support their families by taking on additional paid employment, as 74% of the teachers do in Cameroon (Lambert, 2004), then recognition for a "job well done" may not be enough—additional incentives may be necessary as outlined below.

- Consider the production of OERs in job promotions.
- Pay for a professional development opportunity that the instructor may not be able to afford on his or her own. This opportunity should align with the interests of the individual and the needs of the institution.
- Provide honoraria or stipends for OERs that are produced.
- Contract the production of OERs to instructors.

Note that a number of costs associated with OER development and deployment, such as creating and adapting materials, implementing ICT infrastructures, creating a critical mass of those who have ICT skills, and providing workshops are typical activities any institution would execute in order to stay current.

Producing Resources in Interoperable and Open Formats

If OERs are to be produced inexpensively and shared, they should be produced with software that is freely available to everyone. In addition, OERs should be placed in linked repositories that can be accessed via a variety of digital devices. Currently, there are more than 2,080 repositories listed in the Directory of Open Access Repositories (see DOAR, http://www.opendoar.org/), of which 50 appear to be located in Africa. Perhaps OER Africa or the AVU OER Repository (see http://oer.avu.org/) could provide the portal to the various OER repositories in sub-Saharan Africa. As access to the Internet in sub-Saharan Africa is limited at this time, OERs must also be provided on CDs, DVDs, and/or paper so that they can be accessed offline.

Currently, OER developers in Africa tend to use the software with which they are familiar. This software is not likely to be open source; it may not be freely available to everyone because it is likely to be proprietary software, such as Microsoft (MS) Word. Text-based OER materials could be produced in rich text format (RTF), but MS Word is the most widely used software in the English-speaking world, and users in developed and developing countries are likely to have access to it (Wright, 2011a). Today, most word processors and common productivity tools, such as spreadsheet and presentation software, allow for conversion from one format to another. MS Word documents can easily be converted to OpenOffice Writer (see http://www.openoffice.org/product/writer.html), a free word processor that does not require institutions to pay a licensing fee. Some display features will

not be the same as in MS Word, but the basic data can be viewed. If the OERs contain audio, video, and/or interactivity, it can be a little more difficult and sometimes almost impossible to convert seamlessly from one format to another. Hence, OER developers in Africa could meet to decide what standards they will follow and to review the standards periodically. For example, they could agree on using the free, open e-book standard ePub (set by the International Digital Publishing Forum) as ePub (see http://idpf.org/epub) can display content on most e-readers and smartphones.

Ideally, there should be interoperability among data, software, and services. "International and donor agencies should put extra effort toward the support of global platforms that enable the creation, translation, adaptation, and sharing of OER" (West, 2011, p. 40). The platforms should be able to cope with multiple technical formats that can be used by educators with basic word-processing skills (West, 2011). This concept has merit, but getting everyone in the global OER movement to agree on a standard may take considerable time, and the concept needs to take into account the fact that periodically, other technologies and software will need to be incorporated. Different standards emerge over time and are not always compatible—remember the VHS and Beta video standards? Whatever form these proposed global platforms may take, they must be maintained, updated, and financially supported by an organization or consortium. Currently, educators could use a number of repository management systems, such as DSpace (see http://www.dspace.org/). The free, open-source DSpace software is used by 1,283 academic institutions and organizations to store digital content, including texts, static images, videos, and data sets. The AVU OER Repository uses DSpace to store 219 modules covering biology, chemistry, education, ICT basic skills, mathematics, and physics in three languages (English, French, and Portuguese). This repository has been accessed by people from 180 countries.

Finding OERs can be a challenge because there is no agreed-upon standard for labelling them and because items are not consistently indexed in OER repositories. Various forms of metatagging have emerged, but there have been varying degrees of success with their application. However, all labelling should indicate the subject matter of the OER, identify for whom the resource was designed (e.g., primary, secondary, or university), provide a brief overview of the content, suggest how the materials could be used, and, where appropriate, list educational outcomes that the resource is attempting to facilitate. In addition, it should be noted whether items conform to government-dictated accessibility requirements and the principles of universal instructional design (UDI), which were developed to minimize or eliminate barriers in the teaching and learning process.

Since few OER repositories are linked, finding a suitable OER may take time as each repository, such as the University of Cape Town (UCT) OpenContent Directory (see http://opencontent.uct.ac.za/), may need to be searched individually. Yes, search tools such as Google do work, but a search engine that focuses on OERs would be beneficial. Search engines that work in a multilingual environment could locate a wider variety of OERs. Then, the content would need to be translated. Translation of world languages used to be difficult, but now some computer programs will do the translation with minimal obvious errors. Note, however, that successful translation depends on the recognition of cultural context and the

translator's knowledge of the subject area relative to the community in which the information or skill will be applied. Currently, computer-based translators have no knowledge of the context or community in which the materials will be used. Therefore, prior to distributing a translated OER to students, educators should review the translation to ensure that the material will fit the local social and cultural contexts.

In order to ensure that learners can easily access OERs, educators in sub-Saharan Africa could decide on the software standards to be used in the region. This decision-making process could be conducted with the assistance of various OER-interested bodies, such as the African Development Bank, the Confederation of Open Access Repositories (see COAR, http://www.coar-repositories.org/), UNESCO, and the William and Flora Hewlett Foundation (a major force in advising on and supporting global OER efforts). The reality of the world of technology is that there will always be change; thus, standards must change over time. The best one can do is to agree to use open file formats wherever possible, along with the most commonly available software—until the next most commonly available software emerges.

Establishing and Maintaining Quality

How good can a free product be? This question has been raised among those who query the legitimacy and quality of OERs. Their perceptions about the quality of OERs have limited the uptake of these resources. But it is a valid question to ask: How can the quality of OERs be assured?

> Quality is an elusive concept, as it can be defined differently by all who measure it and it is affected by the context in which the measurement is taken. The real measure of a quality course (or OER) is whether it helps learners achieve the stated learning outcomes. (Wright, 2011b, p. 1).

Education is one of the few human endeavours in which quality is decided by the creator rather than the user (McMartin, 2008). If an institution states that a resource is authoritative and/or provides the list of criteria used to define inputs into the design process, we tend to believe that the institution has produced a quality course. In almost any other human pursuit, quality is defined by the consumer or user of the product.

Two common approaches to the design of quality OERs are a centralized, carefully controlled, top-down approach and an open approach that invites contribution from everyone (Plotkin, 2010, p. 6). The development and review of OERs benefits from both approaches. The top-down approach leads to the establishment of criteria and guidelines that are consistently applied during the development and review process. The bottom-up approach is decentralized and more scalable and sustainable. OERs are subjected to mass peer review—the greater the number of eyes focused on the OER, the greater the amount of feedback that can be provided to improve the resource. Those OERs that are produced via a collaborative partnership of educational providers are likely to be more complete and suitable for a wide

audience. If you knew that your work would be published online, wouldn't you present your best for the world to see? The fact that an OER can be seen by anyone often leads to more attention being paid to its quality.

