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Effects of Multimedia Feedback on Pre-Service Teachers' Perceptions, Self-Assessment, and Academic Achievement

Gökçen Aydin, Mithat Çiçek, Mustafa Güleç, Middle East Technical University, Turkey

Introduction and Review of Literature

The importance of feedback for learning is recognized by a number of theoretical perspectives rooted in behaviourism and pursued by many others such as goal setting theory (Locke & Latham, 1990), social cognition theory (Bandura, 1991) and conditions of learning (Gagne, Briggs, & Wager, 1992). Feedback serves as an essential component of teaching and learning process in these theories because it provides important information to learners about their performance on a specific task or goal (Hollenbeck, Karam, DeRue, & Lam, 2011).

This crucial component of the learning is mostly classified in terms of its source (Brett & Atwater, 2001; Greller & Herold, 1975; Vancouver & Morrison, 1995, as cited in Lam et al., 2011), timing (Druskat & Wolff, 1999, as cited in Lam et al., 2011; Kulik & Kulik, 1988), type (Earley, Northcraft, Lee, & Lituchy,1990; Hammond, Summers, & Deane, 1973; Jacoby, Mazursky, Troutman, & Kuss, 1984, as cited in Lam et al., 2011) frequency (Anderson, Kulhavy, & Andre, 1971; Hundal, 1969, as cited in Lam et al., 2011) and its methods for response (Dopke, 2010). These methods are known as text-based (Tang, 2000; Quible, 1997 as cited in Dopke, 2010), audio (Sipple, 2007) and multimedia (Ice et al., 2007).

Text based feedback is the most common one for the majority of instructors because it seems the most pragmatic method for providing feedback (Dopke, 2010). Butler and Nisan (1986) reported that the group which received task related written comments showed significantly more interest on the task than the other group which received only the grades (as cited in Styrk, 2007). Kumar and Stracke (2007) stated that expressed opinions of instructor in written feedback were perceived very helpful for doctoral students to build their confidence (as cited in Can, 2009). Providing written feedback seems to be same with the feedback that is provided electronically. However, it offers lots of benefits. Gould (2012) argues that two most common benefits of electronic text

based feedback are its legibility and efficiency. In a study, Denton (2001) found that emailing feedback to learners contributed to the improvements in students' report writing skills over a 2-week period (as cited in Gould, 2012).

Audio feedback is mainly known as recorded comments that are prepared by the instructor on a task. This method has some advantages compared to the written-based. According to Dopke (2010), instructor can provide a great deal of information than can be provided in writing with the help of audio based feedback. Some researchers (Ice et al., 2010; Norcliffe & Middleton, 2007; Oomen-Early et al., 2008, Rotheram, 2008) reported favourable results on instructor workload and learner perceptions, performance, and satisfaction when providing assessment feedback in recorded audio format (as cited in Gould, 2012). Providing audio feedback has also proven to be more time efficient than text, under certain circumstances (Davies, 2010; Nortcliffe & Middleton, 2007; Rotheram, 2008, as cited in Gould, 2012).

Combining text, audio and video into one format can increase the effectiveness of the feedback, because lots of benefits of these methods can be combined in multimedia feedback experience. Several studies indicated that students preferred a combination of these methods in the process of receiving feedback (Ice et al., 2010; Oomen-Early et al., 2008; Simonsson et al., 2009, as cited in Gould, 2012). Tsutsui and Kato (2001) designed a multimedia feedback tool that was developed by the University of Washington's Technical Japanese Program in their study. Results showed that this tool was approved as effective for oral skills training. Additionally, in Gould's (2012) study on multimedia feedback, the findings revealed that students reported positive effects on their cognitive, affective, and psychomotor learning through the learning process along with the multimedia feedback.

Majority of existing research about effectiveness of feedback in terms of response method is based on text-based feedback (Butler & Nisan, 1986, as cited in Styrk, 2007; Denton, 2001 as cited in Gould, 2012; Quible, 1997; Kumar & Stracke, 2007;) and audio feedback (Ice et al., 2010; Oomen-Early et al., 2008; Davies, 2010; Nortcliffe & Middleton, 2007; Rotheram, 2008, as cited in Gould, 2012; Sipple, 2007). However, based on technological developments, using multimedia technologies in educational environment is increasingly becoming popular among researchers. Some of these researchers argue that students prefer multimedia method, a combination of audio and text-based methods, in the process of receiving feedback (Ice et al., 2010; Oomen-Early, Bold, Wiginton, Gallien, & Anderson, 2008; Simonsson, Kupezynski, Ice, & Pankale, 2009, as cited in Gould, 2012). In the light of those statements, the investigation of pre-

service teachers' experiences on this new response method of feedback might be beneficial in order to determine its effect in educational environments.

The purpose of this study is twofold: One of them is to investigate the effect of providing feedback in digital multimedia format on pre-service teachers' perceptions toward multimedia feedback and self-assessment about their skills on a performance-based task. The second purpose is to investigate whether or not providing feedback in digital multimedia format affects pre-service teachers' academic achievement on a performance-based task.

In compliance with these purposes, the following research questions are addressed:

- Does providing feedback in digital multimedia format affect pre-service teachers' perceptions toward multimedia feedback?
- Does providing feedback in digital multimedia format affect pre-service teachers' self-assessment on their skills for a performance-based task?
- Does providing feedback in digital multimedia format increase pre-service teachers' achievement on a performance-based task?

Methodology

Two different research designs were used in the light of research questions of current study.

Study 1

A matching only pre-test-post-test control group design among quasi-experimental designs was applied in this study. This type of design is more suitable when the random assignment for study groups is not applicable since some of the other variables may not be equal in a study (Frankel, Wallen & Hyun, 2012).

The sample of the study composed of 19 sophomore students from Computer Education and Instructional Technology department at Middle East Technical University and they voluntarily participated in this study. The data were collected from laboratory sessions of *Design and Use of Instructional Material Course* being taught in this field. The participants were assigned into two groups named as experimental and control groups. This selection process was administrated by applying to the pre-test scores, prior feedback experience, GPA and gender of the participants.

Gould's (2012) pre- and post-course survey was used in this study to obtain the information of participants. This instrument was a modification of an instrument that was used and validated by Ice et al. (2007). It is composed of four main parts such as demographics, experience, course expectations, and multimedia feedback. The multimedia feedback section of the survey consists of nine questions aiming to obtain information about participants' perceptions on multimedia feedback. The second instrument in this study is a self-assessment form about the competency levels on use of software program which is Microsoft Expression Web. The researchers developed the instrument and content validity was provided by an expert from the field. The data analysis of Study 1 was conducted by using SPSS 23 software. As a non-parametric test, Mann-Whitney U test was utilized along with descriptive statistics.

Study 2

One of the sequential types of mix methods design, explanatory sequential design was utilized in this study. The quantitative data collection and analysis process is followed by qualitative data collection and analysis phase in this design. Two types of data are analysed separately. The results of qualitative analysis are used to extend the results of quantitative analysis (Fraenkel, Wallen & Hyun, 2012). In this direction, the qualitative analysis results were used to support the quantitative analysis results.

Only the experimental group students ($n = 9$) from the previous study participated in this study. For the quantitative phase, convenient sampling method was used for the selection of the participants. A purposive sampling technique was applied for the qualitative phase of this study. Four participants from the experimental group were invited for interviews after taking the post-test.

In quantitative phase, achievement scores of the students were obtained via the rubric developed by the researchers to evaluate the web sites designed by students. This rubric consists of twenty criterions that have different percentages out of 100-point. For the validation of the instrument, expert view was taken into consideration. On the other side, semi-structured interviews were administrated with four students for qualitative phase of the study. The content validity of interview questions was provided by expert views. A schedule was also followed during the interviews. The quantitative data of Study 2 was analysed by applying Wilcoxon test in SPSS 23 software. For qualitative data, codes were defined and reported with related quotations.

Procedure

After pre-defined lab sessions of Design and Use of Instructional Material Course, there were assignments for students. Students uploaded the related file prepared via Microsoft Expression Web design editor to online course page. The researchers examined these assignments and feedback files which were created. Students could download their feedback file from the same course page. Feedback files were different for experimental group and control group. For the experimental group, this file was created with Adobe Captivate software that enabled to record onscreen activities easily. In these activities, text and audio based feedback was provided via videos as a part of multimedia feedback. On the other side, feedback files created with Microsoft Office Word software in text were delivered to students in control group.

Results

Descriptive Statistics and Past-Feedback Experience of Participants

Of 19 participants, the number of females was 12 and the rest (n = 7) were males. Their ages ranged from 20 to 23. The experimental group was formed by 10 students. While 5 of them reported that they had already taken feedback in text format in three or more courses, the number of students whom had taken such feedback in two courses was 2. The rest (n = 3) stated that they had taken this type of feedback for only one course. Besides, 6 students had never taken feedback in audio format, whereas 3 of them had taken this feedback type in one course and 1 student had already taken this type feedback in two courses. Finally, for multimedia feedback, when 7 students out of 10 had never taken this type of feedback, the remaining 3 students had taken such feedback in one course.

On the other side, 9 students were assigned to control group. While 3 of them had previously taken feedback in text format in 3 or more courses, 4 students had taken this type of feedback in two courses and 2 of them had taken in two courses. For audio type of feedback, 4 students reported that they had never received such feedback before. When 2 of them had taken this feedback type in one course, the rest 3 students had taken in three or more courses. Lastly, the majority of the control group reported that they had never taken this multimedia feedback before (n = 6). One of them had received in one course and the remaining (n = 2) had received multimedia feedback in two courses previously.

Results for Study 1

The aim of Study 1 was to investigate the difference between pre and post test results of experimental and control group in terms of skills and perception towards multimedia feedback. As the number of participants was below 30 ($n < 30$) (see Table 1), among non-parametric tests, Mann-Whitney Test was utilized. The results showed that there was no statistically significant difference between pre-and post-test results of experimental and control group except the perception post-test results as indicated in Table 2. The significant difference was found between post-test scores of experimental and control group and experimental group (M = 13.25) had larger mean score compared to control group (M = 6.39). That is, experimental group had an increase in their level of perception towards multimedia feedback, $z = -2.71$, $p < .05$.

Table 1: Means of Pre-Post Test Results for Groups

	Study Group	N	M
Perception Pre-Test	Experimental	10	11.00
	Control	9	8.89
Perception Post-Test	Experimental	10	13.25
	Control	9	6.39
Skill Pre-Test	Experimental	10	10.40
	Control	9	9.56
Skill Post-Test	Experimental	10	10.15
	Control	9	9.83

Table 2: Results of Mann-Whitney U Test

	Perception Pre-Test	Perception Post-Test	Skill Pre-Test	Skill Post-Test
Mann-Whitney U	35.00	12.50	41.00	43.50
Wilcoxon W	80.00	57.50	86.00	88.50
Z	-.82	-2.71	-.33	-.12
Asymp. Sig. (2-tailed)	.41	.007	.74	.90
Exact Sig. [2*(1-tailed Sig.)]	.447[b]	.006[b]	.780[b]	.905[b]

a. Grouping Variable: group
b. Not corrected for ties

Results for Study 2

The aim of Study 2 was to find whether there was a significant difference between pre and post test result of experimental group in terms of academic achievement. According to descriptive statistics, the mean of scores before multimedia feedback was 71.50 and the mean scores after multimedia feedback was 90.30 (see Table 3 below). The results of non-parametric test indicated that there was a significant difference between pre and

post test scores of students who participated to experimental group, $z = -2.66$, $p < .05$ as stated in Table 4. Providing multimedia feedback increased students' academic achievement.

Table 3: Descriptive Statistics for Multimedia Feedback Scores

	N	M	SD
Score before multimedia feedback	10	71.50	17.76
Score after multimedia feedback	10	90.30	8.19

Table 4: Results of Wilcoxon Test

Test Statistics	First Score-Second Score
Z	-2.668[b]
Asymp. Sig. (2-tailed)	.008

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks

In order to support these findings, four students from experimental group were interviewed based on their academic achievement. The important aspects mentioned by students included understanding and correcting mistakes easily, remembering the concepts or steps to be followed, opening space for new learning, discovering even small mistakes, increasing step by step learning, giving the opportunity to work on mistakes and flexible learning as a result of getting multimedia feedback. As there was the opportunity to watch the feedback again, one participant resembled this type of feedback to face-to-face feedback. The students also underlined some motivational factors leading to higher academic achievement: The more interaction between instructor and student encouraged students to work on the necessary changes about feedback; reduction of procrastination; new ways of providing feedback was supportive for students in terms of motivation because they know how to find answers to their questions whenever they need. Interestingly, one participant stated an increase in her level of self-confidence as a result of much care from instructor. Getting multimedia feedback was not only useful for checking mistakes about the task, but also useful for willingness to discover mistakes. Some of the direct quotations were provided below:

> *"I looked at the feedback there, and did the task again according to feedback. I watched from the beginning by checking my mistakes and when I thought that it was completed, I uploaded it."*

"When I got written or oral feedback, I can forget if I do not take notes. When you provided multimedia feedback, I could look at it whenever I want."

"This shows that the instructor spends time for student. In a way, instructor cares for student, and this supports studying much. Somehow, it gives student self-confidence."

"I did what you said and showed one by one there and so, my score increased."

Conclusions and Discussion

The aim of this study was to examine the effect of providing feedback in digital multimedia format on pre-service teachers' perceptions toward multimedia feedback, their self-assessment about their skills, and academic achievement on a performance-based subject. Pre, post-test experiments and semi-structured interviews were applied in order to response the research questions under two different research designs.

According to pre, post-test results for perception and skill scores in Study 1, significant difference was found only post-perception scores of study groups. Experimental group had larger mean scores than control group in terms of their perceptions toward multimedia feedback. One can interpret that students in experimental group perceived that taking multimedia feedback for a performance-based task is useful for their performance. They prefer to take multimedia feedback. In the light of this result, Tsutsui and Kato (2001) found multimedia feedback more efficient and rewarding for students while comparing to other feedback types. Furthermore, Ice at al. (2010) reported that students preferred taking a combination of different feedback types which refers to multimedia feedback. On the other side, no significant difference between study groups was found in terms of their self-assessment scores for their skills while performing during the study. That is, providing multimedia feedback did not significantly affect students' self-assessment scores while using a web based material for a performance-based task.

Finally, academic achievement of experimental group was examined in Study 2. The pre, post-test results concluded that statistically significant difference was found. Students' achievement scores during that performance based task significantly increased with the help of multimedia feedback they took from the instructor. The interview results also supported the experiments' results. Four students stated that taking multimedia

feedback helped them to increase their course scores, complete related task, have chance to follow task steps when needed, increase the interaction between instructor and student, and increase their self-confidence. They all had positive attitudes toward taking multimedia feedback during a performance-based task. The results of Gould's (2012) study were also parallel to current study. He reported that providing multimedia feedback increased the satisfaction, motivation, interaction level and learning of students.

Since the number of participants in this study was not efficient enough for making reasonable generalizations, more research studies formed from larger samples are suggested to be conducted. Furthermore, different performance-based tasks can also be applied in order to explore the effect of multimedia feedback for various parameters in educational environments.

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Towards Privacy Issues in Personal Learning Environments: A Conceptual Model of PLE Privacy

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Abstract

Personal Learning Environments (PLE) as an approach to technology enhanced learning emphasizes the shift of control and ownership from the educator or the designer of a learning environment to the user or the learner. While more and more private data is created and shared on the Internet, more and more enterprises, government agencies and marketers are collecting personal data. Many users and learners are not aware of how their private data is used or misused and they are not taking steps to protect their personal data from being used by others. At the same time, it is possible to use the data created and shared on the Internet for educational purposes. This paper firstly introduces the topics of data literacy and safety as part of the digital competence regarding privacy issues. Then, it discusses several issues related to privacy in different types of PLEs such as: informal Web 2.0 / Social Media PLEs, mobile PLEs, ePortfolio-based PLEs, badges-driven PLEs, PLEs connected to formal learning process in higher education in the context of self-regulated learning. In this article the relationship between privacy and PLEs and between privacy and students' learning control is presented; and, a conceptual model of privacy in PLEs is developed to present current factors influencing it.

Abstract in Spanish

Los Entornos Personales de Aprendizaje (PLE, por sus siglas en inglés) como un enfoque del aprendizaje potenciado por la tecnología enfatiza el cambio del control y la propiedad del educador o diseñador de un entorno de aprendizaje hacia el usuario o el alumno. Mientras más y más datos privados se crean y comparten en Internet, más y más empresas, agencias gubernamentales y comerciantes están recopilando datos personales. Muchos usuarios y alumnos no son conscientes de cómo se utilizan o se abusan de sus datos privados y no están tomando medidas para proteger

sus datos personales de ser utilizados por otros. Al mismo tiempo, es posible utilizar los datos creados y compartidos en Internet con fines educativos. En este documento primeramente se introducen los temas de seguridad y alfabetización de los datos como parte de la competencia digital que tiene que ver con la privacidad. Seguidamente, se examinan varias cuestiones relacionadas con la privacidad en diferentes tipos de PLE, tales como: PLE basados en la Web 2.0 y medios sociales en contextos informales, PLE móviles, PLE basados en ePortfolios, PLE promovidos por insignias y PLE conectados con el proceso de aprendizaje formal en la educación superior en el contexto de la autorregulación del aprendizaje. En este artículo se presenta la relación entre la privacidad y los PLE y entre la privacidad y el control del aprendizaje de los estudiantes; y, se desarrolla un modelo conceptual de la privacidad en los PLE para presentar los factores influyentes actuales.

Abstract in German

Personal Learning Environments (PLE) als Ansatz für technologiegestütztes Lernen betont die Verlagerung von Kontrolle und Eigenverantwortung vom Lehrer oder Designer einer Lernumgebung auf den Benutzer oder Lernenden. Während immer mehr private Daten im Internet erstellt und weitergegeben werden, sammeln immer mehr Unternehmen, Behörden und Vermarkter personenbezogene Daten. Viele Benutzer und Lernende sind sich nicht bewusst, wie ihre personenbezogenen Daten verwendet oder missbraucht werden, und sie unternehmen keine Schritte, um ihre personenbezogenen Daten vor der Verwendung durch andere zu schützen. Gleichzeitig ist es möglich, die im Internet erstellten und geteilten Daten für Bildungszwecke zu nutzen. Dieses Papier stellt das Thema von Datenkompetenz und Datensicherung als Teil der Digitalkompetenz bezüglich des Datenschutzes vor und behandelt mehrere Fragen im Zusammenhang mit dem Datenschutz bei verschiedenen Arten von PLEs, wie z.B.: informelles Web 2.0 / Social Media PLEs, mobile PLEs, ePortfolio-basierte PLEs, Badges-gesteuerte PLEs, PLEs, die mit dem formalen Lernprozess in der Hochschulbildung im Kontext des selbstregulierten Lernens verbunden sind. In diesem Artikel wird die Beziehung zwischen Privatsphäre und PLEs und zwischen Privatsphäre und Lernkontrolle der Schüler vorgestellt; und ein konzeptionelles Modell der Privatsphäre in PLEs wird entwickelt, um aktuelle Faktoren darzustellen, die die Privatsphäre beeinflussen.

Abstract in Catalan

Els Entorns Personals d'Aprenentatge (PLE, per les sigles en anglès), com a enfocament de l'aprenentatge potenciat per la tecnología, emfatitza el canvi del control i la propietat de l'educador o dissenyador d'un entorn d'aprenentatge cap a l'usuari o l'alumne. Com més i més dades privades es creen i comparteixen a Internet, més i més empreses, agències governamentals i comerciants estan recopilant dades personals. Molts usuaris i alumnes no són conscients de com s'utilitzen o es abusen de les seves dades privades i no estan prenent mesures per protegir les seves dades personals de ser utilitzats per altres. Alhora, és possible utilitzar les dades creats i compartits a Internet amb fins educatius. En aquest document primerament s'introduexien els temes de seguretat i alfabetització de les dades coms part de la competència digital que té a veure amb la privacitat. Seguidament, s'examinen diverses qüestions relacionades amb la privacitat en diferents tipus de PLE, com ara: PLE basats en la Web 2.0 i mitjans socials en contextos informals, PLE mòbils, PLE basats en ePortfolis, PLE promoguts per insígnies i PLE connectats amb el procés d'aprenentatge formal en l'educació superior en el context de l'autoregulació de l'aprenentatge. En aquest article es presenta la relació entre la privacitat i els PLE i entre la privacitat i el control de l'aprenentatge dels estudiants; i, es desenvolupa un model conceptual de la privacitat en els PLE per presentar els factors actuals que hi influeixen.

Keywords: Personal Learning Environments (PLEs), Higher Education, Data Privacy, Conceptual Model, Web 2.0, Data Literacy

Introduction

Higher Education has been enriched by an increasing diversity demanding inclusive practices (Kaur, Noman, & Nordin, 2016), among which technology enhanced learning (TEL) has emerged as paramount for more student-centred (personal) learning. This personal learning involves changing the nexus of power and control from institutions and teachers to learners, e.g. students being able to orchestrate the different educational tools, resources and content (Buchem, Attwell, & Torres, 2011). It occurs causally in informal learning settings, and can be connected to parts of the formal learning process. The learning happens in an open and social environment of the web – social media, social networks and community of practices – and contributes to expanding the possibilities of personal learning to collective and social learning (Camacho & Guilana, 2011). Personal Learning Environments (PLE) as an approach to technology enhanced learning emphasizes the shift of control and ownership from the educator or the

designer of a learning environment to the user or the learner, bestowing decision making and choice upon the learner, especially the choice of the learning tools and the use of these tools for learning (Buchem, Tur, & Hoelterhof, 2014). According to the PLE approach each learner designs a unique learning environment to support and enhance individual learning, collecting a wide variety of personal data related not only to the private life, but also to the student learning profile. Especially young people share their private lives online, providing huge amounts of data while older generations are fighting to keep private, among others because they do not fully understand the public nature of the Internet and its implications (Barnes, 2006). While more and more private data is created and shared on the Internet, more and more enterprises, government agencies and marketers collect this data for purposes other than learning and education which can involve another political agenda (Parrota & Williamson, 2018). Barnes (2006) names this situation *a privacy paradox* since many users and learners are not aware of how their private data is used or misused and they are not taking the necessary steps to protect their personal data from being used by others. At the same time, it is possible to use the data created and shared on the Internet for educational purposes, for example by means of learning analytics and recommender systems to support individual learning processes.