At the AVU, modules for the Teacher Education Program were developed using a collaborative approach. Authors and reviewers from 12 universities in 10 participating countries were involved in the development and rigorous peer review of the teacher education modules. This collaborative process took into account the guidance of the Teacher Education Advisory Committee and the AVU Quality Assurance Framework (QAF). The latter was based on best practices obtained from international and African institutions. The implementation of the QAF has instilled confidence in the quality of the resources the institution produces and has fostered continuous improvement. Over time, it is expected that quality will be ingrained into the daily habits of university instructors and the fabric of the AVU community (African Virtual University, 2011d). The approach AVU uses for ensuring the quality of its modules could be adapted for the development and review of OERs used throughout sub-Saharan Africa. In addition, the criteria and success factors for quality distance-education materials and services developed by SAIDE (2004) could be revised and adapted for OERs. These criteria were developed with the assistance of educators from Botswana, Kenya, Namibia, and West Africa. Regardless of how the quality standards are crafted, they must be implemented and monitored.

Normally, when learning materials are designed, course developers know exactly who the learners will be and what their attributes are. They know what interests and motivates learners. They know how to make learning relevant to the learners' lives. However, when designing OERs, developers may not know who the actual users will be as anyone can access an OER. Consequently, OER developers must focus on designing learning resources that meet the needs of a specific audience and must clearly indicate who that audience is. Thus, the quality of the learning material can be judged by those for whom it was designed. Although feedback about the OER should be requested from all who use it, the feedback should be judiciously examined. As Wikipedia has discovered, not all feedback is helpful feedback that improves the accuracy, currency, and quality of its materials.

Due to the scarcity of resources and student support in sub-Saharan Africa, individual OERs may need to be more comprehensive than OERs produced for an audience who may have easy access to additional information. Developers in sub-Saharan Africa may need to provide a context for using the resource by including the following with each OER: introduction, learning objectives or outcomes, learning activities, self-assessment questions, answers to the questions, and sources of additional information. OERs should not be seen as a content dump, however; engagement should be built in.

OERs, like traditional resources, need to be updated. If no changes are made to an OER over time, the material may be become inaccurate or obsolete. Hence, efforts should be made to review and renew OERs at the same time that curriculum reviews are being conducted, perhaps once every 5–8 years. Shorter review cycles are needed for subjects such as technology and health care, which change rapidly.

Although this section has focused on the development and delivery of quality course content, attention also needs to be paid to the management of the educational institution and to the development and delivery processes. Institutions could consider the standards set by the International Organization for Standardization (see http://www.iso.org/iso/iso_9000_essentials), which has established standards and guidelines that relate to a quality management system. Institutions may not want to become certified and receive the ISO 9001:2008 designation, but they could use the globally accepted ISO framework to improve their management functions and thereby create a more efficient and effective organization focused on learners.

Providing Local Context

Currently, most of the OERs that are available were developed in countries with strong economies. These resources may present points of view that are different from those that are customary and/or acceptable in Africa. The material may touch on cultural, social, political, and religious sensibilities. However, an educational experience should include exposure to new ideas and different ways of seeing the world. Thus, OERs from different parts of the world should be accessible in sub-Saharan Africa, although they may need to be modified to include additional explanations and examples with an African context. OERs should also be reviewed and modified to ensure that there is no explicit or implicit bias relative to age, culture or ethnicity, race, gender, or sexual preference. Biased opinions may be included as examples if they are directly related to the content of the course in which the OER may be used.

English is the mother language of only about 6% of the global population (Vota, 2011), yet it seems to dominate the content on the Web. Children learn best when they are able to learn in their mother tongue or the language of their immediate environment. Adults, particularly adults who have little education, feel more comfortable using their mother tongue. If OERs are going to be accessible to a larger number of people, they must be available in a variety of languages, even though additional time and expense may be required to produce these materials. The challenge for each country in Africa is deciding the language that should be used in educational materials. Nigeria, for example, has 510 languages. However, its official language is English, even though English is not widely spoken in rural areas, where most of the country's 154,729,000 people live (UNICEF, 2010). In rural areas, the most commonly heard languages are Hausa, Igbo, and Yoruba. Producing OERs or translating OERs for use in multilanguage settings can take time and be expensive. Although the following quote was referring to challenges with literacy in multilingual settings, it also applies to languages used for OERs: "Decisions on language must balance political and ethnic sensitivity, pedagogical effectiveness, costs, and learner preferences" (UNESCO, 2006, p. 8). Each OER initiative needs to balance these factors. The TESSA Project, for example, has produced teaching materials in five languages, Arabic, English, French, isi-Xhosa, and Kiswahili, to meet the needs of its various audiences. TESSA is a consortium of 12 African universities, the United Kingdom Open University, and various international organizations such as the BBC World Service Trust and the Commonwealth of Learning. The consortium

has produced OERs in teacher training that can be adapted for local needs in any country.

"How might the developed learn from the developing" (McMartin, 2008, p. 142)? Since most OERs are produced in countries with more advanced economies, it would be refreshing for people in Africa to develop OERs that see the world through their eyes, so others can obtain a better appreciation of the knowledge, skills, culture, and views of Africans. We need to hear the views of more southern voices in our global educational landscape.

Informing the Public and Educating the Users

OERs provide opportunities for individuals within and outside of a formal program of learning to improve themselves and gain information that they can use to help them make decisions about their lives. However, they must be aware of these opportunities and be able to find and evaluate them for relevancy to their situation. The public must be informed about OERs, their benefits, and their uses. In sub-Saharan Africa, those in formal educational programs may obtain this information from instructors who are not intimidated by technology or the perceived loss of their know-it-all status. Those in rural areas may not learn about OERs unless local teachers and community leaders are informed about these resources. Community leaders tend to focus on issues dealing with water, health, face-to-face traditional instruction, and local politics. They are likely to think that technology is more suitable for those who live in urban settings and that technology doesn't address the basic needs of the local people. Yet there are OERs that can address the provision of clean drinking water, the improvement of face-to-face instruction, and health needs, such as the OERs available from the repository of the African Health OER Network (see www.oerafrica.org/healthoer). The public, as well as government and education leaders, must be sensitized to the flexible benefits of OERs.

Governments and institutions should consider launching a community inclusion initiative that involves key stakeholders and the public. They could launch a public relations or marketing plan that not only outlines the benefits or opportunities of OERs, but also addresses the myths, fears, and quality concerns as outlined earlier in this article. The plan should include training sessions that help users find and use OERs. Due to the large number of online resources, users must learn to conduct effective searches and to evaluate the items they find. Implementation of this public relations or marketing plan does not have to be expensive as students in formal educational programs could receive credit for finding OERs, constructing and evaluating them, and informing others how to use them. Youths everywhere seem to be able to master ICTs quicker than senior instructors who have not had technology as part of their educational tradition. By being involved in this public relations or marketing initiative, the learners would become more actively engaged in the learning process. They are likely to identify OERs that members of the community would find useful, create OERs that instructors can improve upon and use with future students, and find sources for OERs beyond the familiar sources, such as Academic Earth (see http://academicearth.org/), College Open Textbooks (see http://collegeopentextbooks.org/), the Community College Consortium for Educational Resources (see CCCOER, http://oerconsortium.org/), Connexions (see http://cnx.org/), Curriki for K-12 (see http://www.curriki.org/), MER-

LOT (see http://www.merlot.org/), MIT OpenCourseWare (see http://ocw.mit.edu/index.htm), OER Africa, OER Commons (see http://www.oercommons.org/), Open Courseware Consortium (see http://www.ocwconsortium.org/), Open Course Library (see http://www.opencourselibrary.org/), OpenLearn, Project Gutenberg (see http://www.gutenberg.org/), TESSA, VUSSC, and WikiEducator. Many free resources that could be used for educational purposes lie outside of formal OER repositories. If additional financial resources were available, teachers and community-based health workers could be contracted to inform the public about OERs, demonstrate their uses, and show how OERs can be accessed.

Taking the Initiative: Making a Commitment

Implementing OERs and technology is not a panacea for all that ails the various educational systems in Africa. As this article has shown, there are many challenges to be overcome. But the article also presented possible solutions to address these challenges. The solutions are not limited to those presented here as additional experience and future research may lead to novel yet heretofore-unseen pathways.

Creating and sustaining a vision for OERs.

The vision does not have to be based on OERs and technology in particular; it could be based on how one could best improve the provision of safe drinking water and sanitary conditions, the prevention of diseases, or the increased production of foodstuffs. Alternatively, the vision could be more focused and centre on how to improve the quality of education for minimal financial costs. Although we often think of administrators as drivers of educational visions, it may be the youth who become drivers of change as they are desperate to get ahead and are willing to try something new. The youth may put pressure on educators and administrators to act. In North America, for example, youth have encouraged traditional faculty to use more technology in the classroom.

Developing and distributing resources with an open license.

As the creation and distribution of materials with an open license sweeps through the publishing industry in other parts of the world, it is likely to sweep through Africa. Unless educators in Africa start to produce materials with an open license and contribute to the global movement, they may feel left behind and become inundated with materials that do not address their unique social and cultural norms and interests. By developing and distributing their own OERs, they can counter the influences of others. Thus, it is imperative that they find OER development and deployment mechanisms that work best for them. But no one has to wait for grand visions or policies to be formulated or enacted in order to become part of the OER movement. All one needs to do is to share educational materials he or she has produced under an open copyright license. With the use of ICTs, digitized material can be easily shared locally and internationally.

Improving the technology infrastructure.

During the last 10 years, there have been significant changes in the technology infrastruc-

ture in Africa; this will continue. Many African countries have partnered with China to build roads that are used by everyone to transport themselves and their goods. The roads are transforming people's lives. Similar partnerships could be established with other nations to develop the technology and electrical infrastructure that could increase efficient communication and thus advance the transmission of ideas via computers and the ubiquitous mobile phones. However, until researchers develop a smartphone that can project a larger image, it will be difficult to use these phones effectively for teaching subjects such as the sciences, which require detailed visual displays. Furthermore, the input devices need to accommodate the size of a human hand so that information can be entered quickly, or voice-recognition systems must be designed to permit effortless use and accurate translation of African languages.

Establishing communities of educational collaborators.

The British Open University is widely known for establishing and promoting course development in a collaborative manner. Collaboration, especially from a survival point of view, has been the basis of many cultures in Africa. If African educators want their societies to grow and thrive, how can they build upon their collaborative history and apply their principles of sharing to education? Diallo, Wangeci, and Wright (2012) suggested one collaborative model, but what other models could be developed that align with traditional collaboration in Africa?

Sustaining involvement.

Any new initiative brings excitement and an inflow of foreign funds. However, excitement and funds wane as challenges are encountered and foreign donors lose interest. What is the vision or driving force that will sustain interest in Africa for OERs when challenges are encountered and external funds are reduced? If OERs can be directly linked to improvements in health, education, and economic outlook for the people, then it is more likely that governments will be willing to provide funding to sustain OER efforts. OER initiatives may not need as much new funding as governments may first believe. Existing funds used to develop traditional materials could be used to develop OERs instead, and when these resources are exchanged with other people who provide similar but different materials, everyone benefits. In order to bolster this argument, some current facts about education material acquisition and development costs in Africa would be helpful.

Producing resources in interoperable and open formats.

There is a plethora of software tools that can be used to create and distribute OERs. Some are highly promoted by external funders who want to grow their industry back home. If the OERs are to be produced and used in Africa, shouldn't the simplest and most accessible software be used rather than the more eloquent and/or Internet-intensive solution? Would it be practical to suggest that all OERs be developed using open-source software? Would it be beneficial for African educators to conduct a survey of what they currently use and de-

cide on one set of standards for materials developed for laptop computers and a separate set of standards for mobile handheld devices? Selecting standards for static material such as text, photographs, and streaming video should be relatively easy; choosing standards that can be used for interactive material will be more difficult. Also, it must be recognized that as technology advances, standards will need to be modified.

Establishing and maintaining quality.

African educators and government officials are rightly concerned about the quality of OERs, and this issue has prevented a number of them from embracing OERs. Yet they do not appear to be as concerned with the quality of material used in traditional instruction. From our experience working on several educational projects in Africa, quality is a concern throughout the educational system, particularly the use of outdated material, the predominance of low-level cognitive objectives, the emphasis on the memorization of content rather than the active engagement of learners in the application of knowledge, and the use of material that presents sociological, cultural, and economic views that have not been explained or adapted for use by local learners. As noted by Jung and Latchem (2012) in reference to ODL, quality assurance can be a contentious issue. Quality in education is usually defined by the inputs, but perhaps the outputs of the education system would yield a better measure of quality. If OERs enable an individual to do something that he or she could not do before, shouldn't they be defined as quality OERs?

Providing local context.

One of the goals of education is to introduce new ideas. But if the ideas are to have meaningful impact, they must be adapted for local use. What effective and efficient adaptation mechanisms could be established in Africa? Can Africa truly afford to adapt materials to its many languages? Or is it sufficient to produce materials in just a few languages and have local teachers verbally adapt the materials? Whatever materials are produced, it would be beneficial for learners and instructors if the materials produced in Africa were placed in searchable repositories that are linked to a common portal.

Informing the public and educating the users.

Unless OERs are embraced by teachers, community health professionals, and community leaders, it is unlikely that the use of such resources will be sustained. Perhaps African educators and government leaders could learn from Brazil, India, Peru, and Uruguay some of the many lessons learned in trying to implement educational technology, including OERs. These lessons are discussed in the World Bank's ongoing EduTech Debate (see https://edutechdebate.org/) and EduTech Blog (see http://blogs.worldbank.org/edutech/), which provide a cornucopia of ideas that could be investigated for their applicability to countries and regions with weak economies, such as Africa. Then African leaders will need to reflect on educational development projects in Africa and decide what is best for them—what models of OER implementation are best for sub-Saharan Africa?