The term *data* can be defined as meaningful information that can be stored and recorded for further processing (Data Protection Act, 1998) and also as representation of information that includes a personal identifier (Woo, 2010). The term *personal data* is related to the data used for identification of individuals (Data Protection Act, 1998). Personal data contains any opinion expressed by individuals or expressed by other individuals towards the first ones. Personal data can be divided to *ordinary* and *sensitive*. Ordinary data presents the main information about any individual including name, address, phone number and sensitive data describes person from political, ethnic, religious, criminal, etc. point of view, including biographical information, facts, opinion (Data Protection Act, 1998). In the context of PLE, sensitive data includes also learning background, student's profile, progress, shared documents or opinions. The unauthorised disclosure of personal data is normally considered a breach of privacy, although what is personal data and hence data privacy has been a matter of dispute. Sociological theories consider privacy as part of social life. In the past people experienced social life in relation to small, often local communities, while with the advent of the Internet social life is becoming increasingly networked with access to much larger, distributed and more loosely defined social connections (Rainie &

Wellman, 2012). From this perspective, the practice of personal information sharing can be considered as part of social participation and social learning.

By addressing the problem of privacy in Personal Learning-Environments in this paper, we are focusing on privacy of ordinary and sensitive data in context of digital, social learning. The emerging research questions are:

- What kind of skills are needed to support a safe PLE?
- What kind of personal data is required to support organisation and management of learning in a Personal Learning Environment?
- What kind of personal data should be shared and with whom to support learning achievements and personally successful learning?
- How can student's data privacy be guaranteed in PLEs, if it is to be connected to analytical tools applied for educational purposes?

This paper introduces the topic of data literacy and discusses several issues related to privacy in different types of PLEs such as: informal Web 2.0 / Social Media PLEs, mobile PLEs, ePortfolio-based PLEs, badges-driven PLEs, PLEs connected to formal learning process in higher education in the context of self-regulated learning. This is a first attempt to identify the relationship between privacy and PLEs and between privacy and students' learning control. A conceptual model of privacy in PLEs is developed in this paper to present current factors influencing on privacy.

Framework

PLE and digital competence: data literacy and safety

Safety and data literacy are two of the areas in which digital competence has been described in the DigiComp 2.0 Framework (Vuorikari, Carretero, Punie, & Van den Brande, 2017) – supported by the European Commission –, along with others such as communication and collaboration, digital content creation and problem solving. Data literacy is described in a set of four sets of competences which are very closely related to the search, management and critical selection of information. In this regard, data literacy has a lot to do with cognitive and metacognitive skills that help in the processes of browsing, finding, filtering, evaluating, storing and retrieving information. The safety area is described by a set of four skills, two of them related to the person's well-being and ethical usages and the sustainability of the environment. As for the two others, one is about taking care of the devices and the second is about particular skills needed in terms of protecting personal data and privacy. In the DigiComp 2.1 framework (Carretero, Vuorikari & Punie, 2016), further work on the digital competence area is

presented and those skills are described in levels of performance. Each competence area is shown in eight proficiency levels, in which the users' skills are developed from awareness and autonomous learning (levels from one to four, structured in initial and intermediate stages) to levels of mastery and high specialization, which involve the use of skills in a wide range of contexts and play a key role at the social level by helping, giving feedback and support to one's own community.

Data literacy as a competence skill area is described in terms of abilities needed to manage, select, store and retrieve information, but it fails in contextualizing the neoliberal current economy in which users become data sources for the economic benefits of big financial enterprises (Adell, Llopis, Esteve, & Valdeolivas, 2019). Thus, both safety and data literacy need to be addressed from an approach that deals with a critical perspective, highlighting new skills for the awareness and control of one's own personal and private data. Data, analytics, coding and algorithms play a central role in what contemporary education is, lying at the heart of range of recent education developments (Selwyn, 2016; p.82, p.91). There are clear benefits of data-based education, such as the possibility to use data to place educational decision-making in the hands of learners and keep it apart from experts and institutions (Selwyn, 2016; p.94), which is also in line with a perspective of privacy control in PLEs by learners. Another one points towards to collaborative data sharing strategies (*data for good*), which help to make progress in specific areas and enhance data literacy in those contexts (Voiklis, Fraser, Flinner, & Norlander, 2018). Despite this, the use of educational data is not exempt of dangers. One is the arising hierarchy of data classes. Most of the individuals create data that others process, often without being aware of it. There are others that do create data too but have the awareness of doing so. The smaller groups of individuals have the means to collect data and the expertise to analyse data (Selwyn, 2016; p.100). Another is related to the type of measurement that educational data systems generate, which is mainly what can be easily measured, leaving behind what is difficult to measure but still important (Selwyn, 2016; p.98). Both benefits and dangers of data-based education expose the relevance of developing what has been called as *data literacy*, which consists of "the desire and ability to constructively engage in society through or about data" (Bhargava et al., 2015; p.7). Although it is indeed important to adopt measures for data safety and data management, the focus on the development of learners' skills to manage and control the data traces they leave when using digital media for empowerment and own profit for learning (Pangrazio & Selwyn, 2018) is cornerstone in an era where data plays a crucial role in educational decisions.

Web 2.0 / Social Media PLE

The conceptualisation of PLE has been carried out through two main strands of research as observed by Fiedler and Väljataga (2010; 2014). The main one has been about its technical nature, and the second one, has been about the pedagogical aspects that need to be addressed when implementing PLEs in different learning contexts. The former integrates diverse issues such as the ones which have arisen through Web 2.0 and Social Media based PLEs; the latter is mainly based on the self-regulated learning as an educational aim (Dabbagh & Kitsantas, 2012). In the context of social media, the PLE approach is addressed to tackle the lack of student control and sense of ownership observed in institutional VLEs, such as traditional Learning Management Systems (LMS). Thus, social media has been observed to give students the opportunity to control and own not only the tools as tangible elements but also the processes or the intangible ones (Buchem, 2012; Buchem, Tur, & Hölterhof, 2014; Torres et al., 2018). Therefore, Web 2.0 and Social Media based PLEs, especially where social networks have a predominant role, have become environments where learners can bring together individual, group and multiple communities learning spaces. In these learning spaces, multiple levels of publicity and privacy can be established, considering a more comprehensive approach that takes into account the fact that there are common aspects in the way people perceive the privacy of their information (Razavi & Iverson, 2007). Hence, a PLE can contain collective spaces, accessible only to collaborators, specific people or open publicly, and private individual spaces and other individual spaces, which are accessible to certain people or completely public (Coll & Engel, 2014). However, challenging as it may be, privacy has not given much attention in either of the two strands of the PLE research, although some research in progress related to self-regulated learning in PLEs and trust and safety can be identified (Muthupoltotage & Gardner, 2018) and it has been discussed as a critical issue in the context of Web 2.0 and Social Media studies (Selwyn, 2016). Especially, Social Networking Sites (SNS), such as Facebook and Twitter, create privacy problems that may make users more self-conscious (Blank, Bolsover, & Dubois, 2014). For instance, Forgerock research shows that about half (53%) of the European adults surveyed are worried about how much personal information they have shared online but 47% affirms do not feeling they know how much of it is available online, and 51% felt uncomfortable with the amount of information social media platforms have about them (Forgerock, 2018). Also other types of PLEs may create similar privacy issues as these related to Web 2.0 and Social Media, since most PLEs integrate some of elements of the social web.

PLE and Higher Education

There are different good practices in the use of PLEs in higher education, e.g. as bridge between formal and informal learning. iPLE environment proposed in Salinas and Marín (2016) consists of Learning Management System (LMS), Web 2.0 tools and ePortfolio. Students have possibilities to take advantages of these three elements to construct their PLEs. The organisation of personal data is an aspect that students revealed as problematic; and therefore, proposals to support students bringing together LMS and PLE through information management, such as in Pérez Garcías, Marín and Tur (2018), may result helpful. Another study reports successful connection between social LMS and PLE using bookmarking tools for knowledge creation and sharing (Hölterhof & Heinen, 2014). Different studies (e.g., Bartolomé & Cebrián de la Serna, 2017; Pérez Cascante, Salinas, & Marín, 2016; Saz, Engel, & Coll, 2016) report on iPLE experiments that bring together academic and social environments. Two directions for knowledge transfer are possible: from LMS to PLEs and from PLEs to LMS. The question that emerged in this context is related to the private data flows in these two directions – what and where data is shared, stored and processed. A specially developed social media platform Graasp for university students is introduced by Benson, Morgan, and Tennakoon (2013) with features for arrangements of collaborative spaces, recommendations in context and management of privacy. Mechanisms for privacy management are introduced to protect users from unauthorised access to the social shared items. Users express their need to control the privacy in spaces and their profile.

ePortfolio-based PLE

Web 2.0-based ePortfolio has been an interesting educational implementation and research aimed at incrementing students' awareness of their PLE (Gewerc et al., 2016). In this context, social media has been argued to impact the ePortfolio construction, see for example, implementations based on blogs (Tur & Castañeda, 2016) or social networks (Gewerc et al., 2016). The open nature of Web 2.0-based ePortfolio has been observed both as a potential and a limitation (Tur & Urbina, 2014). In parallel, it has also been claimed that in order to maximise the learning effect of the use of an ePortfolio-based PLE, the student's personal space requires having some proprieties such as privacy, property and permanence (Rodríguez et al., 2014). Privacy in the case of PLE is related to the control that the learner has on the publication of the content. E-portfolio users can store their own artifacts and evidences in a private way until they decide to publish the content on the web or provide access to the teacher. Gillet et al. (2017) describe the possibilities of Graasp as an ePortfolio-based PLE -a personal shareable online space- insomuch it allows learners to archive learning artifacts and

activity traces for analytics-driven self-assessment. However, privacy issues have not been addressed in the exploratory studies on ePortfolios, in which learning is enhanced by an open environment for collaboration and peer-feedback.

Mobile PLE

Further development of the PLE approach has been carried out with the use of mobile technology (Attwell, Cook, & Ravenscroft, 2009; Conde, García-Peñalvo, Alier, & Piguillem, 2013; Humanante-Ramos, García-Peñalvo, & Conde-González, 2015). Mobile devices have been claimed as powerful tools for contextual and ubiquitous learning and have been introduced in designs of formal PLEs which included mPLEs from technical and pedagogical perspectives (Humanante-Ramos, García-Peñalvo & Conde-González, 2017). The development of geolocalisation, navigation and communication apps has empowered the possibilities for learning everywhere although some risks have also been observed in mobile learning research such as distraction or the negative effect of multi-tasking (Mendes, de Oliveira, & das Neves, 2018). The affordances of mobile technologies have had an important drawback related to privacy issues as mobile devices and apps capture personal data during browsing, trace Web habits, look into contact lists, and gather phone numbers and the unique ID number of the personal phone, among others. Currently, this aspect has become a topic of key concern as many businesses take advantage of the information obtained through mobile devices and applications.

Open Badges and PLEs

Recently, the question related to educational uses of Open Badges, i.e. digital credentials and/or micro-credentials, has emerged as an important aspect of capturing and visualising learning in digital learning contexts (Buchem, 2017). Open Badges, have been also used as parts of ePorfolios to demonstrate learning achievements, recording learning processes, recognising learning (Buchem, 2016). Different types of digital credentials based on the Open Badge standard can be designed and issued according to the student profile, e.g. based on the background, prior and current knowledge, learning activities and learning performance (Abramovich, Schunn, & Higashi, 2013). Open Badges may be used to support (a) recognising skills, achievements, experiences, practices, memberships, engagement on individual, peer and community levels, (b) assessing learning including summative, formative and transformative assessment, (c) motivating learning and providing orientation, (d) studying learning based on the information contained in a badge such as what the badge represents, criteria, evidence, issuers, earners (Buchem, van den Broek, & Lloyd, 2016). Since issuing and earning of

Open Badges includes tracking of student progress, participation activities, learning outcomes, learning systems may be designed to process data related to the personal profile of every learner, including personal data. This learner-related data opens new opportunities but also creates new questions about data privacy. The latest blockchain technological development contributes to open credentials with Blockcerts technology, as a new standard that may support the issue with greater possibilities for trust, security and ownership over one's own personal data (Grech & Camilleri, 2017).

Learning Analytics and PLE

Learning analytics could be used to improve learning through the information that can be obtained, but more importantly in the PLE context, it can also provide learners with recommendations in their learning based on earlier learning activity (Fournier, Kop, & Sitlia, 2011). For that purpose, not only data from a formal learning context (such as Virtual Learning Environments or VLE) is required, but more importantly, information from the outside of the institutional context, where learners are in an informal and personal learning context (PLE), which has also been defined as a source in the capturing data process (Leitner, Khalil, & Ebner, 2017). This new context involves using distributed services across multiple learning scenarios and, consequently, new methods of data collecting and interpretation, for instance, Social Network Analysis (Casquero, Ovelar, Romo, & Benito, 2014; Fournier, Kop, & Sitlia, 2011). Evidently, these learning analytics methods can raise uncovered data of privacy issues related to the gathering of information that the learner is creating and sharing across multiple learning scenarios.

Privacy Model in PLE

Based on the different types of PLEs and their specific privacy issues, we propose the PLE privacy model to conceptualise privacy on different levels. Figure 1 summarises the main factors that have impact on privacy in PLEs. The model includes two levels of privacy control – learner-driven and institution-driven privacy control. Learner-driven privacy control is especially relevant in Web 2.0 and Social Media PLEs as well as in mobile PLEs, which are usually applied to support informal learning. Informal learning with PLEs gives more flexibility to learners to organise and control their private data. At the same time, learners in informal learning context are at a higher risk of disclose and misuse of private data, such as using default privacy setting in registration to Social Media, posting risqué pictures or excessive sharing of own and other users private data. In contrast to that, institutional PLEs limit learners possibility to control their privacy, but at the same time protect learners from inappropriate usage of their private data, e.g. by introducing certain regulations, such as Social Media Guidelines or keeping private

data locked in an LMS, and more recently the EU citizens call to take control of their personal data by the EU General Data Protection Regulation (GDPR) that also includes, among others, individuals' rights to access the own data (European Union, 2018). In the centre of the model, ePortfolio-based and Open-Badges-driven PLEs connect informal learning and formal learning contexts and require a both learners and institutions to apply common data privacy principles. An important question here is related to the connections between data privacy in formal and informal learning contexts and in data permeability.

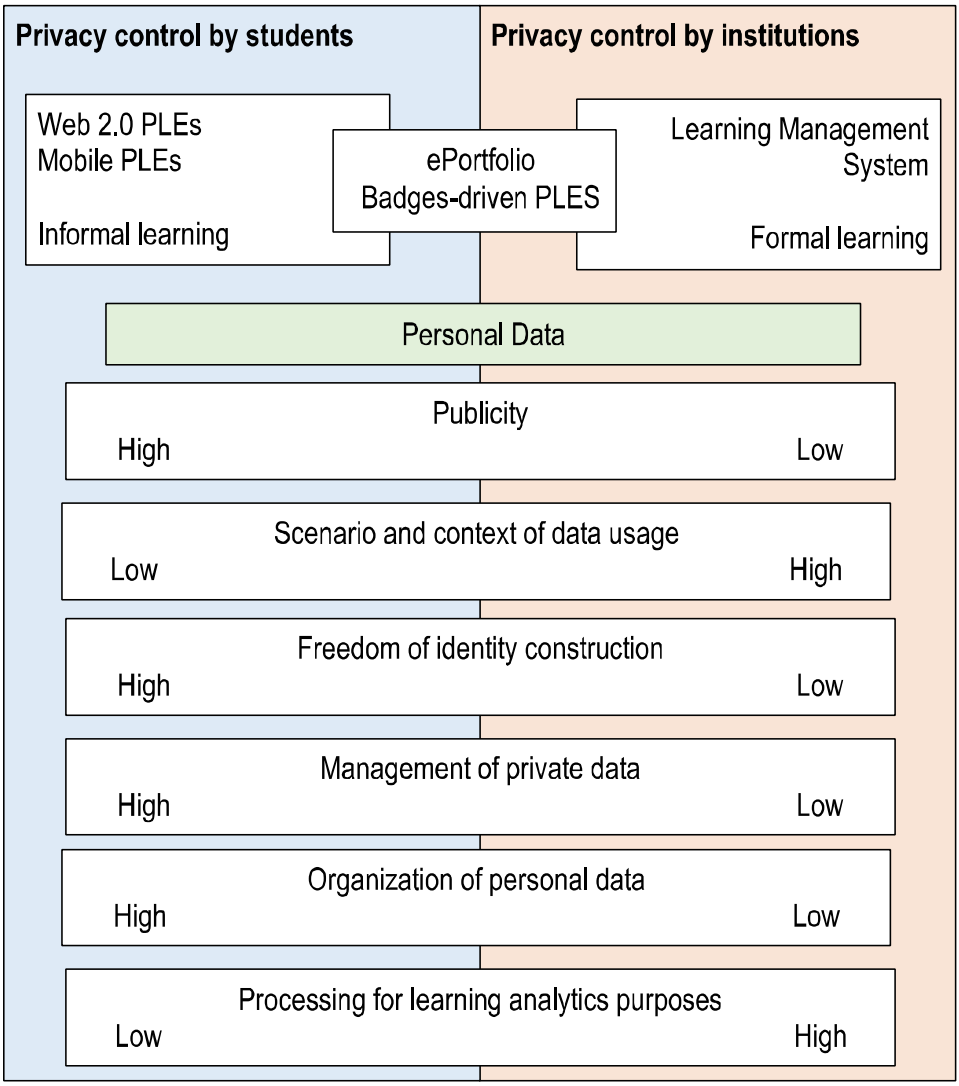

Figure 1. The PLE Privacy Model

The proposed PLE privacy model shows that the data privacy could be controlled more or less by students as well as by the training institutions. The main factors that reflect on the data privacy are extracted from the above described PLEs different implementations and they can be explained using a scale from low to high. The meaning of the factors is summarized as follows:

- Publicity: Publicity in PLEs means how much information is shared by students and universities and it is available for public usage outside the purposes of the educational process. It can be seen that Web 2.0 and mobile PLEs are characterized with high publicity, because of the nature of the web and mobile applications which usage drives students to generate content – sharing information, communicating is social networks, annotating, etc. In contrast, when the personal learning process is organized in LMS, the shared information is closed in the training institution and the publicity is low.
- Scenario and context of data usage: PLEs organized in the web utilizes learning scenarios consisting of learning in open groups of interests, learning in community of practices, learning in social networks that leads to the low level of privacy and usually it is a self-directed learning. PLEs that are part of the formal learning space are more closed just to the pointed learning groups by an educator and the PLEs are used in support of formal learning in well-defined educational scenarios according to a given course curriculum.
- Freedom of the identity construction: The possibility for students' identity construction is higher in the PLEs which purpose is to facilitate informal learning, because the students have freedom to prepare their own profile according to the specific learning interests and used tools/applications/services. This possibility is lower in the institutional PLEs, because the students' identity is forming from their participation and achieved results during given classes.
- Management of private data. The private data are with high possibility for management in Web 2.0 and mobile PLEs where students decide how to arrange the personal information. In university PLEs such freedom of private data management is not allowed, because of the strongly regulated principles and rules of the institutional learning environment.
- Organization of personal data: What kind of personal data will be hidden, shared or stored, kept or deleted, it depends of the students' understanding and this data organization is controlled by students. In the university settings the organization of personal data is low controlled by students, this process is typical for educators.

- Processing for learning analytics purposes: The control on the personal data usage for the purposes of learning analytics is low in web-based and mobile PLEs, because the students' data are utilized in many cases without their permission. In contrast of that, the training institutions have policies for personal data delivery to the third parties or applications where such data are analysed.

Conclusions

This paper provides an overview of existing PLE types in the context of data privacy to reveal several problems related to data privacy. The model summarizes the current situation of personal data usage in PLEs and could be used in the form of a recommendation tool explaining the possibilities for personal data sharing, organization and management and the influence of this fact on the data privacy. As learners need more tools to organise and control private data, there is a need for more research related to data privacy in Personal Learning Environments and safe and critical usages by learners. One of the key directions in this emerging research may be the question of effective mechanisms and digital competence for a responsible use and sharing of own and others private data in different media, learning systems, services and applications to enhance self-regulated learning in the context of growing diversity in higher education and to empower lifelong learners through personal safety skills and data literacy.

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Framework for Digitally Mature Schools

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Abstract

Rapid diffusion of Information and Communication Technologies (ICT) in all professional and personal areas require digital maturity from schools. In order to assess this aspect of school, a concept of digitally mature school has been developed and translated into different frameworks. In this paper, we describe development methodology of Framework for Digitally Mature Schools (FDMS) in Croatia. The FDMS, together with the accompanying instrument and software, represents a unique and comprehensive tool set for the assessment of digital maturity of a school. The FDMS recognized five areas divided into 38 elements that are described on five digital maturity levels in the form of a rubric.

Introduction

A concept of digitally mature schools is increasingly becoming significant within the modern educational system due to the growing importance of Information and Communication Technologies (ICT) in education. The European Commission has recognized the significance of this concept and, through its policies, encourages the development of digitally mature schools. We described digitally mature schools as schools with a high level of integration of ICT and systematized approach to ICT use in school management and in their educational processes. The use of ICT in schools is no longer a matter of individual enthusiasm, but a systemic approach planned and implemented at the level of school in accordance with local and state policies (e-Schools). The Framework for Digitally Mature Schools is therefore needed to enable the identification of areas and elements that contribute to the digital maturity as well as for planning of possible progress in the integration and use of digital technologies.

There are several frameworks designed regarding the digital maturity of educational institutions (Table 1). However, based on the performed qualitative analysis of these frameworks we conclude that neither of them provides a comprehensive concept which could be used as the basis for the establishment of a digitally mature schooling system. There is no concept that would encompass framework, the instrument for evaluation nor a software supporting implementation.

Based on the analysis of the existing frameworks and in line with the goals of e-Schools project in Croatia ("e-Schools: Establishing a System for Developing Digitally Mature Schools (pilot project)" funded by the ESF and ERDF), we developed a comprehensive Framework for Digitally Mature Schools (FDMS), instrument for self-evaluation and external evaluation of schools, as well as the software supporting FDMS implementation. The FDMS consists of five evaluation areas and five levels of digital maturity and it is in line with the generic European Framework for Digitally Competent Educational Organizations (DigCompOrg). In accordance with the FDMS, the instrument for evaluation of the digital maturity of schools was prepared. The self-evaluation and external evaluation of 151 schools in Croatia was performed according to the mentioned instrument and online software. The purpose of evaluation was to determine the initial level of the digital maturity of each school included in pilot project. This was necessary in order to enable the monitoring of their progress and the planning of the most suitable means of support for schools.

Finally, in this paper, we present the methodology used in developing the Framework for Digitally Mature Schools (FDMS), as well as the FDMS itself. The methodology will not be presented in detail due to the page limit.

Objectives of the research

The overall objectives of the research within e-Schools project related to the FDMS are:

- to review the existing findings on maturity of schools, to propose main areas and elements, to describe digital maturity of schools and to build a comprehensive framework for assessment of digital maturity of schools;
- to develop a framework for evaluation of digital maturity of schools for Croatian educational context;
- to develop the Instrument (in form of a rubric and accompanying questionnaire) for self-evaluation and external evaluation of schools in order to be able to determine the digital maturity level for each school;
- to assess the level of digital maturity of schools in Croatia with self-evaluation and external evaluation using the developed instrument;
- to perform in-depth analysis of maturity levels of all schools included in the research, as well as to monitor their progress and plan the means of support within e-Schools project.

The specific objectives of this paper are:

- to briefly present methodology used in developing the Framework for Digitally Mature Schools (FDMS);
- to present developed FDMS based on theoretical findings and survey results.

Analysis of Digital Maturity Frameworks

In the scope of our research the qualitative analysis of 15 digital maturity frameworks was performed. The following Frameworks were analysed:

1. Assessing the e-Maturity of your School (Ae-MoYS);
2. DigCompOrg (DigCompOrg);
3. eLearning Roadmap (eLearning Roadmap);
4. eLemer (eLemer);
5. The ePortfolios & Open Badges Maturity Matrix (ePOBMM);
6. Future Classroom Maturity Model (FCMM);
7. HEInnovative (HEInnovative);
8. Jisc Strategic ICT Toolkit (JISC);
9. Ledning, Infrastruktur, Kompetens, Användning (LIKA);
10. Microsoft Innovation Framework & self-reflection tool (MICROSOFT IF & SRT);
11. NACCE SRF (NACCE SRF);
12. OPEKA (OPEKA);
13. Up-scaling Creative Classrooms in Europe (SCALE CCR);
14. SCHOOL MENTOR (SCHOOL MENTOR);
15. VENSTRESS (VENSTRESS).

Within the analysis, a special attention was paid to the following elements: implemented development approach, application area, sensibility to beginning and/or advanced levels, the existence of accompanying framework, instruments for evaluating the maturity level and for the supporting software and best practice examples. An overview of the frameworks analysed in this research is shown in Table 1. The analysis revealed two frameworks/toolkits (DigCompOrg and eLearning Roadmap) that, due to their characteristics, best describe the comprehensive field of digital maturity of schools. However, further modifications and adjustments are needed for both frameworks on grounds of two major reasons: (a) to adjust the framework to the local (Croatian)

context (also required and suggested by the DigCompOrg framework), (b) to update outdated elements (due to fact that the second identified framework/tool – eLearning Roadmap is outdated).

Table 1: Overview of frameworks analysis

Name	Framework /Instrument	Level	Approach	Application area	Best practice
Ae-MoYS	Framework and online self-evaluation questionnaire	Elementary	Qualitative Quantitative	Elementary and high-school	EU
DigCompOrg	Framework	Advanced	Qualitative	Elementary and high-school, HEI	World
eLearning Roadmap	Framework and matrix	Advanced	Qualitative	Elementary and high-school	Ireland
eLEMER	Framework and online self-evaluation questionnaire	Advanced	Qualitative Quantitative	Elementary and high-school	Hungary
ePOBMM	Framework and matrix	Advanced	Qualitative	Mostly HEI	EU
FCMM	Framework and online self-evaluation questionnaire	Advanced	Qualitative	Elementary and high-school	EU
HEInnovative	Framework and online self-evaluation questionnaire	Elementary	Qualitative	HEI	World
JISC	Framework and online self-evaluation questionnaire	Advanced	Qualitative Quantitative	HEI	EU
LIKA	Framework and online self-evaluation questionnaire	Elementary	Qualitative	Elementary and high-school	Sweden
Microsoft Framework	Framework and online self-evaluation questionnaire	Advanced	Qualitative Quantitative	Elementary and high-school	World
NACCE SRF	Framework and online self-evaluation questionnaire	Elementary	Qualitative Quantitative	Kindergartens, elementary and high-school	United Kingdom
OPEKA	Framework and online self-evaluation questionnaire	Advanced	Qualitative Quantitative	Elementary and high-school	Finland

SCALE CCR	Framework	Beginning	Qualitative	Elementary and high-school	Europe
SCHOOL MENTOR	Framework and online self-evaluation questionnaire	Advanced	Qualitative Quantitative	Elementary and high-school	Norway
VENSTRESS	Online self-evaluation questionnaire	Beginning	Qualitative	Elementary and high-school	Netherlands

Research methodology

The Framework for Digital Maturity of Schools (FDMS) was being developed in the period from October 2015 to June 2016 within the framework of e-Schools project by FOI (Faculty of Organization and Informatics, University of Zagreb) and CARNet (Croatian Academic and Research Network) experts. The methodological approach we used for the development of the FDMS was for the most part qualitative. It was based on the comprehensive review of academic and grey literature, a pool of the existing frameworks, meta-analysis of selected frameworks and a number of stakeholders' consultations.

First phase

In the first phase, we have done a comprehensive qualitative analysis of 15 frameworks for the digital maturity with focus on digital technologies or some forms of digital maturity in different sectors (Section 3). Based on the results of the analysis two frameworks have been selected to form the basis for the creation of the FDMS: (a) DigCompOrg, the framework developed by the European Commission for the digitally competent educational institutions, and (b) the eLearning Roadmap tool which is very successfully used for the purpose of certification of digitally mature schools in Ireland. However, these frameworks did not cover the entire concept needed to support building of the FDMS. Roadmap is not a framework but a tool which mostly covers e-Learning. Therefore, it enables schools only to test the current level of their e-Learning maturity. Namely, the digital maturity is a broader concept than e-Learning maturity. Further, it is adjusted solely to the Irish educational system which influences its applicability in Croatia or any other country. DigCompOrg is a framework for digitally competent educational institutions and includes all the main areas of digitally competent educational institutions. Additionally, it represents a very complex and comprehensive framework that can be the basis for the assessment of all educational systems. In the development of our Framework, DigCompOrg served as a generic framework.

However, its elements within the main areas were reduced and modified in order to correspond to the context of elementary and high-schools in Croatia. The described analysis was based on expert knowledge and experience. Table 2 shows the mapping of the basic dimensions of two above-mentioned frameworks on the newly created FDMS. The result of the first phase was the first version of the Framework, developed by using qualitative analysis of 15 Frameworks with focus on two indicated European models. It was followed by several demanding cycles of confirmation and revision using expert knowledge.

Table 2: Mapping of the FDMS to existing frameworks

Croatian framework	DigCompOrg Thematic Elements	eLearning Roadmap Constructs
Planning, management and leadership	Leadership and governance practices	Leadership and planning
ICT in learning and teaching	Teaching and learning practices Assessment practices Content and curricula	ICT and curriculum
Development of digital competences	Professional development	Professional development
ICT culture	Cooperation and networking	E-learning culture
ICT infrastructure	Infrastructure	ICT infrastructure

Second phase

In the second phase of the framework development, we applied sorting cards (Q-sorting) method and two focus groups analysis as tools for defining new framework areas and their elements as well as descriptors related to the levels. Ten experts that participated in the card sorting method covered the areas of digital technologies, their application in the educational system, strategic planning and similar. The suggested pool of elements in the Q-sorting method was created on the results of the DigCompOrg analysis and on the conclusions of two focus groups performed with more than 60 principals and teachers. The new elements included in the Framework are: Assessment, Learning Analytics (LA), Content repository and licensing, Learning spaces and E-inclusion. At that stage, it was decided to base the framework on five maturity levels and to present it in a form of a rubric. Namely, the rubric enables mapping of the achievement against explicit assessment criteria. However, it is important to describe the criteria as clearly as possible.

Third phase

In the third development phase, the experts who developed the framework now determined the descriptors for all levels in rubrics form. A research was conducted, using a questionnaire, on about 70 examinees who had to prioritize the areas and elements and list new ones if they considered necessary. There were also semi-structured interviews with the representatives of school founders, ministry, school principals and digital technology experts. The participants were asked to assess the implementation of digital technology in school in order to confirm and improve the proposed areas, elements and descriptors in the FDMS. It is important to mention that, in this phase, the specificities of the Croatian system were built into the developed FDMS and Instrument. With this, the procedure of defining areas, framework elements and descriptors for all the elements on all levels was completed.

Fourth phase

Based on the FDMS, the fourth development phase resulted with the rubric (maturity matrix) for each domain with 5 maturity levels, 5 areas and 38 elements. We used mathematical (propositional) logic with logical operations and quantifiers to clearly connect statements and accurately describe maturity levels. However, since the pilot group of respondents found challenging to work with the rubrics directly, it was decided to convert the rubrics into questionnaire items. In order to map the questionnaire items into the rubrics, the use of mathematical logic proved to be valuable. In order to determine the overall maturity level of a school, Taxicab metric was used.

Fifth phase

In the fifth development phase, there were several consecutive iterations of improving the Framework and descriptor elements, the rubrics, as well as the questionnaire items (in the Instrument) with help of experts from CARNet, principals of several Croatian schools and the representatives of school founders. This resulted with the final version of the FDMS and with the Instrument that was further implemented in form of an online software. The Instrument was further validated on a sample of 151 schools in Croatia where evaluation of digital maturity was conducted.

Framework for Digitally Mature Schools

The Framework for Digitally Mature Schools (FDMS) defines the areas and levels of the digital maturity of schools. The methodology used in developing the FDMS was presented in Section 4. The schools can use the FDMS as a guide when planning and integrating the ICT in learning and teaching, as well as in their management processes.

The policy creators and the decision-makers in the educational system can exploit the FDMS for the development of policies and initiatives aiming at successful integration of the ICT into the educational system. The FDMS consists of five areas and five levels of digital maturity of schools. Table 3 presents the areas and elements of the digital maturity of schools within the FDMS (e-Schools, Begicevic Redjep, 2016). Each area consists of a larger number of elements which have been described for each maturity level. In Table 4 Rubric for the element "Vision, strategic guidelines and objectives of ICT integration" is shown to illustrate the approach.

Table 3: Areas and elements of the FDMS

Area	Elements	Area	Elements
Planning, management and leadership	Vision, strategic guidelines and objectives of ICT integration	ICT culture	Access to ICT resources by educational staff (teachers)
	Plan and programme of school development from ICT perspective		Access to ICT resources by students
	Managing the integration of ICT in learning and teaching		Network presence
	Managing the integration of ICT the school's business activities		Communication, information and reporting
	Learning analytics (LA)		Netiquette
	Regulated access to ICT resources		Copyright and intellectual property
	Use of ICT in teaching students with special educational needs		Projects
ICT in learning and teaching	Awareness	ICT infrastructure	Planning and procurement
	Planning		Network infrastructure
	Use		ICT equipment in the school
	Digital content		ICT equipment for educational staff (teachers)
	Evaluation of students		Programme tools in schools
	Students' experience		Technical support
	Special educational needs		Equipment maintenance

					Central repository of digital documents and educational content Information security system Licensing control
Development of digital competences	Awareness and participation Planning Purpose of professional training Self-confidence in the use of ICT Digital competences of students Special educational needs Informal learning				

Table 4: Rubric for the element "Vision, strategic guidelines and objectives of ICT integration"

	Basic	Initial	e-Enabled	e-Confident	e-Mature
Vision, strategic guidelines and objectives of ICT integration	In the school documents, general vision and strategic guidelines for school development are not defined. The ICT integration in learning and teaching processes as well as in school management processes is not included in the general vision and/or strategic guidelines for the school development. Long-term objectives of the ICT	In the school documents, general vision and strategic guidelines for school development are defined. However, the ICT integration in learning and teaching processes as well as in school management processes is not included in the general vision and/or in the strategic guidelines for the school development. Long-term objectives of	In the school documents, general vision and strategic guidelines for school development are defined. This includes the ICT integration in learning and teaching processes as well as in school management processes. Long-term objectives of the ICT implementation are partially defined in the school documents.	In the school documents, general vision and strategic guidelines for school development are defined. ICT integration into learning and teaching processes and school management processes is defined as a separate vision in strategic guidelines. Long-term objectives of the ICT implementation are defined. However, there is no	In the school documents, a general vision and strategic guidelines for school development are defined. ICT integration into learning and teaching processes and school management processes is defined as a separate vision in strategic guidelines. Long-term objectives of the ICT implementation are defined. The school board

	implementation are not defined.	the ICT implementation are not defined.	periodic evaluation of effects of the defined long-term ICT implementation objectives.	periodically evaluates the effects of the defined long-term ICT implementation objectives.

Below, there are brief descriptions of each maturity level. The descriptors indicate the characteristics of a typical school on a particular level of digital maturity. A specific school may differ in some aspects from a typical representative for a particular level. In the process of self-evaluation and external evaluation, each school receives the feedback based on their characteristics and regarding the assessed maturity level.

Level 1: Basic

The school is not aware of the possibility of using ICT in learning and teaching nor in management processes. Therefore, the school does not take the ICT into consideration in planning its growth and development. The ICT is not used in learning and teaching. The educational staff (teachers) do not develop their digital competences. The online communication with school is generally not possible. The ICT infrastructure has not been provided yet and the computers are used only in few classrooms in the school.

Level 2: Initial

There is awareness of the possibility to use ICT in learning and teaching and in management processes, but it has not yet been implemented. A small number of teachers use ICT in learning and teaching. There is awareness of the need to enhance the digital competences of teachers and students. However, the system for the professional development of digital competences still does not exist. The school is still inactive in the online environment and access to their own ICT resources is limited. The ICT infrastructure is generally undeveloped and computers with Internet access are available only in few classrooms in the school.

Level 3: e-Enabled

The school is aware of the possibility to use ICT in all its activities, guides the development of its strategic documents and integration of ICT into these documents. The ICT is used for working with students with special educational needs. The teachers advance their digital competences, develop digital content and start introducing innovative teaching methods. The school participates in small ICT focused projects. The access to different ICT resources is provided in most classrooms. A special attention is

given to equipment maintenance and to controlling software licensing. The school is active online, in terms of content presentation and communication.

Level 4: e-Confident

The school recognizes the advantages of ICT usage in its activities very clearly and integrates the ICT implementation into strategic documents, as well as in everyday activities. The teachers use ICT for advanced teaching and assessment methods, as well as develop their own content and protect it by copyright. There is also a shared repository of content which can be used by teachers and students. The continuous professional training of teachers for the purpose of acquiring digital competences is planned and performed. Students are encouraged to develop those competences. Access to different ICT resources is provided in most classrooms, whereas the procurement and maintenance of the ICT resources is planned. The school is active with respect to ICT projects. The school is also very active online in terms of content presentation and communication. Software licensing is controlled and the security aspects of ICT use are taken into consideration.

Level 5: e-Mature

In its strategic documents and development plans, the school very clearly recognizes and requires the use of ICT in all activities. The management practice relies on the integration and obtaining the data from all school information systems. The approach to enhance digital competences of teachers and students is systematic, professional training for the teachers and additional course activities for the students are available. The teachers use ICT within advanced teaching methods, for the development of new course content and for the assessment of student accomplishments. Teachers and students regularly protect digital content by copyright. There is also a shared repository of content available for use by teachers and students. Access to ICT resources from own devices is provided in all classrooms and other rooms in the school. The school independently plans and acquires ICT resources which are available in nearly all classrooms and other rooms in the school. The entire school has a developed network infrastructure. An information security system was developed and software licensing is systematically controlled and planned. The school is characterized by varied ICT project activities, cooperation between teachers and students, as well as between other schools and stakeholders. This is done through the use of online communication tools and e-services.

Conclusion

The Framework for Digitally Mature Schools (FDMS), the accompanying Instrument for evaluation of the digitally mature schools and the supporting software developed in the scope of the e-Schools project represent a unique and comprehensive tool set created according to sound research methodology. The FDMS identifies five areas organized as a rubric with 38 elements, each described on five levels of maturity. Due to their generic characteristics, the FDMS and the Instrument can be applied in other educational systems and countries with minor adjustments. The Instrument can be used as a tool to evaluate the school's digital maturity level but also for the identification of the areas for improvement that could enable the growth on the scale of digital maturity and improve the overall reputation and school results. The FDMS, the Instrument and the accompanying software have been already successfully applied in the process of self-evaluation and external evaluation of 151 schools in Croatia. The significant feedback for improvement of the FDMS and of the Instrument was collected in this validation process. The evaluation of further 1400 elementary and high-schools in Croatia is planned for 2017.

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Enhancing Understanding, Flow and Self-Efficacy in Learners with Developmental and Attention Difficulties through ICT-based Interventions

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Abstract

The purpose of this paper is to investigate in which ways technologies may be used to increase inclusion and a feeling of flow and self-efficacy in learning processes when it comes to learners with developmental and attention deficits (focus learners) in a mainstream classroom. The paper is one piece of outcome of a wider study on ICT facilitated inclusion, and this current piece of research addresses the challenges of enhancing focus learners' comprehension when working with the curriculum. Several technologies have been tried out in a real school context and seven types of interventions are identified as valuable for focus learners' capability in learning processes. The paper discusses the findings and concludes that conscious use of technology-based interventions makes it possible to provide learning challenges balanced to the learners' individual skills. But a broader understanding and acceptance by all stakeholders of the specific challenges of this group of learners in mainstream educational systems seems needed to fulfil the potential.

Abstract in Danish

Formålet med denne artikel er at undersøge, hvorledes teknologier kan anvendes i det almene skolesystem som redskab for inklusion af elever med udviklings- og opmærksomhedsproblemer (fokuselever) og styrke elevernes oplevelse af flow og tiltro til egne evner (self-efficacy) i læreprocesser. Undersøgelsen er en del af et større studie om it-faciliteret inklusion, hvor denne artikel handler om udfordringer i forhold til at øge fokuselevernes forståelse for det faglige indhold. Adskillige teknologier har været afprøvet i en reel skolekontekst, og syv typer af interventioner er identificeret som værdifulde for fokuselevernes kapabilitet i læreprocesser. Artiklen diskuterer resultaterne og konkluderer, at bevidst brug af it-baserede interventioner gør det muligt at tilbyde læringsudfordringer

tilpasset elevernes aktuelle faglige og kompetencemæssige niveau. Men det synes nødvendigt med en bredere forståelse og accept hos alle interessenter for denne gruppe elevers specifikke udfordringer i det almene undervisningssystem, hvis dette potentiale skal realiseres.

Keywords: inclusion, ICT, special education, attention deficits, learning, differentiation

Introduction

Inclusion of learners with special educational needs (SEN) in mainstream schools appears an ambitious item in the educational-political agenda in Denmark, where bewilderment and frustration are common phenomena among teachers facing the challenge of teaching SEN learners (Baviskar, 2015). In general, teachers find themselves neither possessing the required specialized pedagogical knowledge and competencies to include youngsters with developmental and attention deficits (Danmarks Evalueringsinstitut, 2011) – nor the sufficient technological skills to utilise the affordances of digital learning resources for this group of learners (Andersen & Sorensen, 2016a). Learners with Developmental and Attention Deficits (also named *focus learners*) form a broad and inhomogeneous group of children, who are challenged with respect to both life and learning. The term *focus learners* includes learners with Attention Deficit Hyperactivity Disorder (ADHD), Attention Deficit Disorder (ADD) or Autism Spectrum Disorder (ASD). To enable inclusion in terms of increasing presence, participation and achievements for focus learners, it is crucial that teachers have knowledge about these learners' specific challenges and competences: "In order truly to help someone else, I must understand more than he – but certainly first and foremost understand what he understands. If I do not do that, then my greater understanding does not help him at all" (Kierkegaard, 1859). Likewise, teachers must be able and willing to arrange learning environments, which take this knowledge into account: "If One Is Truly to Succeed in Leading a person to a Specific Place, One must First and Foremost Take Care to Find Him Where He Is and Begin There" (ibid.).

Children diagnosed with ASD often demonstrate restricted communication and social skills as well as a reduced repertoire of behaviours, interests or activities (Cihak et al., 2012). They might be unable to communicate their needs in an appropriate way or might engage in disruptive behaviours (ibid.), and their learning experiences will often be affected from echolalia, disorganisation, inattentiveness or stereotypic behaviours (Delano, 2007). Learners with ADD or ADHD are affected by the core symptoms of the diagnosis: attention difficulties and/or hyperactivity and impulsivity (Barkley, 2006). The problems include poor attention span, distractibility and difficulty staying on task,

which impact their ability to manage time, to keep deadlines, to plan/organize schoolwork or to make friends. The symptoms are very sensitive to situation and context, the situated demands and the level of cognitive complexity in a task (ibid.). Low working memory often pose a barrier as it is necessary for controlling attention in complex cognitive processes such as learning, understanding and reasoning (de la Guía et al., 2015). Focus learners often lack self-regulation, which is why they master skills at a lower level than their peers. They often experience themselves unable to cope with demanding situations and feel incompetent about their performance. According to (Barkley, 2006) children with ADHD generally have low self-esteem and may easily be frustrated. That is why teachers must be aware to construct learning opportunities, which motivate these learners and encourage them to participate despite their problems.

Theoretical Approach

In Denmark focus learners with low self-esteem and lower skills are included in the mainstream education system without – or with limited – special educational support. They are taught in mainstream classes by mainstream teachers, who are searching for new ways to engage the focus learners and help them to enhance their feeling of flow (Csikszentmihalyi, 2014) and self-efficacy (Bandura, 1997) in task solving processes and their learning outcome. According to Flow Theory (Csikszentmihalyi, 2014), it is necessary to ensure an appropriate balance between a person's ability to do something and the challenge at hand to attain a feeling of satisfaction and inner motivation in a process. Flow can be experienced in situations, where a task is both challenging and shaped to the focus learner's skills, while an unbalance between challenge and ability triggers anxiety, worry, apathy or boredom as illustrated in Figure 1.

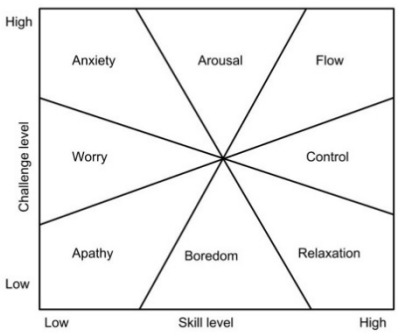

Figure 1. Flow illustrated as a harmonic balance between challenge and ability

Furthermore, a learner's belief in his or her ability to succeed in a situation or accomplish with a task (self-efficacy), also affects the learners' approach to tasks and challenges. Bandura's (1997) social cognitive theory describes how individual's actions and reactions are influenced by actions, which they have observed in others, and how persons with high self-efficacy are more likely to see challenging tasks as something to be mastered, rather than something to be avoided. In other words, if you are to change focus learners' behaviour, you must change their beliefs. Schaffer (2013) states with his research that flow only appears during the following conditions:

1. high perceived skills;
2. knowing what to do;
3. knowing how to do it;
4. knowing how well you are doing;
5. knowing where to go (if navigation is involved);
6. freedom from distractions and
7. high perceived challenges.