It is inevitable that the development and deployment of OERs will continue to expand in sub-Saharan Africa as they can benefit independent learners as well as those registered in distance and traditional institutions. Although OERs can be used informally and formally by themselves, the use of a single OER from organizations such as AVU, TESSA, and OER Africa does not an education make. Quality OERs are only one component of an effective course or program offered by educational institutions. For many learners, access to content is not enough (Lane, 2008; McMartin, 2008), even if the resources are accessed from the award-winning AVU OER Repository. To maximize the full potential of OERs, they should be incorporated into a system of effective learner support, active engagement, quality interaction with instructors and fellow learners, critical and timely feedback, credible assessment, excellence in research, and recognized accreditation—qualities that also apply to traditional education. In addition, institutions may need to develop or adapt internal policies that facilitate the use of OERs, and governments may need to permit public institutions to use OERs that have not been created by a specific government agency.

Despite the emergence of "Do-It-Yourself Universities" (Kamenetz, 2010) and the OER University, there will always be a need for formal institutions such as AVU, SAIDE (a founding member of the OERu), UCT, and UoM. Using the experiences of these organizations, as well as the knowledge and skills of the African Development Bank, COL, UNESCO, and the William and Flora Hewlett Foundation, it will be possible to advance the implementation of OERs in sub-Saharan Africa. OER Africa, the AVU OER Repository, and TESSA are just a few successful projects in sub-Saharan Africa. African leaders should take the initiative to build on the experiences of the aforementioned organizations in order to ensure that the potential of OERs is attained as the employment of OERs may have a significant impact on the accessibility and quality of education—a driver of social and economic growth. OER development and deployment is *one* of several pathways that will contribute to achieving education for all.

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Assessment of Challenges in Developing Self-Instructional Course Materials at the National Open University of Nigeria

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Abstract

The National Open University of Nigeria (NOUN) is Nigeria's only university dedicated to providing education through the use of distance instructional methods. So far, however, the lack of availability and poor distribution of course materials, which underpin instructional delivery at NOUN, continue to be hindrances to achieving the university's vision and mission. There are delays and difficulties in developing and distributing materials to students and Study Centres. Many pioneer students cannot graduate because of this challenge. This paper examines the process of developing self-instructional course materials at NOUN. It reflects on the challenges associated with the quantity, quality, and timely production of course materials, labelled "the hills, the wills, and the skills" obstacles. The paper concludes that there is a need for better professional development in order to provide efficient ODL delivery.

Keywords: Open and distance learning (ODL); conventional universities; distance instructional methods; course materials development process

Introduction

Since its independence in 1960, Nigeria has demonstrated its commitment to education as a tool for national and personal development and as an inalienable right of its citizens (NOUN, 2006). But providing education for all is daunting, considering the country's population (about 150 million) and the compelling needs of its people. The ever-growing demand for education in Nigeria cannot be met by the traditional means of face-to-face classroom instructional delivery. The National Open University of Nigeria was established because the carrying capacity of the face-to-face conventional tertiary institutions in Nigeria was insufficient. For instance, the Joint Admission and Matriculation Board (JAMB) received more than 1.5 million applications to Nigerian universities in 2009, but the facilities at the 96 universities in the country could not allow admission of more than 20% of this number (Jegede, 2009, July). No carrying capacity is set for NOUN's upper-limit admission. NOUN is Nigeria's only specialist provider of open and distance learning at the tertiary level. It is the country's largest tertiary institution in terms of student numbers, and it operates from the administrative headquarters in Lagos, Nigeria, with Study Centres spread throughout the country.

NOUN was established to make education available to as many people as are able, willing, and ready to benefit from it. NOUN's vision statement is as follows: "The National Open University of Nigeria is to be regarded as the foremost university providing highly accessible and enhanced quality education anchored by social justice, equity, equality, and national cohesion through a comprehensive reach that transcends all barriers." Its mission statement is "to provide functional, cost-effective, flexible learning, which adds lifelong value to quality education for all who seek knowledge" (NOUN, 2006, p. 4).

NOUN is committed to openness and publishes many of its courses as open courseware on its Web site (see http://www.nou.edu.ng/noun/NOUN_OCL/courses.htm). It is an equal opportunity university. Like its conventional counterparts, it is subject to the accreditation exercise put in place by the federal government of Nigeria through the National Universities Commission (NUC). The major difference between NOUN and conventional universities is the mode of instruction used (NOUN, 2007). NOUN students are instructed by open and distance learning methods within an open learning environment. This instructional mode is designed to provide students with the opportunity to acquire knowledge, skills, and techniques that may be relevant to either their present work situation or to future career prospects.

Admission and Accreditation Processes in NOUN

Students are admitted into the various academic programmes in NOUN's Schools and Centres based on the minimum academic standard for all universities that was approved by the National Universities Commission (NUC, 2005). NOUN's programmes are expected to follow the due process of accreditation of open and distance learning (ODL) programmes in Nigeria. To earn full accreditation status, a programme must have 70% of its course materials available and must score at least 70% from each of the core areas, of which course materials is 20%. Hence, in order to attain the desired standard, the issue of course mate-

rial, which is the mainstay of instructional delivery at NOUN, must be viewed seriously.

NOUN's Instructional Delivery System and Style

NOUN's instructional delivery system does not provide lectures to registered students in a normal classroom situation, but instead provides specialized study materials that are based on self-learning. Each course has material written specifically for it, which students are expected to study prior to being examined. They are assessed mostly on the content of the materials for grades, leading to graduation and certification. These materials are written as lecture units or practical units. NOUN students depend mostly on the use of printed materials, and printed materials are expected to remain a major instructional mode until the infrastructures for total online teaching become available (Jegede, 2009, July). Print is still a powerful medium in many open universities in developing as well as in developed countries (Gaba & Dash, 2004).

Regular textbooks cannot adequately fulfill the needs of students at NOUN because of the absence of face-to-face sessions, which are available at other ODL institutions practising dual-mode delivery. These other institutions, such as the University of Lagos Distance Learning Institute, the University of Ibadan Distance Learning Centre, the Obafemi Awolowo Centre for Distance Learning, the University of Abuja Distance Learning Centre, the University of Maiduguri Distance Learning Centre, and the Federal University of Technology Yola Distance Learning Centre offer open and distance learning and are practising dual-mode delivery, but their students are not engaged with self-learning materials as is the case at NOUN.

Finding the right caliber of academics in the various subject areas to write course materials is a challenge. NOUN course materials are mostly developed from scratch; the materials are developed in-house, and course content is aligned with the aims and objectives of the programmes (NOUN, 2009). The house style of the institution guides the writers from start to finish. The institution has to hire and train writers (mostly from conventional face-to-face universities) who are knowledgeable in the course content. Writing from scratch takes not only money but time to hire venues, pay resource persons, and procure support services. This can be very expensive, and it might take the institution several years to break even. Other means used to supplement writing from scratch include outsourcing or adoption of course materials written elsewhere. In both cases, adjustments have to be made to ensure that the course materials are suitable for NOUN's students.

The process of developing NOUN's course materials is relatively lengthy and complicated. NOUN's print course materials comprise a self-study course book and its study guide. Most of the course materials are produced in hard copy, some are put on CD, while some are available both in hard copy and on the Web.