Technology today is a natural part of people's life and impact many aspects of education, training and development. Education is a human right, and disabled people should receive appropriate support. Assistive technologies (AT) are seen as solutions for providing this support and remove barriers in education (McKnight & Davies, 2012). They are internationally recognised as "a particular valuable tool for people with disabilities… [in order to] … improve their quality of life, reduce social inclusion and increase participation" (Waller & Watkins, 2013). A large number of assistive learning technologies have been investigated (ibid.), but "there is perhaps a tendency for research to focus on the technology rather than its uses" (McKnight & Davies, 2012). This counts for e.g. development of technological tools (Bul et al., 2015), comparing tools (Hill & Flores, 2014) or evaluating the value of a function under specific circumstances (Kang et al., 2007). Furthermore, most literature on AT for the focus learners examines technologies used in therapy by psychologists (de la Guía et al., 2015) or by special educational teachers in special educational schools (Cihak et al., 2012). Therefore, the authors of this paper call for investigations of the use of AT in the mainstream classroom. This paper examines how ordinary teachers have used AT to help focus learners to a more constructive meeting with the learning content and, thus, experience a feeling of flow and self-efficacy in learning activities in mainstream classes.

Research Contexts and Design

Research Question

This paper is an outcome from a wider research project, ididakt, running 2013-2016 (Sorensen, Andersen, & Grum, 2013). The project has "tested digital learning resources and developed ICT-based pedagogies, where the possibilities for structuring working processes and stabilize focus in classroom activities are enhanced for children with developmental and attention deficits" (Ministeriet for Børn og Undervisning, 2012). The project has been focusing on "barriers and possibilities, when ICT-tool were used to create including learning environments for learners with developmental and attention deficits in mainstream classes in public schools" (ibid.).

The overall research questions were chosen in order to generate an understanding of both what, how and why:

- In which ways are focus learners challenged when participating and contributing academically and socially in the classroom? What are their specific needs?
- In which ways are teachers challenged when including focus learners in their classroom teaching? What are their specific needs?
- Which technologies could be implemented in the classroom activities, and in which ways would they be helpful to the focus learners? How would they fit into the learning environment?
- Which challenges occur, when implementing technologies in the classroom?
- Which support is needed, when implementing technologies in the classroom?

In order to answer these questions, the research design contains two concurrent research processes:

1. A Participatory Action Research Process – where schools and teachers are encouraged and prepared to use new pedagogical strategies and new technologies in the classroom activities and supported to develop their own practice while sharing their experiences with the researchers.
2. An Empirical Investigation Process – where data are collected, gathered, analysed and simultaneously used to both document the results of the study and inform the development processes at the participating schools.

A five-type-model of including ICT-based interventions is identified and described in earlier work from the ididakt project (Andersen & Sorensen, 2015; Andersen & Sorensen, 2017). This model is presented in Figure 2.

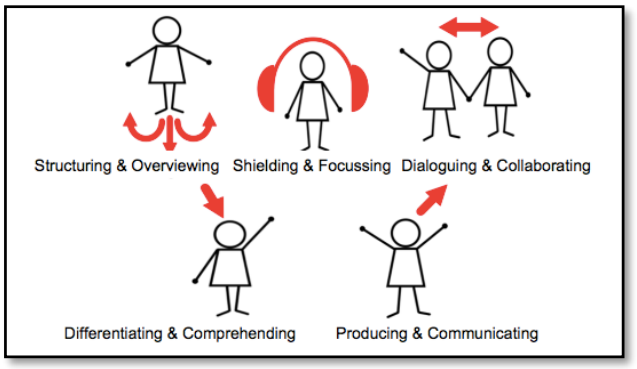

Figure 2. A five-type-typology for ICT-based interventions

The intervention types are presented and discussed in separate research papers:

- *Structuring & Overviewing* (Andersen & Sorensen, 2016b; Sorensen & Andersen, 2016a);
- *Shielding & Focussing* (Andersen, 2015);
- *Producing & Communicating* (Sorensen & Andersen, 2017) and
- *Dialoguing & Collaborating* (Sorensen & Andersen, 2016b).

This present paper frames the investigations of enhanced *Differentiating & Comprehending* through ICT-based interventions in the classroom.

Research Methodology

Ididakt is an iterative and explorative research project, where data are collected in a real school context at public schools in Denmark. The study is mainly qualitative, but inspired by a mixed methods approach in the frame of Educational Design Research (EDR) (McKenney & Reeves, 2012) with a hermeneutic-phenomenological interpretation of data. EDR is a "genre of research in which the iterative development of solutions to practical and complex educational problems also provides the context for empirical investigations, which yield theoretical understanding that can inform the work of others" (ibid.; p.7). EDR is not a fixed method. It is a genre, where multiple approaches can be combined considering the different initiating problems, research questions and contexts. EDR portrays a process, which can be described as a complex

and multi-faceted endeavour, defined by being theoretical oriented, interventionistic, collaborative, responsively grounded and iterative (ibid).

Mixing methods in EDR provides an opportunity to generate ecologically valid, relevant and robust knowledge, where methods, materials and settings for the study are closely related to real life situations (Brewer, 2000). The aim of an EDR study is to generate usable knowledge for researchers as well as practitioners. Since EDR is conducted in real life settings and data are developed in classrooms or other learning environments, the research design has to embrace a very complex system with many different participants, interactions and influencing factors. Multiple methods and methodological creativity seem crucial to capture the complexity. Different research questions and different research purposes also advocate for using a repertoire of different approaches.

As described above, there is no fixed receipt to follow, when conducting a mixed method study in the frame of EDR. But it is not the same as "anything goes" (Greene, 2007). Mixed methods research is defined as "research in which the investigator collects and analyses data, integrates the findings, and draw inferences using both qualitative and quantitative approaches in a single study or program of inquiry" (Teddlie & Tashakkori, 2006; p.15). Greene (2007) challenges and extends this definition, as she seeks space for more than qualitative and quantitative traditions and calls for multiple different paradigms and methodological traditions. She perceives a strong link between intended purpose for mixing and the mixed methods design decisions. She states that methods are always implemented from within a particular assumptive framework, why self-conscious attention on this is needed. Such inquiry mixes theories, disciplines and methods, but try very carefully to handle all of them humbly respecting their different characteristics and underlying understandings of the social world and the knowledge we can have on this social world (ibid.).

Research context

The ididakt project is realized as a learning endeavour, where the authors/researchers have been professional dialog partners and facilitators in transformations processes at 11 schools, where they in collaboration with 46 teachers have examined the impacts of using ICT facilitated interventions in 26 classes. More than 500 learners from 1st to 10th grade (age 6-16 years) were included in the project – among them 56 focus learners with extensive developmental or attention deficit disorders. These 56 focus learners do not necessarily have a diagnose, but they are all described by their teachers as children who "breaks with age appropriate rules, norms and expectations to children in basic schools

with a regular character over time" (Nordahl, Mausethagen, & Kostøl, 2009; Dyssegaard, Larsen, & Tiftikçi, 2013) and challenged in the field of ADHD, ADD or ASF in areas of:

- memory;
- attention;
- persistence;
- hyperactivity;
- impulsivity;
- behaviour;
- emotions;
- prosocial behaviour;
- having friends;
- understanding and conception;
- language and communication.

The 56 focus learners in the project are described with a test battery of both quantitative and qualitative tools, where the teachers have answered a number of questions according to the children's behaviour, well-being, academically outcome, working methods, social role etc. in the HOV-survey (Jensen de López, 2013), the SDQ – Strength and Difficulties Questionnaire (Obel et al., 2009), the ADHD-RS (Poulsen et al., 2009) and in a narrative template with descriptions on respectively a good and a bad day at school. The data from the screening has been used to:

1. Validate the relevance of the focus learners for the project;
2. Guide the teachers to choose pedagogical and technological interventions targeted the individual focus learners;
3. Indicate a progress by the focus learners during the intervention period (Andersen et al, 2016).

Research Design

In the Participatory Action Research (PAR) processes are the "researchers in close contact with 'practitioners' within a given field make analyses and experiments in the field and contributes with solutions to the social objectives being studied" (Brinkmann & Tanggaard, 2015). "It is crucial for our data collection, that the unfolding research process goes hand in hand with the involved teachers' work and interventions into the field of study, so the process becomes a learning endeavour in terms of learning how to work with SEN learners and integrating ICT in the classroom." (Andersen & Sorensen, 2015) The research design includes both perspectives: "Real change can come, when we

focus not only on what and how things can be done, but when we also work on understand why" (McKenney & Reeves, 2012; pp.1–2).

The researchers contribute with theoretical knowledge and understandings about inclusion, learning and technology. They participate as a professional dialogue partner in the transformation processes occurring at the schools (Jungk & Müllert, 1989; Duus et al., 2012) and assist the teachers in their development of practice, while learning from their experiences (Sagor, 2000). The requirement to the researcher is to study the movements, but also initiate the actions, which generate learning in the field into a given objective (Duus et al., 2012; p.83).

The teachers are involved as co-researchers, where their active participation and actions are based on their own perceptions on problems in their local context, which might both enhance their understanding of the objectives, and generate ownership and empowerment (Freire, 1970). The tasks for researchers and teachers are listed in Table 1.

Table 1: Researchers' and Participants' roles and deliveries in Participatory Action Research (Duus et al., 2012)

Level of effort	The participant's task: Develop practice	Shared tasks: Collaborate, plan and manage	The researcher's tasks: Running the business
Basis level	Deliver data Co-produce new knowledge Test new knowledge Transform knowledge into practice	Articulate problems and objectives Study learning processes Work out contradictions and conflicts Support the process	Collect data Analyse data Deliver new knowledge Support transformation of new knowledge
Meta level	Discuss appropriate ways to initiate learning processes	Analyse the organisation as a learning unit – create learning strategies	Give feedback on participants learning processes
End level	Develop and refine practice	Evaluate results, finish the collaboration between researcher and field	Develop local and eventual generalizable knowledge

The PAR process is scheduled to last two years and is running in two iterations with 5 schools in first iteration and 6 other schools in second iteration. The aim of this construction is to develop solutions in the first year in one context (Sandbox 1) and to test or refine them in another context the second year (Sandbox 2). The two iterations are generally identical, but with some minor differences, because the research design was slightly refined from Sandbox 1 to Sandbox 2.

Data Collection Processes

During each one-year iteration a rich empirical data set is collected consisting of teachers' statements at seminars/workshops/Skype meetings, in blog entries at a research blog, by researchers' observations of classroom activities or from ad hoc interviews or minor surveys as illustrated in Figure 3.

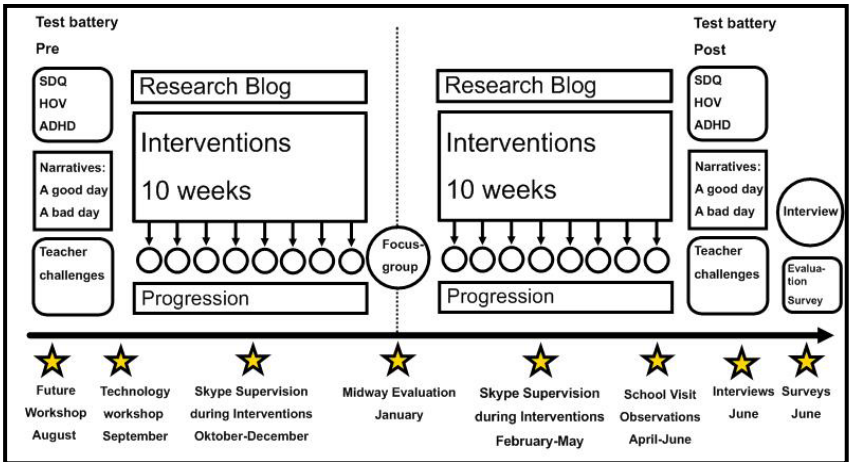

Figure 3. The research design for each iteration in Sandbox 1 and 2 (Andersen et al., 2016)

Table 2: The data collection techniques and the generated data in the ididakt project

Method	Aim
Pre-post test battery	Quantitative data on the focus learners' challenges in classroom activities before and after use of ICT-based interventions verify the focus learners' challenges and describe their progress during the project.
Pre-post test battery	Qualitative data on the focus learners' challenges inform the researchers and improve their recommendations and support to the practitioners.
Future workshop – teacher challenges	Qualitative data generated, and to some extend quantified and analysed, during the future workshops collaboratively with the participants (by voting and arguing) by which teachers' challenges are identified.
Evaluation survey – teachers challenges	Qualitative and quantitative data collected in a final survey and combined with data from the Future workshop to investigate teachers' progress during the project.
Research blog	Qualitative data collected in a shared research blog, where teachers describe their experiments with ICT-based interventions and the focus learners' reactions when using technologies in the classroom activities. Researchers have commented and facilitated the dialogue.

Observations	Qualitative data collected as field notes, photos and videos from researchers' classroom observations of teachers' and focus learners' advantages and challenges when using technology in the classroom activities
Field notes and photos from seminars, school visits, skype supervision etc.	Qualitative data, which elaborate and clarify the understandings from surveys or blog entries. The teachers have opportunity to express whatever they feel and have experienced in relation to the intervention processes.
Ad hoc unstructured and semi-structured interviews, quick surveys or written narratives to get a deeper understanding of elements from research blog or observations.	Additional qualitative data collected to capture the teachers' or learners' voices and gain a deeper understanding on topics recognized in the other data sets in proportion to e.g. the inclusion processes or their experiences of the technology based interventions.

As illustrated in Table 2, both qualitative and quantitative data is collected both parallel and sequential but analysed and used separately in order to enlighten several perspectives by the overall research questions:

1. Map the challenges by the focus learners before and after the interventions.
2. Map the teachers' challenges in including classroom practices Knowing how to do it.
3. Map the used technology and the interventions in which technology was used Knowing where to go (if navigation is involved).
4. Map the learners' perspectives on inclusion and their use of technology.
5. Evaluate the value of the ICT-based interventions, when it comes to focus learners' presence, participation and contribution in the school.
6. Evaluate the interventions value for the teachers' practice.
7. Identify potentials and challenges when implementing and using technologies in the schools.
8. Evaluate the value of the research/development program.

Analysis and Findings

Data Analysis Processes

The quantitative data from the Pre-Post test were analysed separately and independently by one of the co-researchers, who did not participate in the PAR. The results indicate if focus learners meet the inclusion requirements identified by teachers for this study (with attention and developmental difficulties). A descriptive statistic is presented as an average for the whole group before and after the ICT-interventions were introduced and

as a percentage of focus learners with a score in respectively normal, borderline or high level. Statistically, comparisons of the groups score before and after the introduction of ICT-interventions were calculated using independent and repeated measures t-test with a significance level on 5% and by using the statistic SPSS program version 19 (Andersen et al., 2016).

The qualitative data were analysed from different perspectives, but in an overall phenomenological hermeneutic interpretation inspired by Ricoeur's hermeneutical function of distanciation, where the text becomes more "objective" and "have its own life", when it is being removed from the original authors intentions, meaning or significance (Ricoeur, 1973; Ricoeur & Thompson, 2016; Dreyer & Pedersen, 2010). The different qualitative data sets were converted into text and unified as a compiled 'story' of the case. After several readings new sub-stories were structured from different perspectives:

- The story of the technologies – which technologies were used, for what purpose and with which value?
- The story of each individual focus learner – which challenges, which technologies with which purpose and impact?
- The story of the teachers – which strategies and which challenges when implementing technologies

Inspired by Ricoeur, poetic narratives were used to derive a distance in the interpretation of qualitative data, qualify the interpretation by enabling a transformation from the authors intentions towards a deeper understanding of the referring objectives in the text. This analytic approach allows us to create narratives across data and the analytic process may be understood in four sequentially phases:

1. Converting speech into writing and naïve reading.
2. Rewrite the text to a structured work – as a new narrative.
3. During this work deduce a kind of being-in-the-world related to data.
4. Read, analyse and re-write the new structured work in a critical analysis and discussion to reach a higher level of understanding of the topic investigated.

During these iterations of analysis, patterns and explanations have emerged with both a deeper understanding of the focus learners' specific needs and the value of the ICT-based interventions and challenges for using technology in the school context. A preliminary analysis of data from Sandbox 1 compared initial findings from both qualitative and quantitative data, whereby a typology of five overall purposes for ICT-

based interventions were identified and suggested (Andersen & Sorensen, 2015; Andersen & Sorensen, 2017). The typology was subsequent used as an analytical optic across all data sets from both Sandboxes, where findings were discussed in the light of our theoretical perspectives on inclusion, learning, psychology, technology and professional development.

Findings

By categorising, analysing and interpreting data from a technology perspective, seven types of ICT-based interventions were identified as valuable enabling differentiation and enhancing comprehension in the learning activities:

1. the use of digital textbooks;
2. the use of digital course portals;
3. the use of video content;
4. the use of digital training resources;
5. the use of learning games;
6. the use of reading and writing technologies;
7. the use of digital summary or comprehension tools.

Several technologies were used in the 26 classes to facilitate differentiation and increase learners' comprehension in the seven types of interventions showed in Table 3.

Table 3: Technologies used in the seven intervention types and the prevalence of these

Intervention type	Used technologies	In Classes	Per cent of Classes
Digital Textbooks	Superbog.dk, Flexbøger.dk, E17.dk	9	35%
Digital Course Portals	Clioonline.dk, Gyldendal.dk,	3	12%
Video Content	Youtube.com, Restudy.com, Screencasts,	21	81%
Digital Training Resources	Matematikfessor.dk, LytogStav.dk, Quizlet.com	15	58%
Learning Games	Runerod.dk, Villeby.dk, Kahoot.com, QR-codes,	9	35%
Reading/Writing Technologies	CDord, AppWriter, Ordbogen.com, Google Translate	22	85%
Individual or Shared Summary/Comprehension Tools	Mindmap.com, Digital Portfolios, Flipped Learning, Google Apps for Education, Office365, Meebook, ElevIntra,	17	65%

The seven identified types of ICT-based interventions for differentiation and comprehension is presented and discussed in the rest of this section.

Digital Textbooks

Digital resources as Superbog.dk gives focus learners access to a collection of the same books as they can find at the school library. The digital books are nicely illustrated, and they can read them themselves or get reading help when necessary. When the book is finished, they can answer a few questions to check their understanding. The reading assistant tools are built in this learning resource which optimizes the functions. The focus learners are actively turning the pages over which help them to be attended in the reading processes. Resources as Flexbøger.dk offer learners a pdf-version of school books for several subjects while E17.dk have a large number of fiction and schoolbooks in both pdf-format or recorded audio books. With pdf-books learners have to use separately Reading Technologies, which functionality is very dependent on the quality of the pdf-files to be Optical Character Recognized (OCR-processed) and thereby readable. It is important, that the digital books provided offers the focus learners the same quality of reading experiences, same words and concepts and same intellectual level of language to stimulate their academically growth. Finally, digital books should offer more modalities – not less – to stimulate the readers' attention and with an expansion of expression strengthening their memory capacity.

In the ididakt classes, digital textbooks provided the focus learners with opportunities for using Reading Technologies (Text-to-speech) and listening to the written text if they are poor readers or if they are exhausted during the school day. Access to extensive libraries of digital textbooks enable focus learners to choose books of interest, which motivate their reading. They get an appropriate intellectual challenge AND necessary reading support, which facilitate a harmonic balance between challenge and ability (flow) and enable their independently reading (self-efficacy). In the books at Superbog.dk they are guided visually to know what to do, how to do and they are able to monitor their own progression in reading statistic and control questions. Digital text books as pdf-files in Flexbog.dk makes it as well easier to use digital writing support tools with an impact on both flow and self-efficacy:

> *"A couple of boys are now able to deliver a readable product, why they now get response as well" (Teacher G).*

It is important, though, that these text files are accessible in and organized in a well-structured learning environment. Chaotic and confusing interfaces will rapidly steal the

attention and disturb the reading processes. Accessibility from any platform in school or at home has been helpful for learners with poor memory or planning skills:

> *"Now books are not forgotten at home or disappeared in school. Reading support is at hand both in school and at home" (Teacher G).*

Finally, have we observed, how focus learners use the digital text and audio books to calm down and take a break from impressions and expectations and 'recharge their batteries' during a school day.

Digital Course Portals

Publisher produces digital course portals as e.g. Clioonline.dk or Gyldendal.dk provide access to the full curriculum for a subject and contains texts, information, tasks, models etc. Focus learners might here find course content at different levels of complexity with digital reading support at hand, supplemented with materials in various modalities as e.g. pictures, videos, graphics, sound clips, links or interactive features. These multiple modalities offer the focus learners knowledge from different perspectives, and enable enhanced motivation for and comprehension of a topic in a harmonic balance between challenge and skills (flow). Focus learners have access to Digital Course Portals in both schools and at home. If the Portals are well structured and well designed with a simple visual navigation design, the focus learners will easily know what to do and how to use the resources:

> *"The focus learners get started really focused. They are looking for information for answering an assignment. They read and make a quiz about what is learned. They choose between easy or difficult texts. They follow different media links and watch different kind of movies" (4th grade).*

Focus learners monitor their own progression at the site:

> *"The reading log has been helpful to N (boy, 10th grade) to keep track of his answers – it offers him an overview and simplify his options" (Teacher K).*

When all materials are compiled in the same digital environment, it seems to provide focus learners with an overview of a subject content, which they themselves are hardly able to foster. They do not have to search for e.g. lyrics, background knowledge and analytic tools in different resources, because they are all at hand at the course portal.

Teachers have observed, how focus learners easily work both individually and collaborate with peers with more surplus, when the learning content are unified in one place.

Video Content

Video has been used to support differentiation and comprehension at the schools, but differently with learners as either *consumers* or *producers* of videos. Teachers have provided learners with videos from either Youtube.com or Restudy.com or made their own videos as e.g. screencasts to the learners. Youtube.com offers both teachers and learners a huge number of video content that can be used as content in or as supplementing explanations to classroom activities. But the resource is also able to provide the learners a smooth road to entertainment and interruption of the learning processes. It seems important to give the focus learners a specific link to a specific video for a specific task. They are too often disappeared in searching activities when they have to find videos themselves.

Restudy.com provide video content for all subjects and academic topics related to higher secondary school and high school activities. The videos are made by teachers and directly related to a specific part of the curriculum. The resource was very useful to our oldest focus learners, who have used the videos to be prepared before the lessons (flipped learning), instead of reading during the lessons or as a source for repetition to get ready for the final tests. Finally, teachers have produced their own video content using technologies as Screen o-matic.com, Screencastify.com or their mobile phone video camera. They have expressed that it takes time for them to find the right videos at Youtube.com and they often prefer another explanation in the videos than provided. But some of the teachers are reluctant and insecure when it comes to produce their own videos. They want to create a perfect product, and that is as well a very time consuming activity. They might be willing to accept an easier cut-to-go product – or take out a subscription to video resources as Restudy.com, where both teachers and learners can rapidly find videos for a specific theme or topic.

In one class (2nd grade) the teachers were experimenting on simple videotaping the classroom instructions with an iPad during the lessons and sharing these videos on the fly with the learners in an online file archive. They find this method valued, given that learners during the lessons are using the videos to remember and repeat the instructions. It seems to be of more value for the peers than the focus learners, but the teachers experienced then more time to help the focus learners in another way in the classroom activities, when the peers where more self-supporting by the videos.

When videos are provided as a part of the academic dissemination to all learners, a more equal access to information are given:

> *"All learners must benefit from them. The instructions must be brief and clear" (Teacher B).*

For younger focus learners it seems to be important, that the videos are short and only deliver one perspective at a time. It is harder for them to navigate in a long video and remember steps and explanations. The teachers recommend a number of short videos for the youngest focus learners instead. When classes are watching video at the classroom board, many focus learners take a break and drop out of activities. Videos seem to be more useful for individuals or peers, when the focus learners can interact with or dialog about the content.

Some focus learners do not at first benefit from videos:

> *"The impact is higher for learners with academically surplus energy. It is challenging, that the learners not are able to ask questions. I must still give them oral explanations and they can afterward use the videos to remember, what to do. That makes in return many learners self-sufficient" (Teacher F).*

But videos offer many focus learners a fine balance between challenge and skills:

> *"M (boy, 10th grade) can be concentrated very long time by them. He understands the Pythagoras after watching explanations and gives right answers afterwards." (Teacher K).*

Learners have easier access to knowledge, they can replay if needed and receive information in their own speed. Focus learners interact autonomously with the content and express self-efficacy:

> *"I am learning better with the computer because there are more options. I can e.g. watch video – and look at both video and text. It is easy for me to make notes because I can pause the video. It is much easier to use a video than to ask my teacher all the time" (girl, 8th grade).*

Differentiation and comprehension is not only supported when focus learners are consumers of videos, but also when they act as producers. In the ididakt project, videos have also been used to sustain and visualise, what is learned – as an externalised memory or an alternative to classroom presentations. Such videos help focus learners to remember and guide them, when shifting from one activity to another, and illustrate their progression as well:

> *"I would continue with this method, because my focus learner (boy, 6th grade) had so much drive when creating the video. Normally he would not take part in such activities" (Teacher B).*

During the project video presentations are made by vulnerable learners as a scaffold or an alternative to classroom presentation, where the learners production of the video has prompted a feeling of confidence about their skills (self-efficacy):

> *"Presentation via video for B (boy, 4th grade). It was a good idea. He really liked that option. But when he saw his peers present, he wanted to do the same. So he did not use his video… He has so much non-attendance and it is very difficult for him to get into flow. Video presentation is a good idea as a backup. It would be fine, if everybody had this opportunity, and just chose in the moment, if they would like to present via video or in real life. Then it would be less stigmatising" (Teacher F).*

Digital Training Resources

The schools have access to different kinds of digital training resources as e.g. Matematikfessor.dk, LytogStav.dk, Quizlet.com or apps for more operant conditioning learning activities like e.g. *PopMath*, *120 ord* or *Cut&Slice*. Such activities have traditionally often been used in for Special Educational Needs learners. Many of our focus learners also find those activities attractive and seem to calm down and take a break from impressions and expectations, similar to the way they act with digital books described above.

Digital Training Resources provide learners rehearsing specific skills and possibilities for choosing challenges that fit their capability. The program scaffolds them to know what to do, how to do and how well they are doing. They work in their own speed with a minimum of distractions and often feel both flow and self-efficacy, when they find the programs interesting. Many focus learners express, that they like these predictable

resources, and teachers observe learners more focused and active in learning activities, where task solving is guided and response or help is available:

> *"M (boy, 10th grade) uses matematikfessor.dk. He follows explanations using good, closed, headphones and is able to stay at the tasks even with some noise around him. Normally, he would do nothing" (Teacher K).*

It is important, though, to be aware if the learners are rehearsing any valuable skills and how they could be used in other contexts, as they do not want to be passivated in trivial and unemployable activities.

Learning Games

Different kinds of game based learning activities have been tried out during the project using resources as e.g.

Runerod.dk, Villeby.dk, Kahoot.com or QR-codes. At Villeby.dk has the youngest focus learners (1st-4th grade) experienced a virtual world with game based activities for Math, Danish, English, Nature & Science, Artwork, Religion etc. The children were engaged in the tasks, but the teachers have noticed how important it was for the focus learners to show what they have achieved and work against a goal. When the resource was used as a random activity for the focus learners they were less attended and did less care if the task were appropriately solved. Meaning is important. When it comes to learning games, some focus learners got a new role in the classroom:

> *"We used a learning game. N (boy, 6th grade) was really in play here and able to help his peers" (Teacher B).*

The learner states that he likes learning games because of the up-tempo and activities:

> *"It is not boring and slow".*

Some of the classes in 4th-6th grade have tested a Math learning game at Runerod.dk. It is an online game similar to World-of-Warcraft, where they visit a fantasy world and need to solve different kinds of math quest to finish the game. There were quite a lot of reading in the game, but the environment and the task were engaging, which powered some of the focus learners to read more than they usually did. The learning game did - like the Digital Training Resources – scaffold the learners and tell them what to do, how to do it and monitor how well they were doing. They can work in their own speed with

minimal distractions and obtain a feeling of flow. Several schools have tested this game and the teachers' judgement is clear. Focus learners were more motivated and engaged when playing learning games if the tasks in the game were appropriate to their skills:

> *"A (boy, 4th grade) was very focused at the game. He wanted to continue at home, which is totally new for him. He should also continue in the school, but unfortunately it is finished in few hours. It should have been more extensive – they are finishing the game to fast" (Teacher C).*

Some teachers designed game based learning activities by themselves to enhance focus learners' motivation, e.g. a Run & Spell game with QR codes to provide restless focus learners with more mobility in the lessons:

> *"I find these games really funny" (girl, 4th grade).*

In the 6th-10th grade teachers have used online game based resources like Kahoot.com, Quizlet.com or quizzes related to superbog.dk (Digital books), Restudy.dk (Video content), or Course Portals to test and monitor how well the learners were doing. Both teachers and learners find quizzes and games motivating because of the competition between learners and the immediate feedback. We have observed very engaged learners when these games have been used as a variation in the teaching sessions, but we have also experienced how some of the focus learners expressed, that they feel stress, anxious and worry, when they participated in time limited activities with tasks beyond their actual skills.

Assistive Reading and Writing Technologies

Due to their deficits challenges many of the focus learners are behind when it comes to academically skills as reading and writing. Other with a low arousal, persistence or attention were just as much distracted and on 'overtime work', and therefore only achieved very little. Most of them were developmentally years behind their peers and could need a helping hand by using assistive reading and writing technologies as e.g. CDord, AppWriter, Ordbogen.com, Google Translate, Siri etc.

Assistive reading technologies read text aloud for learners while writing technologies offers learners word suggestions, help them spelling or write what they are saying. Assistive Reading and Writing Technologies helps focus learners to feel flow and self-efficacy:

> *"We have used it for some years now. Earlier, I found it very difficult to write a text. I made a lot of failures and all sounded wrong. Now it is easier. When I got it, I wrote a whole story, and it was almost right. Then I was happy and joyful and thought it was funny to write" (girl, 4th grade).*

Almost every focus learner in the project mention Assistive Reading and Writing Technologies as valuable tools they would recommend to other learners. Slow readers or learners with reading difficulties appreciate to "hear the reading while being attentive at the text" (6th and 7th grade). Reading and writing technologies helps them to work more independently (self-efficacy):

> *"Then I do not need help from the teacher all the time" (boy, 6th grade).*

Individual and Shared Summary/Comprehension Tools

The classes in ididakt have used several and very different digital resources as e.g. Mindmap.com, Google Apps for Education, Office365, Meebook or ElevIntra with the aim of providing learners an individual or shared space for summarising what is learned or how concepts and topics could be understood. The learners use these technologies to create e.g.

- a *Word-of-Wisdom-blog* in math with their own explanations on calculation rules or equation solving processes;
- a *Concept-mind-map* in Danish, where they build their own glossary and explain concepts with words and photos or
- an *Expectation-Diary*, where they are dialoguing with their teachers and meta reflect on their own learning progression and achievements.

Such interventions give learners a place for reflection, reification and evaluation of what they have done and learned. It seems valuable for focus learners to compile their experiences of successes and development, as they often experience their school work very fragmented and need help to establish an overview. They will often meet with a feeling of lacking skills, why an evident reification of their progression might impact their self-esteem and self-confidence. To build these summaries activate their thinking, their reflection and allow them to articulate their understanding in preferred modalities. They can return to them for repetition and memory support.

Likewise, many of the schools start during the project to use a shared digital production/working platform at either Google Apps for Education or Office365 to

gather all learning material for the classes. It was a learning process to design and use these new Virtual Learning Environments (VLEs), but after a period of experiments, adaptions and modification they offered the focus learners a great help in their learning processes:

> *"Google Websites is a good resource in Danish Language, where all topics from all years are compiled. All learners can see, what the peers have made. They learn to find help from other learners and be respectful for that. We have e.g. structured a novel reading course with on page for introduction to the novel, another with tasks before reading, a third while reading and a fourth after reading. Tasks are compiled and different modalities are used for information, instruction, analysis models etc. The learners return to and compile with earlier work. It works well for all learners that content and contributions in a subject are structured and gathered. They can add text, pictures or videos to support their individually comprehension" (Teacher B).*

For focus learners with lacking ability for overviewing and navigating it is important to be aware of the fact that these challenges occur both in the real and the virtual world. It is important that focus learners are offered a helping hand with organizing their digital learning environment if the potential of the technologies should be fulfilled. Unstructured and poor organized digital learning tasks and environments often lead to cognitive overload resulting in loss of control and a feeling of frustration, anger or apathy.

Discussion and Perspectives

Even though we during this paper have enlightened how valuable digital resources can be, our research has also uncovered some negative implications. In order to keep a high arousal, a feeling of control and flow it is important that focus learners meet both high-perceived challenges and skills. But many of our focus learners are – due to their deficits – years behind their peers developmentally, socially and academically. In mainstream classrooms, they often meet the same tasks as their peers, and even though they might get a helping hand or an assisting tool, they still will be evaluated against the same curriculum. This impacts their experience of self-efficacy or being good enough.

Teachers are frustrated, when they cannot appreciate and acknowledge focus learners' progression with marks in relation to their actual growth.

> *"I tell him he is doing well, but tomorrow he will have his marks, and then I know his courage will fail and he will stop trusting me." (Teacher J).*

We cannot expect learners to grow in the same speed.

The same problem is noticed in relation to assistive reading and writing technologies: When teachers encourage learners to use text-to-speech or speech-to-text-tools other teachers, parents or peers express, it is a kind of "cheating". It seems important to clarify the purpose of reading and writing activities for all stakeholders: "To be able to read or write" or "To learn as much as possible and express knowledge and thoughts"? An inclusive school should generate a Universal Design for Learning approach – not only when developing, buying or providing assistive tools – but also when it comes to pedagogy and policies.

We have experienced how pedagogical deliberate introductions to and use of Virtual Learning Environments, digital resources and assistive tools impact focus learners' self-efficacy in terms of knowing what and how to do things:

> *"We have many academically weak children in our classes and observe how CDord (reading/writing technology) makes them much more autonomic. It is difficult to find good reading materials to weak readers, but now they can unassisted read and be more at the same level as their peers" (Teacher J).*

Unfortunately, we have seen, that many teachers do not know how to use these technologies, which is why they cannot support focus learners and leave them on their own.

The value of technology-based interventions and assistive tools depends on the individual focus learner's deficits and challenges. When it comes to e.g. learners who are years behind their peers with small vocabulary, poor comprehension or weak memory, they might need alternative pedagogical initiatives and approaches than the mainstream teaching practice offers:

> *"He (boy, 6th grade) has been at a special education school for three years. He cannot just jump into the curriculum here. He can read using technology, but he might not understand the words. We must help him step by step" (Teacher G).*

It seems difficult for teachers to help learners with weak working or short time memory:

> *"M (girl, 4th grade) finds math videos of relevance for what we are doing in the lessons. Videos for the lower classes are short and simple. Then she is concentrated. When they are getting longer with more operations involved – it is difficult for her to remain on task" (Teacher D).*

We will suggest further research in rehearsing memory capability, which seems crucial for a major part of our focus learners learning outcome.

Gathering all learning materials into online portals improve focus learners access to learning experiences (e.g. enable differentiation, several modalities or repetition). Navigation in the VLE seems problematic for some focus learners why teachers must be aware of designing a simple and clear path to materials and keep away unnecessary distractions. Teachers must see themselves as role models for learners and provide focus learners simple learning pathways and structures to scaffold them in both the digital and real-world classroom. Schools must have a critical view on Human Computer Interaction at learning resources: How easy and intuitive is the navigation when the learner is 6, 10 or 14 years old? It is a child friendly learning environment or a measure friendly technology?

Tests, quizzes, games, training resources etc. have been used in many of the investigated classes with both positive and negative impact for focus learners. With no differentiation and evaluation against the same goals, with time-limitations and competition it seems as a stressful adventure for our focus learners. It might be fairer to them, if learning groups were designed after stage rather than age. And it might be of greater value, if schools were more focused on facilitation of reification, meta-reflections and formative evaluation instead of narrow-minded focus on measuring, data documentation and summative quantitative reports of learning outcome.

Teachers have during the project described, how they often feel guilty, because they know full well the focus learners' specific needs without being able to offer them what is needed. Half of the teachers do not feel competent pedagogically or technologically to design technology-based interventions for the target group and state that they neither have sufficient time for designing individual material, explanations and structures for a focus learner's full day at school. Many examples of successful interaction of technology

and pedagogic have been found. But they are used in flash – from time to time – and not a consistent practise in the focus learners' time at school.

Conclusion

This paper has investigated the potential of technology-based interventions for differentiating learning experiences and increasing comprehension by learners with attention and developmental deficits (focus learners). We have observed how use of seven types of technology-based interventions:

1. digital textbooks;
2. digital course portals;
3. video content;
4. digital training resources;
5. learning games;
6. reading and writing technologies and
7. Individual or shared summary tools.

In many ways have supported the focus learners in their learning activities and helped them to experience more flow and self-efficacy in their school work.

Digital books give focus learners access to both fiction and non-fiction at a higher intellectual level than they might be able to read on their own. Assistive reading and writing software help them to work faster and perform at a higher level. Digital course portals and digital summary tools offer them an overview on the curriculum and easy 24/7/365 access to material in many modalities. Video content, learning games and digital training resources has in this project proved to be motivating and engaging for the focus learners and offered them new ways to work with the curriculum.

For teachers with both pedagogical and technological insight it seems to be possible to exploit this favourable potential in their classroom teaching and increase a feeling of flow and self-efficacy in learning processes among this group of vulnerable focus learners. Flow might appear when the technologies makes it easier for the focus learners to join, overview, understand, participate and contribute to the learning activities, while self-efficacy emerge when the technologies helps them to work more independently and autonomous.

All together has this suite of technology-based interventions proven to offer the focus learners learning tasks in respect to their specific challenges and skills. When used consciously and systematic, both teachers and learners has succeeded in taking advantage of the power of technologies to help learners overview what to do, how to do, where to go and how well they are doing. Our research has unveiled how technologies can help minimizing distractions and provide an overview for unattended learners. However, it may also lead to cognitive overload when without structuring and navigating support. Teachers' classroom management is necessary in both real world and virtual environment settings.

If technology should be utilised to its full including potential, it is necessary for schools not only to buy and provide technologies, but also use it in a Universal Design for Learning (UDL) approach that gives all individuals equal opportunities to learn, allow them to meet learning challenges balanced to their actual skills and to grow in their own speed. The seven types of technology-based interventions for differentiating learning experiences and increasing comprehension suggested in this article, could help teachers to foster such an including learning environment, where learners are to be meet as whom they are and become access to appropriate pedagogical and technological support.

Even though this investigation has exhibited many examples where technology and pedagogy interact successfully and increase focus learners' ability to be more self-driven and more actively participating in an including learning community, good examples only still appear in flashes and yet not as a consistent practise in the focus learners' time at school. Organisational limitations and inconveniences in the school system seems in many cases to interfere with and even destroy the inclusion vision and intensions. We might be able to include all learners in the mainstream school system, but we cannot expect them to grow in the same speed. If they were joining classes after stage rather than age it might be easier for the teachers to provide them learning activities at their actually developmentally and academically level and sincerely appreciate and acknowledge their progression with marks in relation to their actual growth. Teachers need both sufficient digital and special educational competencies if they should be able to design technology-based interventions for the target group, and need as well more time for designing individual materials, explanations and structures for a focus learner's full day at school.

Finally, it might be of great value if schools had a more critical view on Human Computer Interaction in the digital learning resources bought and provided to focus

learners: Is it a child friendly and appealing learning environment? And what do we want to achieve when using these technologies? To evolve an including school system, it seems necessary to foster a much broader and deeper understanding and acceptance by all stakeholders around this group of focus learners with respect to their specific challenges in the mainstream educational system.

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Offering Authentic Learning Activities in the Context of Open Resources and Real-World Goals: A Study of Self-Motivated Online Music Learning

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Abstract

Many users of online open education resources (OERs) are learners seeking insights into problems encountered as they pursue their everyday interests and activities. As well as benefitting from intrinsic motivation, such authentic learning activity provides context that helps the learner absorb and integrate the meaning of the knowledge. The purpose of this study was to explore barriers that prevent some online learners from using OERs in this way. Participants had experienced difficulties using music theory OERs to pursue personal music-making goals. Provided with online tutoring through an action research methodology, they appeared to benefit particularly from five aspects of active guidance: additional motivation, connections between generalized knowledge and personal experience, relevant learning activities, focus of attention, and goal-oriented feedback. In an environment rich in open content, providing these supports, in activities oriented towards learners' goals, may be a particularly valuable use of teaching time.

Keywords: open education resources, authentic learning activity, online music learning, inquiry-based learning, action research

Introduction

I first heard of open education resources (OERs) in 2002, from engineering professors who were collaborating at Connexions (currently OpenStax, https://cnx.org) to create modular materials that could easily be shared, reconfigured and reused as needed in various courses. As a music teacher, I had long felt that standard textbook-based approaches to music theory failed to demonstrate the practical usefulness of the concepts. Instead, I introduced concepts as they became relevant to a student's musical practices and goals, but there were no texts available to support that approach. Easily accessible modular materials seemed like an ideal solution, one that I suspected other

teachers might also appreciate. Online educational materials were scarce at the time, and Connexions accepted materials from any educator willing to share, so I published several modules on crucial music theory concepts. Encouraged by high visit numbers, high placements in Google search results, and enthusiastic emails from readers, I published more modules, organized them into online courses, and became interested in open education as a research area.

I originally assumed my OERs, like the engineering materials, would primarily be used to create customized curricula. However, in a voluntary survey of users (Schmidt-Jones, 2012), nearly all respondents related their use of the materials to pursuit of their own goals, rather than to any curriculum. This finding was supported by concurrent analytics evidence suggesting that most users were looking up specific concepts, rather than following the online courses. Respondents generally rated the materials as very helpful in this context. Some volunteered positive comments about easy readability that echoed the enthusiastic emails. In spite of this, some respondents with minimal formal music education were clearly struggling to make use of the OERs.

Other research (e.g. Carson, 2006; 2009; Rosell-Aguilar, 2013) corroborates the finding that a large portion of OER use is motivated by personal goals, rather than course or certification goals. OER support of self-motivated learning enables individuals to follow their own passions (Brown & Adler, 2008) and to seamlessly connect in- and out-of-school learning (Fletcher, Schaffhauser, & Levin, 2012). In a fast-paced world that rewards lifelong learning, this may create a "digital divide" disadvantage for individuals who have difficulty using OERs independently.

Kop, Fournier, and Mak (2011) distilled the quest to widen access to lifelong online learning into two basic questions: "What would be the important factors in the design of a learning environment to support learner self-direction on online networks, and what should be the place and role of the educator?" (p.76). I undertook the current study as an OER provider seeking answers to the first question; I hoped the findings would help me design materials that were more accessible to independent learners. However, the methodology involved working closely with self-motivated online music learners, in order to better understand their needs and difficulties. These generated findings that are relevant to the second question and have affected the direction of my OER research and development.

Some approaches to using technology in education are designed to replace interaction between teacher and learner, which may account for some learner dissatisfaction with

them (Godin, 2012). In my view, OERs instead support lifelong learning through the type of seamless movement between teacher-facilitated and independent inquiry envisioned by Fletcher, Schaffhauser, and Levin (2012). The findings of this study point to five types of supports that OER users may particularly value and seek from teachers: additional motivation, connections between generalized knowledge and personal experience, relevant learning activities, focus of attention, and goal-oriented feedback. Providing these supports may also improve students' subsequent ability to learn independently. Study findings that relate to active teaching are the focus of this paper; please see Schmidt-Jones (2016a) for discussions of the findings regarding the design and content of OERs.

Literature Review

Informal and formal music learning

A constructivist perspective holds that individuals construct their own meaningful and functional understandings, through social activities that reveal how others make use of knowledge (Vygotsky, 1978). Such knowledge construction typically occurs informally, in the course of everyday practices undertaken by communities working together to achieve their goals (Wenger, 1998). For example, most music learning takes place informally, as people create, practice, and enjoy music together (Green, 2002; Lilliestam, 1996). Learning in communities of practice may also involve apprenticeships that pass on specific skills and roles valued by the community (Rogoff, 1990). For example, in most folk music traditions, novice instrumentalists learn primarily through playing alongside more experienced performers (Nettl, 1985).

Much of the knowledge gained informally in communities of practice and through apprenticeships is tacit. Consciously-learned, concept-rich knowledge is more typically taught in formal education settings. Conceptual knowledge gives individuals more control over their own mental activity (Vygotsky, 1978); music theory, for example, affords more purposeful choices in creative activities such as composing. Unfortunately, traditional education methods often abstract the concepts too completely from their socially-motivated, goal-oriented contexts. As Brown, Collins, and Duguid (1989) have pointed out, this can cause the knowledge to become so strongly indexed to classroom activities that it is not triggered by the real-world problems for which it is meant to be used: "The activity in which knowledge is developed and deployed. ... is an integral part of what is learned" (p.32).

Standard music education provides examples: Theory courses typically present concepts in the context of classical music and harmony-writing exercises, ignoring the musical genres and activities that are more in line with students' extracurricular interests (Bresler, 1993). Formal instrumental instruction does not reproduce key aspects of the apprenticeship model (Green, 2002). New music technologies are too often used for formulaic exercises, rather than the types of creative activities for which they were designed (Crawford, 2014).

Learners may react to this abstraction by assuming that formal knowledge lacks real-world value and relevance. Many music traditions explicitly reject formal music education, with informal learning described as "more authentic" by both learners (Hargreaves & Marshall, 2003) and professionals (Lilliestam, 1996). Green (2002) noted that "music education has had relatively little to do with the development of the majority of those musicians who have produced the vast proportion of the music which the global population listens to, dances to, identifies with, and enjoys" (p.5). Woody and Lehmann (2010) found that formally trained musicians had fewer and less efficient music-problem-solving strategies than those with "vernacular" experience.