Writing for open and distance learning is difficult because authors need to use certain styles and techniques that are very different from those used in traditional course writing. Materials are meant to take over the teacher's lecturing responsibilities, as is the case in many other distance learning environments. Writers should not only be aware of learning theories

and techniques but should ensure their proper use in designing and developing distance learning course materials. Generally, training is essential for developing successful course material for distance education. Specifically, training is important because of the particular style that NOUN employs. Open education resources (OERs) cannot adequately fulfill NOUN's needs because NOUN staff lack awareness of and familiarity with them. Course developers would have to be trained to tailor OERs to meet NOUN's specific course requirements. That is, the materials have to be redesigned using a NOUN template and rewritten in a self-learning conversational style. The success or failure of distance education depends on the quality of its course materials.

Problems/Challenges

Jegede (2010) observed that the "National Open University of Nigeria is today the largest university in Nigeria. Commencing academic activities in 2004 January, the university today has admitted close to 100,000 and registered students in her 92 programmes" (p. 155). Jegede also stated, "The university is in the process of developing about 982 course materials for students" (2010, p. 153).

Unfortunately, the lack of availability and poor distribution of course materials is a continuing problem. There are delays and difficulties in developing and distributing materials to Study Centres and students (Jegede, 2009, January). Resolving the situation is critical for the progression of students and for the institution to fulfill its vision and mission. In February, 2011 NOUN's Senate targeted means of addressing the course material challenge after deliberating "on the pioneer students who had been in the university for about eight (8) years mainly due to non availability of course materials ..." (Senate Decision Extract 3).

In the following section the author identifies the major obstacles to course material production at NOUN.

Course Material Production Obstacles

The obstacles associated with the process of developing course materials for NOUN students' use are presented here in three categories, namely wills obstacles, skills obstacles, and hills obstacles, along with possible solutions.

Wills Obstacles

These refer to the desire, intention, or determination of authors to write/develop course materials for NOUN students' use.

Table 1

Obstacles to the Desire, Intention, or Determination of Course Material Writers/Developers

Obstacle	Proffered solution
Competing academic and administrative assignments are given within a limited time for course material development.	Academics within the system (NOUN) should be allowed to manage some percentage of their working time outside the university's immediate environment for proper concentration on course material development, which is an intellectual exercise.
Lack of spirited commitment to the in-house course material development process because producing such material does not count much in terms of career/promotional consideration within the system	Output of academic staff in terms of course material development should be recognized and rewarded with reasonable points for academic and professional progression in order to boost morale.
Lack of adequate motivation and a conducive working environment for in-house writers, leading to low morale and poor output	The working environment for course material writing should include facilities that enable maximum concentration and the devotion needed for this intellectual task.
Delay in and inadequate payment for hired writers, which makes it difficult to engage the desired experts	Hired writers from outside sources should be promptly and adequately motivated and rewarded in order to raise their morale and sustain their willingness to write.
Lack of copyright ownership and payment of royalties to experts who are willing and ready to write, which forestalls the engagement of the best authors.	The issues of the payment of royalties and of copyright ownership should be resolved by balancing the reward in favour of both parties (NOUN and the authors) to enhance the authors' willingness to write.

Skills Obstacles

These refer to the ability, techniques, or expertise of authors to write/develop course materials for NOUN students' use.

Table 2

Obstacles Related to the Skills of Course Material Writers/Developers

Obstacle	Proffered solution
The skills of most writers/course developers are inadequate, and there is a lack of training, exposure, and experience in the desired field of knowledge. Most of the external writers are not technically trained in ODL procedures and so they have difficulty putting materials together that adhere to NOUN's house style.	NOUN's staff should be regularly trained in course material writing/development through internal and external workshops, conferences, and seminars in order to improve their ODL writing skills. This on-the-job training should be continuous.
It is difficult to locate competent staff who can write quality course materials within the stipulated time frame.	The institution should collaborate with other conventional universities/ODL institutions from which they can source authors with the relevant subject matter expertise and skills for course material writing/development in all relevant disciplines. The institution should search for subject experts familiar with the required subject matter in their local environment and also employ more competent subject matter specialists as regular staff of the university.

Hills Obstacles

These refer to natural/environmental challenges that obstruct progress in the writing/development of course materials for NOUN students' use.

Table 3

Natural/Environmental Obstacles to Course Material Writing/Development

Obstacles	Proffered solution
There is a lack of availability of relevant resources and sourcing materials in the physical library. There is also very low bandwidth for Internet services within the university. Sometimes the Internet is not available for weeks. This challenge is compounded by the slowness of the e-library and the low level of IT skills for sourcing online materials.	NOUN should endeavour to upgrade its Internet bandwidth to 3G to improve access to digital library resources. There should be regular hands-on information technology workshops for academic staff. The workshops should train staff how to search for, assess, and adapt open educational resources (OER), which are freely available for use in the writing of course materials for educational and other nonprofit purposes.
There is pressure on in-house course material writers to submit write-ups within a limited time frame. In addition, irregular power supply, irregular water supply, and haphazard Internet access do not make the office environment conducive for the writing/development of course materials by academic staff. The office operates like a civil service office, where staff cannot work late because the university's facilities stop functioning adequately around 4 p.m. Therefore, working outside of scheduled official hours is not always feasible.	The university should as a matter of urgency find an alternative power supply. A situation where the university would be without light for weeks is a major challenge and a drawback that cannot be accommodated by an ODL institution that is technologically driven. The present power-supply situation, if allowed to continue, will lead to the eventual collapse of the system, which is already grappling with several problems. There is a real and urgent need to improve the working environment, especially with regard to those elements over which the university has control.

The power outages and the slow access to online sources are worsened by transportation and traffic problems in Lagos Metropolis, where staff members spend more than two hours one way daily. The situation is hazardous to any human being's health and thus takes its toll on productivity, leading to substandard output.	There is a need for a dedicated period of time for staff engaged in the writing process. This could be in the form of a writer-in-residence programme to allow staff members time to concentrate on their writing tasks rather than being distracted by psychological and administrative issues. The venue for such a programme should be chosen based on the need for a conducive and serene environment, ambient temperature, regular power supply, and fast Internet facility for easy access to online sources. Other needs are transportation facilities for easy movement within the venues and easy communication between the facilitators and the participants. This programme should be preceded by a workshop backed up by adequate supervision and monitoring for effectiveness.
Academic staff members are being made to maintain official hours like administrative staff. There are administrative lapses between writers and editors, leading to systemic delays. There is a lack of prompt orientation for new academic staff members to help them seamlessly integrate into the ODL system, which is necessary because most are products of the conventional system.	NOUN academic staff should be given flexible enough schedules to do meaningful research, to use other universities' libraries, and to produce write-ups. New staff ought to be given orientations. Such orientation periods will pay off in terms of new employees being able to effectively contribute to the university from the onset.
There is a shortage of academic staff, resulting in existing staff being overloaded. Therefore, many of the academic staff members are not able to take their annual leave, sometimes for up to two years. This puts a great deal of pressure on the personnel's capabilities. The same academic personnel are also loaded with administrative tasks, such as admission processes.	There is a need to employ more academics and to streamline the administrative policies that hinder the effective functioning of academics. Academic staff being made to maintain official hours like administrative staff can be counterproductive. As a matter of necessity, academic staff should enjoy annual leave when it is due in order to maintain good health and general well-being, which is needed for psychological balance and productivity.