Authentic music theory learning

Yet, because music theory does enable intrinsically motivating, creative activities, some informally educated musicians become interested in learning it (Green, 2002). A few manage to take theory courses, but others struggle to do so, or are unwilling to pursue courses that are not explicitly tied to their interests (Schmidt-Jones, 2012). *Authentic learning activities* involve solving problems that are complex, open-ended, and oriented towards a goal that makes sense to the learner. Music offers a myriad of opportunities for such activities (Crawford, 2014). For example, authentic music theory learning involves applying the concepts to problems that learners encounter when they try to create music that interests them, using their chosen instruments. This situates the learning, and the knowledge acquired, in contexts that matter to the learners, simultaneously creating and revealing its real-world value.

Modern music-making practices have rendered apprentice-style learning much less available (Green, 2002). Many musicians engage instead in *self-directed learning*, in which they consciously plan, direct, and evaluate their own knowledge acquisition. Self-directed learning "is not exclusively an informal learning process. It can and does occur in formal educational settings, usually under the guidance of an expert teacher and/or in concert with group learning activities" (Peters, Taylor, & Doi, 2009; p.25). Such guidance allows learners to work within the zone of proximal development, the level at

which they are not yet able to solve problems independently but can do so with assistance (Vygotsky, 1978).

Inquiry based learning provides one model for self-directed, authentic learning activities. Inquiry is envisioned as an open-ended spiral, consisting of cycles of problem-posing, research, creative response, and reflection that lead naturally to the next problem-posing cycle (Wells, 2001). The learner retains substantial control over both the means (such as the materials and procedures used) and the ends (such as the work created and the educational goal) of the activity, even when it is facilitated by an instructor.

Authentic inquiry can be supported by technological artefacts that are intentionally designed for it (Boitshwarelo, 2011). Crawford (2014) lists several ways that technology can support authentic music learning, including giving students access to real-world sources and empowering them to take ownership of the learning process. The open-access, modular approach taken by OERs seems well suited to provide these affordances to self-directed learners, many of whom can use well-designed resources independently. However, the findings of this study suggest that, at any level of expertise, learners may need or want active guidance within the authentic contexts supported by open content.

The research perspective: Action research and activity theory

Users of music OERs may lack formal background, either by choice or due to lack of opportunity (Schmidt-Jones, 2012). This creates barriers to learning that are not well researched; self-directed online learning is intrinsically more difficult to study than formal online learning (Harley, 2008). Action research (AR) provides a pragmatic methodology for engaging self-directed online learners. In AR, the researcher takes action with others, with simultaneous goals of improving a specific real-world practice while also contributing to the academic discourse on such practices (Herr & Anderson, 2005; Reason & Bradbury, 2006). Participatory action research in particular focuses on working with other stakeholders in the practice, treating them as knowledgeable co-researchers whose perspectives and understandings raise important issues and provide key insights (Heron & Reason, 2006). AR and self-directed learning involve similar processes, creating a compatibility of perspective that can strengthen a study (Peters, Taylor, & Doi, 2009).

In order to be responsive to participant perspectives, AR studies are open to unexpected changes in direction, including choosing the theoretical framework for data analysis after emerging issues become clear. "Activity theory is a powerful and clarifying

descriptive tool rather than a strongly predictive theory" (Nardi, 1996; p.7), providing a sociocultural framework that can be applied in the analysis phase of a study. First developed by Vygotsky's student, Leontiev, activity theory posits that activity and knowledge are not separable. Attempts to characterize knowledge in terms of contextless individuals or objects are considered misleading; studying activity is considered the best approach to understanding learning. The basic unit of analysis is an activity in its entirety, including the people involved, their interactions, the physical and conceptual tools used, and the immediate object and underlying goal of the activity (Leontiev, 1978). Welch (2007) and Burnard (2007) have both recommended activity theory as a holistic approach that can take into account the multifaceted nature of music learning, including its creative and technological aspects.

Methodology

Action research is often described as an inquiry "spiral of iterative cycles of plan-act-observe-reflect" (Herr & Anderson, 2005; p.47). Boitshwarelo (2011) recommends iterative development of technological artefacts that are meant to support authentic learning, at each stage seeking "to understand the learning ecology of the authentic contexts where the designed objects are used" (p.165). This study represented one cycle of an action-research project aimed at developing more accessible OERs. OER creation is a labour-intensive action best undertaken after a fruitful round of observation, reflection, and planning. The 2012 survey of users did not provide sufficient insights, in part because it lacked the in-depth, sustained interaction that helps a teacher understand the specific needs, backgrounds, and perspectives of learners. The action undertaken in the current study was therefore to work closely with participants, guiding their inquiries in order to develop a deeper understanding of them. Reflection on the findings could then inform my further actions as an OER researcher and developer.

To date, there have been few online action research studies, but the methodology is purposefully flexible; research methods and techniques are chosen to reflect the specific situation under study. In the area of education, AR often takes the form of an inquiry conducted by a teacher who facilitates the inquiries of student-participants with the goal of improving her own practice (Wells, 2001). This approach resonates with the goals of this study, as well as with the learner-centric ethic of open education (Cape Town Open Education Declaration, 2007). By offering visitors to my OERs additional help in reaching their own goals, I hoped to attract study participants who experienced difficulties using the OERs independently. As co-researchers and learner-stakeholders

in the materials, their perspectives might reveal useful insights regarding the barriers they had encountered.

Study sites and participants

The call for participants was linked from my 50 most popular OER modules, each of which used a mix of text, illustrations, and audio files to introduce a concept in music theory, notation, or acoustics. The only registration requirement was that the participant be between the ages of 18 and 65. As is typical of online studies, the registration rate was low and the dropout rate high. Google analytics indicated that the modules together were averaging about 2690 visits per day, but only 60 volunteers responded during the five months that the link was available. Eleven undertook lengthy inquiries within the study; the rest dropped out without attempting to make progress. My analysis focused on understanding the long-term inquiries, but I also compared the known characteristics of long-term participants as a group to study dropouts as a group. Participants' backgrounds, goals, and progress varied so widely that is not possible to describe a "representative" inquiry. Instead, I have chosen five participants to illustrate the variety and provide a sense of the inquiry process.

Sonia was a 54-year-old living in the United States who had taken piano lessons periodically since childhood, including jazz piano. She finished two inquiries within this study. In the first, she asked for help keeping up with an "Intro to Improvisation" massive open online course (MOOC) that she was taking. We used her MOOC coursework, which consisted of self-recorded improvisations, to discuss and work on improvisation skills and the relevant concepts. In the second inquiry, she composed in a jazz style. Resources for Sonia's inquiries included hard-copy books that she owned, as well as the MOOC materials and forum. Her improvisations, self-reports, compositions, and use of terminology all showed evidence of progress.

Jeff was a 22-year-old living in South Africa. Although lacking in formal music education, he was a competent digital audio workstation (DAW) composer. Jeff's goal was to create melodies and harmonies similar to those in a popular anime music style. Because he was unfamiliar with common notation, we used his DAW's "piano roll view" to illustrate our discussions. Most of Jeff's activities involved choosing a small portion of a piece he admired, such as a melody or chord progression, and creating a DAW version of it by ear. We then used standard music-theory concepts to discuss the fragment, and he followed up with short original compositions demonstrating his understanding of the concepts. Our discussions served as the main resource for his inquiry, although Jeff also consulted some books and open online materials. His

compositions demonstrated an increasing ability to purposefully use concepts such as power chord and minor mode to create the desired musical style.

James was a 44-year-old living in Canada who had played guitar as a hobby for over fifteen years. He expressed his inquiry goal as "learn harmony, chord progressions, composition" (James, introductory questionnaire). His local materials were typical of what is available: guitar books that lack theory discussions, and a "piano-centric theory book" (James, contact 5). He initially found the breadth of the OERs overwhelming, but within the structure provided by the guided inquiry he volunteered that they were easy to understand. Over the course of a variety of activities that included practice notating named chords, naming chords by ear, creating chord progressions that he liked, and improvising over those progressions, James demonstrated increasing ability and confidence in naming and notating specific harmony concepts, as well as recognizing them by ear and using them creatively.

Lee was a 63-year-old living in Singapore who played piano with a group in church services. She had been told that her skills were inadequate in comparison with the other pianists on the roster. She could not instantly transpose music to a different key, nor could she improvise a piano part when provided only with melody and chord symbols. Her inquiry goal was to gain these skills, and the main resources were the music she played in church and our discussions. Most of her inquiry activities involved interpreting chord symbols and creating piano parts based on them. She called this approach "on-the-job-training" and reported that it was much less stressful than trying to follow the generalized rules found in formal materials on transposition and improvisation. However, Lee was one of only two long-term participants who did not appear to progress towards her goal during the study.

Glen was a 31-year-old living in the US. His background included extensive private guitar instruction, university-level theory courses, and experience performing in, and composing for, rock/metal bands. Glen was interested in creating compositions that explored various theory concepts, sound qualities, and instrument techniques. He stated firmly that he was not interested in learning more theory, citing a history of teachers who were interested only in the correctness of theory, rather than in its creative uses. His inquiry activity centred around submitting, discussing, and repeatedly revising several short compositions.

These participants are featured here because each provided a particularly clear example of one of the five aspects of active guidance that appeared to be most useful. To illustrate

the breadth of their usefulness, additional examples from these participants round out the discussion of each aspect. To keep the paper to a reasonable length, examples from other participants are not included.

Inquiry Processes

To protect their privacy, participants were registered under pseudonyms in a closed Moodle course site at my university. Data about them was gathered through the closed site, and the pseudonyms are used in all discussions of them. Participation began with a questionnaire that included questions about musical goals and experience as well as demographics. The next step was to design, with my help, an inquiry that was feasible within the constraints of the study and well aligned with personal goals. Participants were then free to work at their own pace, to contact me for guidance as much or as little as desired, and to leave the study whenever they wished. Study interactions took place in one-on-one discussion forums at the Moodle site. Apart from that site, participants were free to consult any tools, instruments, materials, and people they felt were helpful, including local as well as open online resources. This openness to the goals, processes and resources preferred by the participants was in keeping with standard practices for both action research (Wells, 2001) and adult inquiry (Knowles, 1984) and was aimed at eliciting as much information as possible about how participants had previously approached their goals and how to improve their progress.

Data Sources

The primary data sources were the texts of the discussion forums, where participants asked questions, expressed concerns and enthusiasms, reported difficulties and progress, discussed and linked to resources, and responded to questions I posed in my role as teacher-researcher. Secondary data sources, which provided triangulation in the form of different perspectives on the issues that emerged in the discussions, included the online resources linked or referenced, bespoke materials that I created for some of the inquiries, my researcher's journal, and work submitted by the participants.

Coding and Analysis

The coding system began with issues that I expected but evolved continuously as the participants' actual issues emerged. When the study site closed, one year after opening, I recoded all data using the final coding system. The issues that emerged fell easily into two thematic categories: the physical and conceptual tools that are used to learn about music, and the teacher-learner interactions involved. However, because the characteristics of the individual inquiries were so varied, it was difficult to disentangle

findings regarding these two categories. The holistic approach provided by activity theory provided a way forward, with each inquiry framed as a series of activities with objects and goals that were explicitly agreed in the discussion forums. This allowed the analysis to focus on determining what specifically had changed in a participant's activity when they began to experience progress. Unexpectedly, changes in the immediate object of the activity often proved as crucial as changes in tools or interactions, and all of these appeared to play a role in defining the types of active teaching that benefit self-motivated online learners. (See Schmidt-Jones, 2016b for further discussion of the use of activity theory in this study).

Findings

The study was driven by the goal of creating OERs that are easier for learners to use independently, with no personal teacher engagement. However, the AR methodology provided teacher engagement, so that participants would have a strong incentive to reveal their needs and perspectives. The results did suggest some intriguing possibilities regarding OER design, but in many cases the change from unsuccessful to successful learning activity was brought about mainly by elements that, at present, can only be provided through personal teacher engagement. The types of assistance provided varied greatly, creating the most complex and difficult-to-organize set of analysis codes. When viewed in terms of changes in activity that triggered progress, useful assistance appeared to fall into five categories:

- additional motivation,
- connections between generalized knowledge and personal experience,
- relevant learning activities,
- focus of attention, and
- goal-oriented feedback.

These categories represent five aspects of my actions as inquiry facilitator, rather than separate actions. For example, the point of many of the learning activities was to create knowledge-experience connections, and I tried to make my feedback motivational. The aspects themselves are separable, however; relevant learning activities can have purposes other than creating knowledge-experience connections, and feedback can be demotivating.

Additional motivation

The intrinsic motivation that drives authentic activities is never entirely self-generated, even in independent learners. The assumptions and goals of the relevant community of

practice deeply influence how the learner frames personal challenges and their possible solutions (Vygotsky, 1978; Wenger, 1998). In this study, my involvement in the participants' inquiries appeared to increase their immediate motivation in two ways: through implied expectations of timely progress, and through positive interactions regarding their goals and activities.

Sonia reported difficulty following the discussions of the more experienced students who dominated the MOOC forum; she was reluctant to interrupt with novice-level questions. "Some have left the course because they found it too difficult to navigate on their own. I could have been one of those statistics had I not had your help to get me oriented in the right direction" (Sonia, contact 19). Participation in the MOOC probably contributed to Sonia's progress, but she repeatedly complained that the pace was too fast for her. Unlike OER-supported inquiry, MOOC participation called for linear progress at a standardized pace. Intriguingly, when the MOOC ended, a group of students including Sonia continued to share their improvisations with each other, but at half the pace.

Other study participants seemed to treat their inquiries as an incentive to make faster progress towards their goals. Participation was explicitly self-paced, yet they often volunteered apologies or explanations for lack of progress:

> *No progress yet. Sorry. Work hasn't lightened up yet. (Glen)*
>
> *I'm just having way too much fun with this, which can cause me to dwell on certain aspects longer than I perhaps should. (James)*
>
> *Been very busy and got a new computer so haven't had time. (Jeff)*
>
> *Can I do this later in a couple of days time please? (Lee)*
>
> *I took an extended trip out of town and just got back a few days ago. (Sonia)*

They appeared to have brought to the study an internalized sense of what constituted a reasonable pace, creating an additional motivation to find time for their learning projects when a teacher was involved. Some participants appeared to adopt the closure of the study site as a personal deadline for finishing a project:

> *When is the last day I can post here? (Glen)*

> *Thanks for ... extending the deadline [for closing the study site]. I am really thrilled to finish this project. (Sonia)*
>
> *Are you closing your class soon? (Lee)*

They also appeared to be motivated by my active interest in their inquiries. For example, participants sometimes responded even to constructive criticism with thanks for my "encouragement". Several asked whether they were supplying enough data for the study; Glen in particular expressed concern that his slow pace might be harming my research. The idea that what they were doing was not only adequate but actually helpful – that their progress was also helping me reach my goals – appeared to be an additional motivation.

As with the implied "reasonable pace", this additional motivation may have been tied to a sense that it was possible to meet expectations. Lee reported negative psychological effects from playing with a group whose expectations she found difficult to meet. Her inquiry may have been less successful in part because she could not frame her goals in terms of progress that she believed she could achieve.

Connecting formal knowledge and experience

When education does not help learners link formal knowledge to real-world experiences, they may have trouble making such connections for themselves. When I designed this study, I expected it would attract mainly inexperienced musicians who had difficulty finding OERs that were relevant to their learning goals. Instead, most participants were capable musicians who could easily find relevant information but consistently had trouble making use of it, due to difficulties connecting the generalized concepts to their specific experiences and goals. In fact, this type of difficulty appeared to be the main barrier to independent learning in most cases (Schmidt-Jones, 2016a).

Jeff was seeking knowledge about scales and chords, but he assumed that the scales and chords featured in theory courses were not relevant to the music he liked. As well as focusing on classical music, the courses and texts use common notation, which he could not read, to explain and illustrate concepts. Working in the context of his chosen genre and his DAW screen allowed Jeff to discover that the scales and chords featured in basic theory texts were in fact relevant and useful. His responses consistently indicated eagerness to continue learning in this way: "It makes a lot of sense to me and is EXTREMELY amazing and interesting. ... I don't know much about tonality either. If you could maybe explain it in the ways best and easiest to understand" (Jeff, contact 7).

Sonia's difficulty in creating knowledge-experience connections mainly stemmed from a lack of practice, due to her novice status as a jazz improviser and the fast pace of the MOOC. James' stemmed in part from the fact that his chosen instrument and genres are associated with informal learning practices. Much of my activity within their inquiries involved helping participants connect theory concepts to their experiences and goals. As with Jeff, I did this by using the relevant concepts to discuss their activities, which provided a context that included familiar genres, instruments, and visual representations of music, and by suggesting additional authentic activities in which to practice the concepts.

Relevant Learning Activities

I originally published music-theory OERs because I believed that traditional approaches to the subject do not include enough authentic activities. By explaining each concept in an open-access module, I hoped to make it available whenever it becomes relevant to a learner's music-making activities. However, the activities included in the OERs were similar to those in typical theory books. I assumed that learners or their teachers would supply the real-world activities. Such assumptions create barriers, particularly for independent learners struggling to make knowledge-experience connections.

James relied on me to suggest guitar-based activities that would lead towards his goal, but was surprised by my first suggestion, to analyse the chord progression of a favourite piece and compose something using what he learned. He had expected a rote harmony exercise, but he took up the suggestion enthusiastically. James possessed the necessary skills and knowledges, but did not know how to use them together in this way. When he reported feeling overwhelmed, I proposed instead a variety of activities to focus his attention serially on the specific concepts and skills needed. His response suggested renewed confidence:

> *See, this is where having an experienced instructor makes a difference from looking at endless web pages. Now, I'm inspired to go on rather than give up or set it aside for longer than may be healthy to my musical development (which I've done in the past). (James, contact 7)*

This scaffolded activity demonstrated to James how to make the progress he desired. Suggesting appropriate, authentic activities that are within the learner's zone of proximal development appeared to be a crucial step in helping participants create a knowledge-experience connection. Other participants, such as Jeff, Sonia, and Lee, also

appeared to need suggestions for specific learning activities that were both doable and relevant to their goals.

Focus of Attention

The human brain is capable of coordinating many simultaneous automatic processes, but conscious attention is limited. One goal of education is to create new automatic processes, but this initially requires the learner to focus attention on the concepts and skills that need to be automaticized. This is why the use of familiar tools and actions in the inquiries was often the change-in-activity that led to progress. As James' inquiry illustrated, a crucial feature of good learning activities is that they are doable in part because they permit conscious attention to focus on only one new thing. Similarly, Sonia's fluency increased when we found ways to reduce the number of things that needed her conscious attention when she improvised.

In contrast, lack of a useful focus for Lee's attention appeared to be a barrier to progress that we failed to overcome. The numerous notes in a typical piano part tend to overwhelm the attention of someone trying to improvise or transpose them individually. Chord symbols, which represent specific groups of notes, are a notational shorthand used extensively in most jazz and popular genres for just this reason. They are an example of what makes theoretical concepts so powerful; they focus attention on one characteristic that various experiences have in common (Vygotsky, 1978). For example, Sonia, James, and Glen were capable musicians and music learners in part because they could use concepts such as *C7 chord* to automatically categorize a variety of music reading, playing, and listening experiences. James' inquiry goals indicated a belief that better chord recognition would improve his composition skills, a belief supported by his progress. Like other jazz musicians, Sonia found that the more automatic her response to hearing, seeing, or playing a named chord, the smoother and more persuasive her improvisations became.

Lee reported that she had forgotten her chord theory; she could, for example, easily play the notes constituting a C7 chord and recognize whether they sounded appropriate in the music, but could not name the chord as such. Over the course of the study, her ability to interpret chord symbols improved, as did her ability to use them to create a piano part by extending an example. However, her ability to transfer the relevant knowledge to a new piece did not noticeably improve. It appeared that so much of her attention was focused on the chords that she could not focus on the skills she desired. The inability to categorize her experiences in terms of chord symbols may also have interfered with

her ability to transfer what she learned to a new situation, because she could not focus during a learning activity on its useful, transferrable aspects.

Goal-oriented feedback

Feedback is also necessary for learning. Unlike the right/wrong feedback needed in rote exercises, feedback on authentic activities involves constructive criticism of the work in relation to the learning goal. Self-directed musicians often get sufficient feedback from self-assessment and audience response. However, as Lee's inquiry demonstrated, even experienced musicians may be able to hear the problems in their work yet not know how to solve them, leading to frustration rather than progress.

Glen volunteered self-assessment whenever he submitted his work. I did not limit my feedback to addressing concerns that he raised, but I did try to focus on possible solutions to problems he perceived. He sometimes tried following my suggestions, but as a knowledgeable and experienced musician, he often responded to my feedback by defending his creative choices. Near the end of the study, I pointed out that he had probably been capable of creating the compositions without my input and asked whether he thought the study had any effect. He responded by discussing the difficulties of staying motivated when his community of practice was not interested in his efforts:

> *I am much more productive in a collaborative environment. I don't get much of that from the guys I'm currently jammin' with. ... I see your ... involvement as somewhat of a catalyst. I think it has been significant. (Glen, contact 26)*

It appears that the only thing Glen sought or received from the study was the additional motivation, as discussed above, and my "collaborative" feedback regarding his creative work.

Rote practice, requiring only right/wrong feedback, can be compatible with self-motivated inquiry when clearly tied in the learner's mind to the real-world goal. James and Lee, as well as other study participants, sought and completed such work. However, nearly all the participants were most interested in feedback on creative, open-ended activities. Sometimes this was, as with rote work, a matter of checking the correctness of a particular aspect of the creation:

> *I'm trying to do it by ear, and it's not easy. I would appreciate if you could review it before I start adding sevenths. (James)*

> *[regarding a piano part she had created and then revised] I have made the amendments. ... Is this correct now please? (Lee)*

Sometimes participants felt their work sounded wrong and were soliciting help in locating the problem:

> *I can't get the notes to sound right, especially the end. Any suggestions or help? (Jeff)*

> *Would you please help me and see what's wrong ... ? (Lee)*

In some instances, however, participants were simply open to suggestions that might help improve either the current creation or subsequent works:

> *At this point, I'm not sure what to do with it. The ideas I have experimented with don't really seem to capture my attention. (Glen)*

> *I have attempted as best I could and have added the percussion just for the fun of it. Please advise me more. (Jeff)*

> *I'd appreciate any comments to help me do better next time. (Sonia)*

Participants sometimes reported that feedback led to a change that pleased them:

> *It does sound quite different! I've attached a new score. I've also played it on the guitar, and it sounds quite nice. (James)*

> *Your first suggestion was very helpful. (Jeff)*

Feedback also sometimes led to a shift in activity or focus of attention:

> *How do you know it is in Aeolian A minor? How do you recognise these kinds of things? (Jeff)*

> *Thank you for your very insightful comments. Your suggestions are very helpful. ... I will try your "no wrong note" approach. (Sonia)*

Conclusions

As often happens in AR studies, the findings have changed my own perspective as a researcher. I remain committed to offering OERs that can be used independently, and I

am working on new content that may help informal music learners create useful knowledge-experience connections for themselves. However, I do not want to ignore the implication that online materials are more useful when learners can move "seamlessly" between independence and guidance, as needed. Also, while some online learners may be most interested in quality content, others appear to prefer social learning activities (McAndrew et al., 2008). I now believe that a crucial avenue to pursue, to make my OERs more useful, is to tie them explicitly to various active supports that may be available through informal or formal learning situations, both online and locally. Many thriving online musical communities of practice already offer learners a variety of content, informal support, and formal help in the context of goal-oriented activities (e.g. Lysloff, 2003; Waldron, 2009). I have not yet found any that focus on the creative uses of theory, but involvement in this type of offering may be an important step for my future action research.