Conclusion

Nigeria has adopted ODL because the carrying capacity of its conventional tertiary institutions cannot cater to its citizens' demand for education. NOUN operates within the context of admission requirements and the accreditation process put in place by the federal government of Nigeria. NOUN does not provide lectures to students in normal classroom settings but instead provides specialized study materials that are produced in-house and are based on self-learning. Since the inception of the institution, the timely production of these self-instructional study materials has been a challenge. Many pioneer students who would have graduated by now cannot because they lack the required materials. This paper has examined the process of developing self-instructional materials at NOUN. Various obstacles in terms of wills, skills, and hills were identified, and solutions were proffered. The benefits of the timely production of course materials for NOUN students' use can be enumerated thus:

- students would have a fair chance to complete their programme of study on schedule;
- conventional institutions could use many of the course materials developed for NOUN students because NOUN offers them as open courseware;
- more open content would become available for public assessment; and
- the materials, once developed, could be accessed, updated, and reused as required.

Recommendations

NOUN must establish a stable course material production system. To achieve the desired objectives of ODL in Nigeria and to realize NOUN's vision and mission, the following recommendations are offered. NOUN should

- engage staff, academics, and other relevant personnel solely for course material development and train them adequately in content writing and editing, in the production and publication process, and in sourcing appropriate open education resources (which are abundantly available) and tailoring these materials to suit NOUN's needs;
- dedicate adequate time to course material development in an environment that fosters intellectual reasoning and productivity; and
- ensure an adequate and motivating reward system to attract the right caliber of professionals and to enhance productivity.

These recommendations, if executed, would ensure the availability of the right professionals who could provide efficient ODL delivery. In fact, these recommendations are relevant for all developing countries that have yet to embrace the ODL mode of instruction.

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Who Needs Leadership? Social Problems, Change, and Education Futures

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We are all impacted by leadership; we all have the opportunity to take the lead; hence, we all need leadership and an understanding of this complex social phenomenon. Leadership speaks to a ubiquitous, identifiable set of human activities that support and assist, particularly in relation to change. Currently, changes in many things, including technology, "constitutes [sic] the most consequential set of changes in society since the late nineteenth century, when the nation went from a largely domestic, rural, agrarian mode of living to an industrial, international, and urban economy" (Keller, 2008, Preface xi). For education "this set of circumstances is going to force all academic enterprises to rethink their place and purpose not just in philosophical terms but in very pragmatic ways as well" (Beaudoin, 2003, p. 520). These philosophical and pragmatic changes also affect leadership practice and the role of leader.

Pervasive technology and notable socioeconomic restructuring have changed our society. This change has made it increasingly difficult for education to operate in insular ways; attention to changing demographics, global economies, new social mores, and new information and communication technologies is vital (Keller, 2008). The reach of technology seems limitless and has already changed education in "the way we organize ourselves, our policies, our culture, what faculty do, the way we work, and those we serve" (Ikenberry, 2001, Forward). Change in education to accommodate broader societal change embodies new ways of thinking about access to education, economic issues, accountability, technology in the teaching-learning process, and, most importantly, leadership.

When we speak of leadership in education, we are speaking of leadership in public institutions that are designed to serve the greater good. It is not possible to provide effective leadership without an understanding of the purpose of education and its role in society. Education is fundamentally characterized by a quest for improving the human condition. It is to overcome social and economic challenges, resolve inequities, promote societal power and prowess, and allow for individual development. According to Schofield (1999), educa-

tion is a place where people develop according to their unique needs and potential; one of the best means of achieving greater social equality is to allow every individual to develop to their full potential.

Leadership is required to ensure education institutions are shaped to allow for such individualization. How will we take strides to make things happen in education – who takes the lead, doing what? Notions of defined leadership roles and dutiful followers come to mind. In the postmodern turn of society, more complexity emerges. Here, leadership is founded in service to a collective vision of a dynamic, responsive organization. Here, leadership is built on humility rather than hubris. Here, leadership fosters collaboration rather than competition "on a foundation of generativity and generosity rather than stagnation and resentment" (Berquist, 2010, Challenges).

How do we move these notions of postmodernity to education? For Bloland (2005), the newly emerging society requires a university that takes advantage of the democratization and contestation of knowledge and promotes technological and cross-cultural citizenship. The higher education leader of the 21st century will exhibit strong character, well-developed personal skills, and the ability to create and communicate vision (Garrison & Vaughan 2008). In addition to these personal traits, this new leader will be willing and able to 1) manage change and innovation; 2) listen to and assist stakeholders, maintaining and enhancing relationships between the institution and relevant partners; 3) embrace the realities of network environments; and 4) ensure transformation to a new model of teaching and learning (Cleveland-Innes & Sangra, 2011).

What about traditional theories of leadership? These theories have largely focused on hierarchical relationships where there is a clearly defined power structure with a minority of individuals in leadership roles and a great number of individuals serving in the follower role (Avolio, Walumbwa, & Weber, 2009). According to Gronn (2003), multiple issues in our traditional conceptualization of leadership need to be resolved:

> … difficulties in distinguishing leadership from management; tensions between leadership, influence and power; the potential redundancy of leadership in the face of possible substitute factors; leader-followership's presumption of a division of labour; the prevailing myth of exceptionality; and disciplined subjectivity achieved through emergent forms of designer leadership. Embedded in each of these criticisms is the claim that if leadership is to retain its conceptual and practical utility, then it has to be reconstituted in a distributed, as opposed to a focused, form. (p. 267)

These are issues for education leadership in particular. Highly trained faculty and staff in education institutions exist in an environment of self-governance. Respectful dialogue and distribution of decision-making is expected. In this arena, leadership must be dispersed

beyond central administration to include the rank and file, "reconstituted in a distributed, as opposed to a focused, form" (Gronn, 2003, 267). Relationships must be collaborative and communicative if change is going to be addressed (Cleveland-Innes, Emes, & Ellard 2001).

The theory of collaborative, distributed leadership takes on increased meaning when we see it in reference to developing virtual learning communities (Bligh, Pearce, & Kohles, 2006; Paulsen, 2007). The idea of a shared, distributed lead is contemporary – it is "a dynamic interactive process among individuals in groups for which the objective is to lead one another to the achievement of group, or organizational goals, or both" (Pearce & Conger, 2003, p. 1).

There are some great examples where a social issue is raised, education is determined to be one remedy, and leadership ensues to implement the education innovation. In this case, leadership is often seen as problem-based, solution-centered, ethical, shared and distributed, working continuously toward the greatest good for the greatest number, beyond the reproduction of the status quo toward increased equity. The Leadership in Open and Distance Learning Notes (LODLN) section in IRRODL provides the opportunity to debate potential principles and premises in support of leadership in the new education, education of high quality that is accessible and socially meaningful.

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Educational Leadership for E-Learning in the Healthcare Workplace

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Abstract

Effective educational leadership can make a difference in the resolution of complex issues that impact today's demand-driven educational marketplace. The ongoing professional and skill development needs of human health resources may be best managed through distributed strategic leadership blended with servant leadership. Together these two approaches may offer the critical bridge for effective educational leadership for e-learning within the healthcare workplace.