This small, qualitative study in the area of music cannot support general conclusions about self-motivated learners who use OERs. Instead it illustrates some of the barriers they may encounter and the types of teacher assistance that help overcome these barriers. Like Jeff and James, self-motivated learners may have backgrounds that are not well aligned with assumptions about "prerequisite" knowledge. Like Glen, their goals may not be well aligned with standard curriculum goals. Like Sonia and Lee, they may be busy adults who want or need to absorb new concepts and gain new skills at their own pace over extended periods of time. Given these situations, the study participants first tried to use OERs independently to learn within the contexts of the activities that motivated them. When this proved difficult, teacher involvement in their personal inquiries provided additional motivation, goal-oriented feedback, and authentic activities that focused their attention in ways that helped them connect formal knowledge to their real-world experiences.

The finding that self-motivated learners benefit from these aspects of inquiry guidance is not surprising; these issues are well-studied and recognized. What is new is the finding that it is these, rather other well-known issues, that appeared to be most crucial for learners who had both intrinsic motivation and access to a wealth of relevant materials. It is also important to stress that the benefits were provided through inquiry, with learners choosing goals as well as materials. Many approaches, like the MOOC that Sonia was enrolled in, use technology to reproduce traditional curricula rather than to offer a greater variety of goals, starting points, or pacing. The few MOOCs that are organized to support inquiry may overwhelm less-experienced students (Kop, Fournier, & Mak, 2011). Nor do automated systems provide authentic-learning activities; as Lee

(2008) has pointed out, they tend to close, rather than open up, learner choices. They cannot recommend materials and activities, and provide social motivation and feedback, for personalized learning paths. For example, there are automated systems that can check a music composition for correctness, but mere correctness is not sufficient to create a compelling, interesting piece:

> *In the book 'What Makes Music Work', I read a lot about melodic movement, and I tried to incorporate some of that. I find that it sounds like a sterile scale exercise, rather than a melody, and I'm not sure what to change to make it sound less 'theoretical'. (James, contact 19)*

> *A week ago I decided to dust off my theory book. I wasn't really getting anything significant out of it. ... just a bunch of uninspiring rules. ... The one thing I really took from theory is you can break all the rules if you can resolve your chords. (Glen, contact 18)*

As Glen's inquiry demonstrated, what is motivational about feedback is the social connection to the human communities that value the activity.

In an information-rich environment, one of the most valuable uses of teaching time may be providing these supports within an inquiry-based pedagogy. In this study, learner motivation arose not from the *processes* of inquiry but from its connection to the learners' *goals*. The goals originally created the learners' desire for the formal knowledge and continued to motivate them throughout the process of discovering how to connect that knowledge to their real-world experiences. As James (contact 22) put it:

> *This has been immensely beneficial to me, and has fundamentally changed the way I listen to, and learn music. I will continue on my own, sporadic as it may be. ... I may stumble a lot more than if you were guiding me, but that's part of the learning as well.*

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Emerging Evidence Regarding the Roles of Emotional, Behavioural, and Cognitive Aspects of Student Engagement in the Online Classroom

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Abstract

There is emerging evidence that suggests emotions as a discrete factor in academic online contexts that significantly contribute to student engagement and higher order learning (Cleveland-Innes & Campbell, 2012; You, 2012, You & Kang, 2014; Zembylas, 2008; Liaw, 2008). Pekrun (2000) and Pekrun, Goetz, Frenzel, Barchfeld, and Perry (2011) developed the control-value theory of achievement emotion that not only showed that emotions represent a discrete category in student engagement, but that there are certain factors such as perceived academic control and self-regulation that function as antecedents of students' emotional reactions that affect online learning. The aim of the present paper is to review the emerging research evidence of the impact of emotions on students' engagement in order to understand the distinct role that emotions may play in online learning. The review also proposes strategies and activities that teachers can use in order to enhance students' positive engagement in online learning. The findings suggest that emotions are significant factors in students' engagement in online learning while cognitive and behavioural factors function as antecedents of emotions in online contexts. The inclusion of emotional, cognitive and behavioural strategies in online teaching can enhance students' engagement and learning experience in the online classroom.

Abstract in Greece

Αναδυόμενα ερευνητικά δεδομένα μας δείχνουν ότι τα συναισθήματα αποτελούν διακριτούς παράγοντες στα ακαδημαϊκά διαδικτυακά πλαίσια και συνεισφέρουν σημαντικά στην συμμετοχή των φοιτητών στην μάθηση, στην κριτική σκέψη και στην επίλυση προβλημάτων (Cleveland-Innes & Campbell, 2012; You, 2012, You & Kang, 2014; Zembylas, 2008; Liaw, 2008). Ο Pekrun (2000) και οι Pekrun, Goetz, Frenzel, Barchfeld, και Perry

(2011) ανέπτυξαν την θεωρία των συναισθημάτων που συνδέονται με την επίτευξη μαθησιακών στόχων και βασίζονται πάνω στον ατομικό έλεγχο και στην αξία που έχει η μάθηση για τον φοιτητή (control-value theory of achievement emotion) δείχνοντας ότι τα συναισθήματα δεν αποτελούν μόνο μια διακριτή κατηγορία στην συμμετοχή των φοιτητών στην μάθηση, αλλά ότι υπάρχουν συγκεκριμένοι παράγοντες, όπως η αντίληψη του να έχουν οι φοιτητές ακαδημαϊκό έλεγχο και αυτορρύθμιση, οι οποίοι προηγούνται των συναισθηματικών αντιδράσεων των φοιτητών και επηρεάζουν την διαδικτυακή μάθηση.

Ο σκοπός της παρούσας εργασίας έχει στόχο την ανασκόπηση των αναδυόμενων ερευνητικών δεδομένων για την επιρροή των συναισθημάτων στην συμμετοχή των φοιτητών στην μάθηση έτσι ώστε να κατανοήσουμε τον διακριτό ρόλο που διαδραματίζουν τα συναισθήματα στην διαδικτυακή μάθηση. Η ανασκόπηση επίσης προτείνει στρατηγικές και δραστηριότητες που μπορούν οι καθηγητές να χρησιμοποιήσουν για να εμπλουτίσουν την θετική συμμετοχή των φοιτητών στην διαδικτυακή μάθηση. Τα ευρήματα δείχνουν ότι τα συναισθήματα αποτελούν σημαντικούς παράγοντες στην συμμετοχή των φοιτητών στην διαδικτυακή μάθηση ενώ γνωστικοί και συμπεριφορικοί παράγοντες προηγούνται των συναισθημάτων στα διαδικτυακά πλαίσια. Η ενσωμάτωση συναισθηματικών, γνωστικών και συμπεριφορικών στρατηγικών στην διαδικτυακή διδασκαλία μπορεί να εμπλουτίσει την συμμετοχή των φοιτητών και την μαθησιακή εμπειρία στην διαδικτυακή τάξη.

Abstract in Spanish

Existe evidencia emergente que sugiere que las emociones son un factor discreto en los contextos académicos en línea que contribuyen significativamente a la participación de los estudiantes y al aprendizaje de orden superior (Cleveland-Innes & Campbell, 2012; You, 2012, You & Kang, 2014; Zembylas, 2008; Liaw, 2008). Pekrun (2000) y Pekrun, Goetz, Frenzel, Barchfeld, y Perry (2011) desarrollaron la teoría del control-valor de las emociones de logro que no sólo demuestra que las emociones representan una categoría discreta en la participación estudiantil, sino que hay ciertos factores, como el control académico percibido y la autorregulación, que funcionan como antecedentes a las reacciones emocionales de los estudiantes que afectan el aprendizaje en línea. El objetivo de este artículo es revisar la evidencia emergente de investigaciones sobre impacto de las emociones en la participación de los estudiantes para comprender el papel específico que las emociones pueden jugar en el aprendizaje en línea. La revisión también propone estrategias y actividades que los profesores pueden utilizar para mejorar la participación positiva de

los estudiantes en el aprendizaje en línea. Los hallazgos sugieren que las emociones son factores significativos en la participación de los estudiantes en el aprendizaje en línea, mientras que los factores cognitivos y de comportamiento funcionan como antecedentes de las emociones en los contextos en línea. La inclusión de estrategias emocionales, cognitivas y conductuales en la enseñanza en línea puede mejorar la participación de los estudiantes y la experiencia de aprendizaje en el aula en línea.

Abstract in Portuguese

Há evidências emergentes que sugerem que as emoções são um fator discreto nos contextos acadêmicos online que contribuem significativamente para o engajamento dos alunos e a aprendizagem de ordem superior (Cleveland-Innes & Campbell, 2012; You, 2012, You & Kang, 2014; Zembylas, 2008; Liaw, 2008). Pekrun (2000) e Pekrun, Goetz, Frenzel, Barchfeld, e Perry (2011) desenvolveram a teoria do controle-valor das emoções de realização que, não só mostrou que as emoções representam uma categoria discreta no engajamento do aluno, mas que existem certos fatores como a percepção de controle acadêmico e auto-regulação que funcionam como antecedentes das reações emocionais dos alunos que afetam a aprendizagem online. O objetivo deste artigo é revisar a evidência emergente nas pesquisas sobre o impacto das emoções no engajamento de estudantes para compreender o papel específico que as emoções podem jogar na aprendizagem online. A revisão também propõe estratégias e atividades que os professores podem usar para melhorar o envolvimento positivo dos estudantes na aprendizagem online. Os resultados sugerem que as emoções são fatores significativos no engajamento dos estudantes na aprendizagem online, enquanto que os fatores cognitivos e comportamentais funcionam como antecedentes das emoções em contextos online. A inclusão de estratégias emocionais, cognitivas, e comportamentais no ensino online pode melhorar o envolvimento dos estudantes e a experiência de aprendizagem na sala de aula online.

Keywords: online learning, emotions, cognition, behaviour, student engagement, higher education

Introduction

A number of theoretical advances have emerged as our understanding of the factors important to online learning has increased. One of the most influential theoretical frameworks, the community of inquiry model (COI) (Garrison, Anderson, & Archer, 2000), identifies social, cognitive, and teaching presence as fundamental to the online

learning experience and important for collaborative and higher order learning. Social presence reflects the ability of learners to express themselves socially and emotionally in order to be perceived as "real people" in the online environment. Cognitive presence involves the degree that learners are able to construct and confirm meaning on the basis of discourse and reflection. Teaching presence refers to instructional design, teachers' facilitation, and direction of social and cognitive presence that will help the learner achieve a personally meaningful learning outcome.

The COI model does not consider emotional presence as a discrete factor in student engagement and learning. Instead, the model conceptualizes emotional presence as overlapping with social presence (Garrison, Anderson, & Archer, 2010). Although research has supported the theoretical constructs of the COI model, there is still a debate about its explanatory power related to online learning (Garrison & Arbaugh, 2007). The lack of quantitative studies, the use of different statistical methods in the few quantitative studies that have been conducted, and the focus on qualitative studies that examine transcripts, texts, and coding protocols may account for the lack of consistent findings. Failure also to conceptualize emotional presence as a discrete construct in explanatory models of online learning, including the COI model, may lead to misinterpretation of the potential effect of emotional presence on student learning. While the COI model considers socio-emotional communication to be important, it does not consider its effect on learning. Emotion and social interactions cannot be studied separately from cognitive and teaching presence (Garrison & Arbaugh, 2007).

Student engagement involves cognitive, behavioural, and emotional dimensions that contribute to higher-order thinking and motivate students' learning (Trowler, 2010). The main components of student engagement, on the basis of Bloom's taxonomy, have been conceptualized using three dimensions of engagement – behavioural, emotional, and cognitive. Behavioural engagement refers to student attendance and involvement in a course and includes negative behaviours, such as classroom misbehaviour (e.g., a student is posting aggressive comments or is rude towards his/her classmates). Emotional engagement involves affective reactions such as interest, sense of belonging, enjoyment, boredom, rejection, and frustration, while cognitive engagement reflects interest in learning by going beyond class requirements or even redefining the parameters of assignments.

Cognitive, behavioural, and emotional dimensions of student engagement involve feelings, sense making, and action. Consequently, a dimensional model of engagement would assert that acting without any feeling reflects just involvement or compliance in

learning (Fredricks, Blumenfeld, & Paris, 2004). Although the COI model posits that socio-emotional communication establishing social presence in the online classroom is important for student engagement, it does not consider socio-emotional communication as a dynamic dimension of online learning. In short, the COI model focuses solely on the educational purpose of establishing teaching, social, and cognitive presence and asserts that personal relationships and interactions, which have emotional components, must be defined in strict academic terms (Garrison & Arbaugh, 2007). This appears counter to existing literature that shows the importance of emotional involvement on student engagement and learning in online contexts (Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010).

Nevertheless, we believe that it is important to clarify some misconceptions that seem to characterize the field and that these need to be taken into consideration in the design of future studies on emotions and online learning. Overall, it is essential to distinguish the study of emotion as a distinct factor in *online learning* (e.g., helping students or not helping them to increase higher order thinking) from the study of emotion as increasing *student engagement* with online learning. Emerging evidence, as this review suggests, shows that emotions may have a mediating effect on *online learning* via their significant impact that emotions appear to have on *engagement with their online learning*; that is, emotional states and related factors seem to influence the way students will engage with their online learning and performance.

The aim of this paper is to review the emerging research evidence of the impact of emotions on online learning specifically as it relates to student engagement in order to understand the distinct role that emotion may play in online learning. The relationship of emotion to cognitive and behavioural aspects of learning as well as student individual differences will be also reviewed, as there is evidence that supports the effect of emotion, cognition, behaviour, and individual differences on student engagement and higher order thinking in online learning. On the basis of this review certain emotional, cognitive and behavioural strategies and activities will be discussed with the goal of assisting teachers with improving student engagement in the online classroom.

The impact of emotion on student engagement and higher order thinking in online learning

Although the impact of emotions on learning has not been examined widely in both traditional and online learning environments, emerging evidence suggests the discrete role emotional involvement plays in learning. Pekrun, Goetz, Titz, and Perry (2002) and

Pekrun et al. (2010) showed that emotions, defined as academic emotions which include, hope, pride, relief, anxiety, anger, shame, boredom, and hopelessness, were significantly related to academic achievement, student motivation, learning strategies, self-regulation, and value appraisals.

Cleveland-Innes and Campbell (2012) showed that emotional expressions were not only significant indicators of social presence in the online classroom but that emotions emerge as a distinct factor in the online classroom. The authors defined emotional presence as "the outward expression of emotion, affect, and feeling by individuals and among individuals in a community of inquiry, as they relate to and interact with the learning technology, course content, students, and the instructor" (p.283). The researchers showed that emotions, reflected in the classroom as exhibiting appreciation, delight, disappointment, fear, frustration, hope, and preference, were present when students referred to their online learning experience. Furthermore, results indicate that emotions were reflected in more complex interactions such as student responses in a text format found in asynchronous classroom conference postings and not in responses from students to a modified COI questionnaire/online survey measuring social presence, cognitive presence and teaching presence. The modified COI questionnaire included additional items that were designed to measure emotional presence. Using a grounded theory analysis process of open, axial and confirmatory coding, researchers found that although class conference postings and the responses in the surveys indicated that social presence was important, it appeared that more complex interactions, such as postings taking place during the submission of discussion posts in the classroom, triggered emotional states only.

The distinct effect of emotions on online learning is also evident from research investigating the performance of students during their first year of online study. The first year is a period during which social and cognitive presence is not well established, since students may not be familiar with the methodology of online learning. Zembylas (2008) showed that students experienced anxiety around online learning and stress and guilt surrounding their difficulties in balancing various roles and responsibilities. At the same time, they experienced joy for the flexibility of online learning, pride and contentment for completing the course requirements, and surprise regarding the emotional nature of the online communication. The experience of anxiety due to the unfamiliarity of the online methodology was higher at the beginning of the course, and it gradually decreased as the students became more familiar with the online communication. Overall, Zembyla's approach focused on formulating an account of how emotional discourse is used by the learners, its impact on learning, and how the

students changed over a one year timeframe. Similarly, Conrad (2002) used a survey method to show that both female and male online students' experience of negative and positive emotions including fear, anxiety, curiosity, and excitement was evident from the beginning of an online course. However, female students reported more varied and negative emotions reflecting fear and anxiety compared with male students. Female students used more emotional adjectives to describe their experience such as being scared, intimidated, vulnerable, anxious, cautious, apprehensive, and terrified, while male students reported only feeling anxious, apprehensive, and cautious.

Frustration is a discrete emotion that appears to inhibit learning in all educational settings. Increased dropout rates and retention have been associated with increased levels of frustration in both face-to-face and online learning (Liaw, 2008). O'Regan (2003) reported that frustration was the most frequent emotion associated with online study. Frustration was mostly associated with having to work and study at the same time, a lack of clear instructions for locating the required course links, and the nature or structure of the online material. Examples for the latter include different pages having very similar layouts, difficulty reaching instructions, use of outdated course readings, and superficial nature of online discussions that were not moderated.

The development of self-regulation and self-efficacy in online learning seems to be associated with emotion, academic achievement, and the learning experience. You (2012) analysed the responses of 535 online students and found that experiencing discrete emotions such as enjoyment fostered self-regulated learning, while negative feelings such as fear and boredom did not influence self-regulated learning. You and Kang (2014) found that enjoyment had a mediating effect on the relationship between perceived academic control and self-regulated learning, but the moderating effect of enjoyment was not significant. While anxiety and boredom did not mediate effects associated with self-regulating learning, they were significant moderators of the relationship between perceived academic control and self-regulated learning. Additionally, the relationship between perceived academic control and self-regulated learning differed significantly at different levels of anxiety and boredom. Students' experiences of a high degree of negative emotions was not associated with high academic control and self-regulated learning, suggesting that students experience of negative emotions in online courses in conjunction with the teachers' efforts seem to be necessary in order to increase students' awareness of their academic control.

Emotions and types of teaching

Although collaborative learning activities may have a positive effect on learning by developing higher level cognitive abilities such as problem solving, critical thinking, and communication abilities, there is evidence that shows that online collaborative learning may induce increased levels of frustration in students. Capdeferro and Romero (2012) conceptualized frustration 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 thus a challenge in goal attainment. The researchers investigated computer supported collaborative learning activities (CSCL) that may interfere with students' willingness to engage in the task. The overall tasks involved collaborative writing of papers in which students had to develop a topic or solve a case study. The authors tested groups of four to six students that participated in online CSCL activities two to four weeks duration. The interactions of the students were based on text-based tools such as discussion forums and email. They found that not only was frustration a common feeling experienced among online students, but students' perception of unequal collaboration and commitment imbalance among group members in collaborative activities were the most significant causes of frustration.

Vuorela and Nummenmaa (2004) reported on the significant influence of emotional states on online student engagement during collaborative and individual activities. They found that students who experienced more positive emotions during an online course were less aroused than those students who experienced more negative emotions. Students experiencing positive emotions, compared with those exhibiting negative emotions, tended to participate more in collaborative activities. Shen, Wang, and Shen (2009) conducted a study that included the use of emotion detection technologies from biophysical signals and combined that data with data derived from an online e-learning platform. They reported that customizing learning material delivery on the basis of a student's emotional state improved student performance by 91%. In a further analysis of data, engagement and confusion were the most important and frequently occurring emotions in learning.

These findings suggest that emotions can have a negative or a positive effect on engagement and learning. If emotions do have a direct effect on online engagement and learning, we can design courses that take into consideration the dynamic effect of emotions on the learning process. Findings also show that understanding emotions seems to be more important in online team learning involving collaborative activities than in individual learning. This is probably because the need for emotional

understanding is higher when more students are involved in class discussions and collaborative activities; ultimately, their interactions provoke more complex emotional reactions.

The antecedents of emotions: Cognition, behaviour, and individual differences

The control-value theory of achievement emotion

In addition to the discrete role that emotions appear to have in student engagement in online learning, Pekrun (2006) and Pekrun et al. (2002) showed that cognitive and behavioural factors, such as self-efficacy, self-regulation, perceived academic control, and task values, function as antecedents to emotional reaction. These factors affect student engagement in the online classroom as well as academic achievement. Control value theory suggests that control and value related cognitions are antecedents of achievement emotions or emotions that are related with learning (Pekrun et al., 2002; 2010). Controlled related cognitions refer to (a) subjective appraisals of controllability of achievement-related actions and outcomes of cause and effect relations, such as self-efficacy expectations, and learning outcome expectancies, (b) causal attributions of achievement, and (c) competence appraisals. Value-related cognitions refer to appraisals that relate to the subjective importance of the respective activities and outcomes. Several studies supported the control-value theory of achievement emotion (Pekrun et al., 2002; 2010). Artino (2008a; 2008b) found that task value, self-efficacy and instructional quality were positively associated with students' satisfaction with their online studies. You (2012) also reported that task value, classroom structure, and self-efficacy were antecedents of emotional states.

Behavioural antecedents of emotions

Several theories of learning suggest that motivation is a significant factor affecting student engagement and academic achievement in traditional and online classrooms (Zimmerman, 2002; Yukselturk & Bulut, 2007; You, 2012). Motivation refers to a process or an internal state of an organism that drives it to action. Most theories on motivation assert that motivational states are led by specific drives and needs. Thus, a particular behaviour is observed due to a specific motivational state; motivation is essential and a prerequisite for successful learning. External reinforcement through rewards and vicarious reinforcement (engaging behaviour for which models have been rewarded) can enhance motivation through internalization of motivational processes, self-regulation, and even self-reinforcement (Bandura, 1986).

Intrinsic motivation refers to a behaviour whose manifestation depends on internal factors such as feelings of satisfaction and fulfilment. Intrinsic motivation has been conceptualized as the most self-determined type of motivation. Researchers have examined the relationship between motivation and emotional states in online learning and showed that motivation was related to online student satisfaction with a self-paced course, while a course that minimized the control in learning provoked less satisfaction with the course among intrinsically motivated students (Cho & Heron, 2015).