Keywords: Distributed leadership; strategic leadership; servant leadership; e-learning; healthcare workplace

Introduction

The context of North American education is changing. In educational organizations, change imposed by technology, economics, global connections, and social awareness is challenging leaders (Cleveland-Innes & Sangra, 2010). These challenges are not confined to higher educational organizations but also impact societal institutions including the healthcare workplace. The quality and delivery of Canadian healthcare is dependent upon well-trained healthcare providers responding to consumer needs (El-Jardali & Fooks, 2005). From the perspective of the healthcare workplace, this article explores a distributed strategic leadership approach blended with servant leadership for e-learning.

Central Issues in Educational Leadership in North America

In the past three decades, North American society has undergone revolutionary changes due to demographic, economic, technological, and sociocultural issues that are causing the shift from a "supply-driven" to a "demand-driven" educational marketplace (Keller, 2008). Declining birth rates and increasing longevity are shifting the age distribution towards older age groups who are seeking continuing and higher education, coupled with the upward trend for younger adults to be highly educated (Keller, 2008). Increasing immigration requires a greater emphasis on multiculturalism in education to reduce language barriers and increase skill levels (Canadian Council on Learning, 2007). Additionally, the metamorphosis of family life including single parent homes and women working outside the home are creating new demands for education (Keller, 2008). These demographic changes necessitate leadership and innovative pedagogical practices to respond to the diversity of learners' needs.

The shift from domestic capitalism to a more global knowledge economy has resulted in the emphasis on human capital for increased talent and expertise. This move is creating competition in the educational sector (Latchem & Hanna, 2001). Leadership is required to determine how the education system can effectively contribute to the knowledge-based economy and how each institution within this system evolves (Salmi, 2001).

Technologies are opening access to education across institutional, sectoral, and international boundaries (Latchem & Hanna, 2001). Without educational leadership that ensures "adequate resources, pedagogy, and educational practices, technology could be an obstacle or burden to genuine learning and will probably increase rather than overcome existing divisions of power, cultural capital, and wealth" (Kellner, 2004, p.12).

The last few decades have seen the move to a more egalitarian society including equal opportunity for education. This openness to equality requires leadership for managing changes in educational structural design, infrastructure and services, content and instructional practices, and pedagogy (Keller, 2008).

Canadian Healthcare Workplace

The societal changes driven by demographics, economics, technology, and sociocultural issues have also impacted Canadian health human resources (HHR). HHR include regulated and unregulated workers, unionized and nonunionized, and those working in publicly and privately funded delivery models that provide Canadian healthcare services (El-Jardali & Fooks, 2005).

In 2006, Canada's healthcare workforce was just over 1 million people, or over 6% of the total Canadian workforce, with the average age of HHR at 41.9 years (CIHI, 2007). The exodus of HHR due to retirement is projected to be critical by 2016 (Spinks & Moore, 2006).

Changes in gender, cultural, and generational diversity are increasing in the healthcare

workplace. Approximately 80% of HHR are female although gender diversification is escalating (CIHI, 2007). Younger workers who are technologically more inclined are noted to place greater value on work-life balance than older cohorts who are more work-centric or preparing for retirement (Spinks & Moore, 2006).

The years of cost-cutting, downsizing, and restructuring of HHR have caused demoralization and overwork impacting work-life balance and organizational performance (Lowe, 2002). On the agendas of healthcare employers are workplace practices that improve HHR recruitment and retention, health and well-being, quality of patient care and safety, organizational performance, and societal outcomes (Shamian & El-Jardali, 2007). Part of what Canadians value most in a job is "respect, interesting work, good communication, a sense of accomplishment, work-life balance and opportunities for skill development" (Lowe, 2002, p. 50).

In the healthcare workplace, it is the opportunities for ongoing skill and professional development (PD) that call for educational leadership for e-learning.

Review of the Literature

Over the past decades, numerous educational leadership theories have gained popularity. However, there is no one specific leadership theory that is universally suitable or ensures infallible leadership performance in the ever-changing educational context (Beaudoin, 2003).

The trait-based theory identifies the key characteristics for successful leaders including physical attributes, intelligence, skill, and personality factors (Bolden, Gosling, Marturano, & Dennison, 2003). These authors argue that some common traits are found in leaders but no consistent traits can be identified.

Emergent leadership proposes that a group member surfaces to be perceived as the leader. This leader has to be an innovator and at the same time be a conformist to the group's social norms (Curtin, 2004). Curtin posits that leadership which conforms to followers' social norms may be based on self-interest rather than innovation and new direction-seeking.

The leader-member exchange theory (LMX) suggests that leaders develop different follower exchange relationships that impact the leader and member outcomes (Avolio, Walumbwa, & Weber, 2009). Dyadic relationships may create followers' "in-groups" versus "out-groups" that result in inequities and distrust (Horner, 1997).

Contingency leadership suggests that maximization of followers' performance is dependent upon the interaction of the situation, people, task, organisation, and other environmental variables (Bolden et al., 2003). However, if everything is an interaction that turns into a contingency then "it may become difficult to do what science needs to do—which is to provide a model that, in some way, reduces a phenomenon" (Sternberg, 2005, p.198). Subsequently, the contingency approach may be more appropriate for supervising small groups

of followers rather than leading educational organizations into the future (Aronson, 2001).

Transactional leadership is built on contingent reinforcement where followers are motivated by positive or negative feedback (Bass & Steidlmeier, 1999). Using control strategies maintains the status quo within an organization (Aronson, 2001). The current educational marketplace calls for leaders to embrace change and innovation with new organizational structures and pedagogical models rather than controlling and maintaining the status quo.

Transformational leadership is intrinsic and value-driven, creating a collaborative vision for empowering stakeholders to work together to achieve a shared goal (Burns, 1978). Critics argue that there can be pseudotransformational leaders whose behavior may be deceptive and devious; authentic transformational leaders operate out of genuine concern for others and foster an organizational culture with high ethical standards (Bass & Steidlmeier, 1999).

Strategic leaders' attributes and skills are adapted from transformational and transactional leadership theories. In times of change, organizational learning processes benefit from transformational leadership, while during stable times the transactional approach may reinforce current organizational learning (Vera & Crossan, 2004). Historically, strategic leadership has centered on an individual leader at the top of the hierarchical pyramid. This model is becoming increasingly counterproductive and "strategic leaders constrained by their abilities to deal with rapidly increasing amounts of data and the general complexity of the global economy . . . are now challenged to discharge their strategic leadership responsibilities differently" (Ireland & Hitt, 2005, p. 66).

Distributed leadership focuses on leadership practice that is widely shared between leaders. It is characterised by interdependence and cooperation that encourages members to contribute their knowledge and expertise in the leadership activity (Harris, 2004). Distributed leadership works only in teams where members recognize the potential for leadership practice to coexist as a function rather than a position (Thornton, 2010). As Thornton indicates, distributed leadership focuses on maximizing the capacity of people within organizations by concentrating on expertise wherever it exists.

In servant leadership, the focus is on the role of the leader as a servant rather than on self-interest (Stone, Russell, & Patterson, 2003). Sendjaya, Sarros, and Santora (2008) argue servant leaders encourage followers' learning, growth, and autonomy for development of future leaders in learning organizations. However, caution must be exercised that the followers' needs do not take precedence over organizational objectives.

Research on leadership styles and outcomes for managing the challenging healthcare workplace has examined how leaders can increase satisfaction, recruitment, and retention and promote healthy work environments (Cummings et al., 2010). Gilmartin and D'Aunno's (2007) review of empirical studies of leadership in the healthcare workplace for the period of 1989–2005 concluded that participative and person-focused leadership styles are linked to reduced HHR work stress, increased group cohesion, empowerment, and self-effi-

cacy associated with job satisfaction and retention. Additionally, Cummings et al.'s (2010) systematic literature review from 1985–2009 on leadership styles in nursing identified that relationship or people-focused leadership practices were empirically linked to improved outcomes in this context.

E-learning and Educational Leadership in the Healthcare Workplace

To respond to the multifaceted challenges in the healthcare workplace, educational leadership is required for creating a culture that seeks opportunity for new directions. In the interests of recruitment and retention of HHR in the Canadian healthcare workplace, education for ongoing skills and PD should be broadened and be more inclusive (Shamian & El-Jardali, 2007). The Canadian Council on Learning (2007) also states that employers who support workplace training and skills development receive a significant return on their investment impacting positively on productivity, innovation, and economic success. E-learning in various delivery formats is noted to be an excellent medium for promoting knowledge and skill development in HHR (Chambers, Conklin, Dalziel, & MacDonald, 2008; MacDonald, Stodel, Hall, & Weaver, 2009).

E-learning in the Healthcare Workplace

Historically, education and training programs in the healthcare workplace have been delivered in a face-to-face format. Attendance at these programs has become increasing difficult due to budget and time constraints, staffing shortages, lack of employer or administrative support, scheduling difficulties, and family responsibilities (Penz et al., 2007). "Addressing these 'new age' challenges requires 'new age' approaches and tools to support the teaching and learning of health care professionals" (Kenny, Park, Van Neste-Kenny, Burton, & Meiers, 2009, p. 79).

In the healthcare workplace, e-learning can promote reflection and higher level thinking for knowledge exchange, synthesis, application, and translation for improving healthcare (MacDonald, Archibald, Stodel, Chambers, & Hall, 2008). E-learning includes either synchronous or asynchronous formal learning modes such as online courses or conferencing, and informal learning. Formal e-learning incorporates objectives and outcomes defined by an instructor or educational institution, while informal e-learning is implicit, unintended, opportunistic, and unstructured learning undertaken on the learner's own terms without either prescribed curricular requirements or a designated instructor (Eraut, 2004; Livingstone, 2001). Informal e-learning that impacts skill and PD could be situated at the point-of-care using mobile devices, enabling HHR to interact, maximize ideas, and expand the boundaries for just-in-time learning (McGreal, 2005).

By providing HHR with the opportunity for skills and PD using e-learning, the quality of work-life and overall performance of the healthcare system may be enhanced well into the future (Lowe, 2002). It is up to educational leaders to leverage this strength.

Educational Leadership for E-learning

In this climate of growing societal demands, technology, and the complexities of the global economy, it is becoming increasingly difficult for single individuals at the top of a workplace pyramid to have all the answers (Ireland & Hitt, 2005). In the healthcare workplace, strategic distributive leadership at the senior administrative level blended with servant leadership at departmental levels might be the critical bridge for effectively engaging HHR in e-learning.

With senior administrative leaders, holistic forms of distributed strategic leadership that include intellectual, emotional, spiritual, and behavioral dimensions may produce high levels of interdependence among the leaders emerging from multidirectional and dynamic social processes (Gill, 2006). Hence, the heterogeneity of knowledge and skills would focus on leaders strategically interacting for collaborative and strategic decision-making towards the vision of e-learning in the healthcare workplace. These leaders use a transformational approach to develop a collective healthcare workplace vision for e-learning that springboards off the urgency for HHR recruitment and retention. Instead of providing the answers, distributed strategic leaders will strive to ask the right questions that empower stakeholders to work collaboratively, build engagement, capability, and alignment (Ireland & Hitt, 2005). This approach requires validation of HHR concerns, open communication, empathy, and active listening to seek different perspectives that inspire engagement in e-learning (Gill, 2006).

Where leadership is wholly top-down and outside the departments, employees will be slow to embrace change; it is important to build leadership capacity at all departmental levels (Latchem & Hanna, 2002). In the healthcare workplace, a blending of distributed strategic leadership with servant leadership has the potential to support and inform pedagogical practice with e-learning. Both servant leadership and the transformational aspect of strategic leadership "emphasize the importance of appreciating and valuing people, listening, mentoring or teaching, and empowering followers" (Stone et al., 2003, p.3).

At the department level, servant leaders are called to lead rather than driven to lead; the servant leaders' focus is on other people rather than self-interest (Stone et al., 2003). Servant leadership promotes teamwork and community involvement in decision-making based on ethical and caring behavior that enhances the growth of people and quality of institutions (Swearingen & Liberman, 2004). Servant leadership is characterized by "service orientation, holistic outlook, and moral-spiritual emphasis" (Sendjaya et al., 2008, p. 402) that promotes equality and shared values, respect, open-ended commitment, mutual trust, interconnectedness, and concern for others. As Senge (1997) states "learning organizations are built by servant leaders" (p. 17).

Significance of Educational Leadership for E-Learning in the Healthcare Workplace

The blending of distributed strategic leadership with servant leadership can set direction and develop shared strategies to achieve a vision for effective e-learning for HHR using the

following:

- awareness that helps educational leaders to understand issues involving ethics, power, and values from a more integrated and holistic approach with e-learning;
- foresight to discern possible consequences for the future and to learn from past lessons with HHR to prevent problems with e-learning; and
- conceptualization to look towards long-term goals while strategically balancing day-to-day operations (Swearingen & Liberman, 2004).

For the healthcare workplace to evolve as a learning organization, these leaders must employ e-learning and thus provide HHR with opportunities to learn and grow and to respond to their changing work environments. This blended leadership approach has the potential to build and rebuild community spirit and promote a community of practice that engages e-learning for skill and professional development (Swearingen & Liberman, 2004).

Conclusion

In the healthcare workplace, there is a call for educational leadership for e-learning that broadens "the vision of what can be accomplished, provides guidance through uncharted waters, gains commitment and creates systems that are responsive, energizing and sustainable" (Latchem & Hanna, 2002, p. 213). It is a call for leadership that transforms and increases a shared vision and value focus, creativity and innovation, responsiveness and flexibility, commitment to service, which includes respect, and diversity (Hamilton, 2008). To answer this call, leadership is needed for informing pedagogical practices in the healthcare workplace that is outside the traditional hierarchy, which focuses on one leader. Instead, a distributed strategic and servant leadership blend is required that generates teamwork and community building, shared decision making, and ethical and caring behavior that encourages interdependence and interaction among HHR to serve as well as lead (Neill & Saunders, 2008). Moreover, blended leadership may provide the critical bridge for incorporating effective e-learning to advance the skills and PD of HHR to meet Canadian healthcare needs in the 21st century.

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