Cognitive antecedents of emotions

Self-efficacy has been shown to predict academic success (Zimmerman, 2002), and its positive effect has also been examined with in online courses. Yukselturk and Bulut (2007) found that self-efficacy, intrinsic goal orientation, cognitive strategy usage, task value, and self-regulation were positively correlated with online academic success. On the contrary, the external locus of control and educational level were negatively correlated with online success. Successful online students used self-regulated learning strategies in online courses such as self-evaluation, organization, goal setting and planning, seeking information and social assistance, keeping records, monitoring, rehearsing and memorizing. These findings are consistent with those of Greene and Miller (1996) who found that those students having intrinsic goals tended to use deeper cognitive strategies and self-regulatory strategies and were more successful than students who did not have intrinsic goals.

Task value beliefs are also linked with online students' learning satisfaction and engagement. Specifically, task value refers to an individual's beliefs about the various reasons for engaging in a task (Pintrich & Schunk, 2002). Students' high task value beliefs contribute significantly to online students' engagement and higher order learning. Yang, Tsai, Kim, Cho, and Laffey (2006) found that online students having a perception of high task value not only used cognitive learning strategies more, but also they tended to use their peers and instructors effectively in order to enhance their learning. Lee (2011) also showed that online students having higher task value beliefs and outcome expectancies tended to be more satisfied with their learning experiences than those having lower task value beliefs and lower expectancies.

Individual Differences as antecedents of emotions

The impact of personality characteristics and emotions has been investigated less in the study of student engagement in online learning. Chen and Caropreso (2004) showed that personality affects communication type, pattern, and task engagement of students

but not message length. Furthermore, students with high levels of extraversion, agreeableness and intellectual or imaginative experiences used a two-way communication and consequently participated more in collaborative online interactions. In contrast, students with high levels of introversion tended to use a one-way communication and were less able to engage in online collaborative learning. Extroverts also prefer online instruction (Daughenbaugh, Ensminger, Frederick, & Surry, 2002).

Emotional intelligence (EI), the ability to recognize one's own and others' emotions and to use this information to guide one's thinking and behaviour has been implicated in student engagement in online learning and academic success. There have been few studies that investigated emotional intelligence and personality traits. Berenson, Boyles, and Weaver (2008) reported that the combination of high emotional intelligence and personality traits such as sociability were the strongest predictors of online student academic success, while students with tense and aggressive styles and those with an external locus of control exhibited average or below average EI scores and less academic success.

The emerging evidence about the impact of emotions and personality on online student engagement and academic success led some researchers to propose the assessment of students' individual characteristics before entering an online course. For instance, the assessment of students' entry characteristics before starting a course could be a significant asset in predicting student's engagement and learning satisfaction. Lee and Choi (2011) reported that the assessment of computer skills, internal locus of control, and English proficiency could assist in the development of appropriate course material and provide the necessary support to students, while Berenson et al. (2008) suggested the assessment of EI as a way to assist students and institutions to determine whether or not online studies are appropriate for them. Figure 1 illustrates the behavioural, cognitive and individual differences as antecedents of emotions and their relationship to students' academic success and engagement in the online classroom.

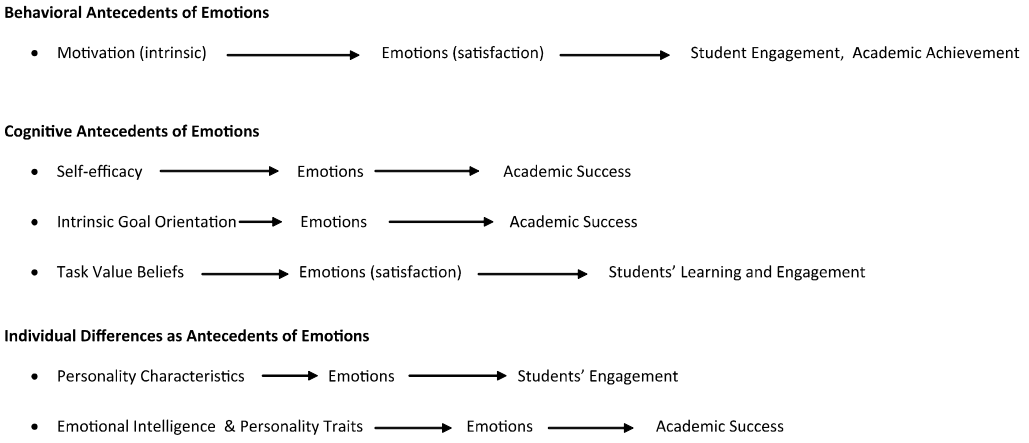

Figure 1. Behavioural, Cognitive and Individual Differences as Antecedents of Emotions and their Relationship to Students' Academic Success and Engagement in the Online Classroom

Strategies and techniques to promote students' emotional engagement in the online classroom

Emotional, behavioural and cognitive strategies can facilitate a positive attitude and engagement in an online learning context (Lee, 2011). Strategies can be used for increasing students' engagement in online contexts such as increasing positive emotions and decreasing negative emotions of students; increasing intrinsic motivation, self-efficacy, and self-regulation; improving cognition; and increasing higher order thinking. On the basis of the present review these strategies are presented below. Tables 1, 2 and 3 summarize the strategies and specific activities that teachers can apply in the online classroom.

Emotional strategies and techniques

The use of emoticons, humour, and audio in the classroom

Aragon (2003) proposed the use of emoticons in conjunction with humour and the use of audio for creating a positive climate during online teaching. These strategies may also increase learning motivation and social presence in the online classroom. Humour should serve an instructional purpose: It should, be student-oriented, consider the instructor as the target since self-deprecating humour does not offend others, and carefully consider how students might react especially in an online classroom whereas humour cannot be embellished by nonverbal cues (Shatz & LoSchiavo, 2006).

The use of pedagogical humour in education can have positive effects on reducing stress levels and increasing student engagement. Although the impact of humour in education has not been studied extensively, there is evidence that shows that the appropriate and wise use of humour can assist teachers. LoSchiavo and Shatz (2005) demonstrated that the use of humour in an online psychology course affected positively student interest and participation in the course, but it did not have an effect on course performance. Further evidence for the positive influence of using humour in the online classroom comes from Kher, Molstad, and Donahue (1999), who reported that the appropriate use of humour increased students' interest and reduced their anxiety about more technical subjects such as statistics and research methods.

Emoticons can also be used for creating a more human atmosphere in the online classroom as well as making connections with students. Emoticons involve facial expressions that are created with the use of punctuation marks on the keyboard. There are recent technological advancements that allow the use of facial expressions that the learner can use that do not require the use of punctuation marks. The use of emoticons can assist the learner in interpreting the messages sent by instructors and other students, because they help convey the nonverbal messages of the communicator.

The use of audio can also assist in the creation of a positive climate in the online classroom. There are two types of audio broadcasting. During one-way audio, the instructor broadcasts to students, and in two-way audio both instructor and students broadcast to each other. The use of audio assists not only in the establishment of social presence, but also in the correct interpretation of text-based messages, since it reflects the emotions of the instructor and other students. In this way, arousal and negative emotions are minimized. The use of emoticons and two-way audio also helps in the development of a classroom community that reflects the social and cognitive presence elements and indicators of the COI model (Garrison & Arbaugh, 2007).

The use of anticipated or self-referential feedback

The use of anticipated feedback seems to have a powerful effect on students' achievement goals and achievement emotions. Anticipated or self-referential feedback reflects students' improvement of performance over time, while anticipated normative feedback reflects the comparison between students' performance/grades. The type of achievement feedback that students anticipate to receive shapes their concept of competence and promotes the adoption of related achievement goals. In self-referential feedback, competence is defined as the improvement of a student's present performance over his/her past performance while in normative feedback competence is defined

relative to other students' performance. Pekrun, Cusack, Murayama, Elliot, and Thomas (2014) showed that self-referential feedback had a positive influence on the adoption of a mastery goal, while normative feedback had a positive effect on performance approach and performance-avoidance goal adoption. Overall, the type of feedback and students' achievement goals predicted test-related emotions. For instance, self-referential feedback that was based on self-improvement initiated mastery goals, while normative feedback that was based on social comparison (normative grading that leads students to perceive they performed better or worse than others) initiated performance goals. Mastery goals have been associated with students' positive affect and enjoyment of learning and were negatively linked with anger and boredom. Performance-approach goals have been associated positively with students' pride and hope while performance-avoidance goals to their anxiety, shame and hopeless. The findings suggest that mastery goals are related to activity emotions such as enjoyment, anger and boredom, while performance-based goals are related to the emotions linked to the success and failure outcomes of the activities (outcome emotions) such as hope, pride, anxiety, hopelessness, and shame.

Consequently, teachers could minimize students' experience of negative emotions and promote enjoyment in learning by helping them to master goals and engage in their learning through providing self-referential feedback. It is expected that anticipated self-referential feedback will lead students to adopt the related achievement goals, and this behaviour will help them to experience positive emotions such as enjoyment and less anger. For instance, if the student is advised to improve critical and analytical thinking, and the teacher can communicate this in terms of the students' course of improvement or non-improvement, then the student can receive a significant type of help via self-referential feedback and will be able to adopt and master the goal. The encouragement of students to employ mastery goals will also contribute significantly to students' experience of positive emotions and fewer negative emotions during online learning. Huang's (2011) meta-analysis of 77 studies (N=30,003) examining correlations between achievement goals and achievement emotions reported that students' adoption of mastery goals were related to more intense positive emotions while performance avoidance goals were associated with stronger negative emotions. Specifically, mastery goals were associated with positive emotions such as interest and enjoyment whistle achievement goals were associated with negative achievement emotions such as boredom and anxiety.

The effect of culture on emotions

Culture has an effect on online engagement and the experience of specific emotions. According to the universality hypothesis, all humans innately express and recognize the same emotions in nonverbal behaviours, including vocalizations (Sauter, Eisner, Ekman, & Scott, 2010). It is widely acknowledged that language and conceptual understanding does not affect the recognition of emotions. However, there is evidence that suggests that the connections between specific vocalizations, such as crying, and specific perceived mental states, such as sadness, are not the same cross-culturally. Barrett, Mesquita, and Gendron (2011), in a review of studies on context and emotion perception, suggested that emotion perception is culturally relative and that performance is dependent on the conceptual context provided to participants (Nelson & Russell, 2013). It is becoming clear that valence perception (the perception of a stimulus as positive or negative) rather than discrete-emotion (e.g., anger, happiness), is robust across cultures (Gendron, Roberson, van der Vyver, & Barrett, 2014).

The relationship between emotion perception and cultural background seems to be very important in online programmes in which students and teachers from different cultures collaborate. Additionally, since verbal communication is limited in many online programmes, it is more difficult to detect emotion perception and reactions from students or teachers. Thus, the valence of emotions that is explicitly evident in verbal communication and that appears to be a universal phenomenon is more limited in online learning, making the perception of affective understanding more difficult. Consequently, the teacher and the learner need to rely on the emotion perception that is based on the perceptual context of the online classroom that is culturally relative; this makes cross-cultural understanding of emotions by instructors mandatory.

The effect of culture on emotions is important in all models of learning, since communication between students and teachers is so fundamental to learning. The way students from different cultures interpret different messages in different academic contexts can lead to misunderstandings and the development of negative emotions. For example, the effect of power distance, which refers to the higher status that a faculty member holds in comparison to students in many cultures, varies among cultures. For example, students from China have a high degree of power distance toward their teachers, and they may avoid approaching teachers or asking questions directly. Misunderstandings may also arise due to differences between high and low context cultures. In a high context culture, it is the listener's responsibility to figure out what is being said in a conversation, whereas in a low context culture, it is the speaker's

responsibility to make sure that the message is understood. Typically, China represents a high context culture, and North American a low context culture. Students from high context cultures typically feel they have the responsibility to understand the message that it is given in an academic context, and they may avoid approaching the teacher to clarify any misunderstandings (Dimitrov, 2014). It is essential to train teachers on intercultural differences in learning to help students from different cultural backgrounds increase the chances of having a positive learning experience. Being aware of how the cultural aspects, such as students coming from high or low context cultures, influence students' behaviour, teachers can guide and support their students from such contexts and reduce students' negative emotions such as anxiety, helplessness, and frustration. For instance, if we have a student from a high context culture who quotes a lot of material from other authors in his work and avoids to evaluate the respective studies then we need to encourage our student to evaluate others' work by saying in our feedback that it 'is fine to critically evaluate others' opinions in the context of academic writing'.

Creating courses with high task value

Negative beliefs of task value are related with increased levels of frustration in the online class. Course designers and instructors can construct and provide interesting, useful and balanced learning tasks and activities in order to help students to perceive a high task value and decrease frustration. Students tend to report feelings of boredom when they perceive task demands as being challenging or not challenging. Acee et al. (2010) showed that students reported that in over-challenging situations, their feelings of boredom and other negative emotions for the task were related to anxiety. Students reported that they experienced higher levels of negative emotions such as anger, hopeless, anxiety and shame in over-challenging situations. Thus, tasks that reflect moderate challenge can reduce the potential boredom or anxiety that students may experience as a result of task demands.

Cognitive strategies

The use of learning strategies and actions to increase motivation has a direct positive effect on students' learning and academic success (Wang, Peng, Huang, Hou, & Wang, 2008). Guidance to students can assist them in developing effective learning strategies. Clear and concise learning objectives will help students make the correct choices of and implementation of learning strategies. Increased academic control and self-regulated learning in a context of positive emotional states can also facilitate students' engagement. You, Kang, and Pahng (2013) found that perceived academic control is

positively associated with self-regulated learning moderated by emotions. The study conceptualized emotions on the basis of the control-value theory of learning. Boredom and anxiety had significant moderated effects between students' perceived academic control and self-regulated learning while enjoyment did not have any significant effect.

The use of self-reflection and correct attribution of successes and failures can help students to develop self-efficacy. The inclusion of an online questionnaire to assess student learning strategies can help as well. The Study Process Questionnaire (SPQ) (Andrews, Violato, Rabb, & Hollingsworth, 1994) examines depth of learning and specifically how students choose to strategize their learning in a particular learning setting. Online programmes can use the SPQ in order to help students improve their learning and specifically to monitor themselves in terms of the way they study and the strategies that they use or do not use. The SPQ can increase awareness of their study and enhance their self-efficacy, since students will understand the way they study and whereas they need to be improved.

The learner's attribution for success or failure is the one that will determine self-efficacy, future expectancies, and emotion. Clear instructions and feedback to students can help students attribute their learning performance correctly. Also, instructor awareness of student understanding of the tasks can help students change attributions via positive instructor feedback or discussion. For instance, if a student believes that effort only produces success in learning, then the instructor can challenge such an attribution by offering information on the use of appropriate and effortful learning strategies that will increase learning (Linnenbrink & Pintrich, 2002).

Behavioural strategies

Behavioural strategies involve understanding individual characteristics of students and the application of appropriate instructional interventions. Chen and Caropresso (2004) suggested that mixing introverts and extroverts in the same group created a more effective communication and task engagement. Thus, knowledge of individual differences can be used to facilitate more student engagement. Teachers can learn about their students' characteristics by inviting them to post short biographies in the classroom during the first week of the module and by asking questions about expectations from the module.

Online student engagement can also be fostered with the use of instructional interventions. The COI model emphasizes the importance of teaching presence and its categories such as design and organization, facilitation of discourse, and direct

instruction. However, exact understanding of the role of teaching presence in online learning and sense of community is not clear yet (Garrison & Arbaugh, 2007). Shea (2006) reported that only one dimension of the COI model – recognition of effective directed facilitation – contributed significantly to students' sense of an online learning community. Directed facilitation, including facilitation of discourse and directed instruction, reflected two factors of the teaching presence construct. Specifically, directed facilitation was used to identify and resolve areas of agreement and disagreements with students, reinforce student contributions, and confirm understanding of content. Directed facilitation also contributed to students' increased sense of belonging to an online community of learners. Although effective instructional design and the instructors' organization contributed also to sense of the online community of learners, which included shared purpose, trust, connectedness, and learning, the collective effect on student sense of the online community was smaller.

Collaborative learning seems to be important for students' academic achievement, but as has been already suggested in this review, it is also positively associated with increased levels of frustration. Capdeferro and Romero (2012) proposed that in order to decrease frustration of online students, instructors could provide explicit information about the learning model and the collaborative activities in order to assist students in adjusting their expectations, preferences, and decision-making abilities. Additionally, in order to minimize frustration in collaborative activities, the instructor can prepare students for collaboration via instruction and development of social skills that are required to work in groups. Instructor presence in the classroom and instructional interaction predicted learning achievement and satisfaction more positively than social interaction between students (Kang & Im, 2013).

Collecting and analysing students' engagement data

Student engagement carries reputational and financial benefits as well. Consequently, student engagement data are useful in determining both quality of the academic experience and the academic success of students (Kuh, 2009). Data on engagement are essential for the measuring and monitoring continuous improvement in higher education institutions (Krause & Coates, 2008).

Quantitative methods can include the use of the Achievement Emotions Questionnaire (Pekrun et al., 2011), a widely used and reliable instrument for assessing the learner's emotions in online classrooms or other available questionnaires, qualitative methods that can be used to understand emotions and engagement in online learning. Word clouds, which are dynamic visualizations of learners' self-reported feelings, offline

interviews and purposeful online conversations, intelligent tutoring systems and avatars can also be used (Rienties & Rivers, 2014). Offline interviews and purposeful online conversations use phenomenological interviews to study emotions and use of online peer mentoring discussions as a corpus for analysis of emotions respectively. For instance, Risquez and Sanchez-Garcia (2012) used online peer mentoring discussions as a corpus for analysis of emotion.

Table 1: Emotional strategies and activities that teachers can use in order to promote students' engagement in the online classroom

Type of Strategy
Emotional
-Use of emoticons by: • Using emoticons in the class's discussions and in the private communication with students to establish a bond with them
-Use of humor by: • Using appropriate and judicious humor in the introduction, transitions and at the end of the unit such as photographs, illustrations and cartoons. • Using sort, simple jokes in the introduction and transitions and using longer pieces of humor at the end of the module (Shatz and LoSchiavo, 2006) • Deriving ideas for using humor from devoted to humor research journals such as the *Journal of Polymorphous Perversity*,the *Annals of Improbable Research*
-Use of audio broadcasting (one-way or two way)
-Provide an orientation to the module prior to the beginning of the module to reduce confusion and emotional frustration (Cho and Heron, 2015)
-Use of anticipated self-referential feedback by: • Focusing your feedback on students' improvement or non-improvement rather on grades • Emphasizing in your feedback to students the importance of mastery goals
-Gain knowledge of individual differences in online learning
-Construct courses and activities with high task value that reflect a balanced challenging of activities and meaningful content. The use of relevant stories or case studies is helpful in assisting students to make connections.
-Develop intercultural understanding of academic contexts, emotions and learning and reflect this understanding in your feedback and to any communication with students
-Encourage students to employ mastery goals
-Use a positive tone in your text and non-text communication with students by: • Using norms in your communication with students such as proper greetings and closings and encouraging a classroom environment whereas a positive tone in communication prevails • Asking from you students to use a positive tone in their communication with everyone in the classroom

Table 2: Cognitive strategies and activities that teachers can use in order to promote students' engagement in the online classroom

Type of Strategy
Cognitive
-Give guidance to students to assist them to develop an effective learning strategy -Have clear and concise learning objectives -Assist students to predict their learned outcomes and recognize their academic control in learning by: • Giving clear guidance and performance standards • Providing explicit information about the learning model and the collaborative activities in order to assist students to adjust their expectations, preferences and decision-making abilities • Utilizing motivational agents and avatars for teaching new concepts (Baylor,2012) -Assist students to increase their self-efficacy -Help students to become aware of their learning strategy by: • Completing relevant scales such as the Study Process Questionnaire (SPQ) (Andrews et al., 1994) and monitor their progress -Challenge students' attributions about learning (e.g. that effort only produces success in learning) by: • Offering information on the use of appropriate and effortful learning strategies that will increase learning

Table 3: Behavioural strategies and activities that teachers can use in order to promote students' engagement in the online classroom

Type of Strategy
Behavioral
-Understand individual characteristics of students by: • Learning about their background, culture, age, previous education, work experience via asking them to post a short biography in the first week of the module • Asking students about their expectations of the module -Prepare students for collaboration via instruction and development of social skills required to work in a group -Be proactive in monitoring and interviewing in collaborative activities in order to reduce students' frustration -Structure classroom discussions -Take an overt, directed facilitation and leadership role in the class by: • Identifying and resolving areas of agreements and disagreements with and among students • Reinforcing students' contributions and confirming students' understanding of the content -Collect and analyze students' engagement data (including emotional data) by: • Using the Achievement Emotions Questionnaire (Pekrun et al., 2011) • Learning analytics • Content analysis • Natural language processing • Behavioral indicators (e.g. the use of emoticons in online discussions) • Word clouds • Offline interviews • Purposeful online conversations • Developing empirical based student personality profiles -Be 'present' in the class by: • Interacting with students as much as you can

Conclusions

This review of the literature review suggests that student engagement involves discrete emotional components and antecedents of emotional reactions that have a significant impact on learning success in the online classroom. The findings suggest that discrete emotions influence self-regulated learning, intrinsic motivation, self-efficacy for collaborative learning activities, and beliefs of high task value in online learning. The effective management of negative emotions such as anxiety and frustration, and the facilitation of positive emotions such as satisfaction, are essential for increased engagement and academic success. Specifically, cognitive, behavioural and emotional strategies increase' engagement in online learning.

Teachers' intercultural understanding of students' emotional reactions as well as an examination of individual differences can also help increase engagement and enrolment in online learning. Institutions need to take into consideration the individual difficulties that students may experience and provide the necessary support. For instance, female students facing complex situations and responsibilities, such as balancing work and home commitments, may need more support and guidance from instructors in order to persist with their learning efforts. Collecting and analysing engagement data via quantitative and qualitative methods can also help in assessing social, cognitive and emotional aspects of online learning.

Student engagement is a significant factor not only for traditional learning, but also for online learning as it fosters students' learning and academic achievement. There appears to be a lack of quantitative research in online learning and the community of learners with an emerging need to examine the impact of emotions on online learning and engagement. Additionally, most of the studies, including the COI model, did not examine or they did not focus their study on the relationship between cognitive, behavioural, and more recently, emotional elements that are related particularly to students' engagement. Future studies need to address the relationship between cognitive, emotional and behavioural aspects of learning and higher order thinking.

Overall, it is critical to establish the discrete effect of emotions on students' engagement and online learning. If such an effect exists, then researchers need to establish its relationship with social and cognitive presence. It is important to advance our understanding of emotional, behavioural and cognitive engagement in online learning, in conjunction with cultural and individual differences. This understanding will help online teachers to design strategies and courses that will minimize the experience of negative emotions and will enhance students' intrinsic motivation for engagement and

academic success. Institutions could accelerate such an understanding via collecting data using instruments that assess emotional, cognitive, behavioural, cultural and individual characteristics.

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Learners on the Periphery: Lurkers as Invisible Learners

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Abstract

Lurkers, who are also known as silent learners, observers, browsers, read-only participants, vicarious learners, free-riders, witness learners, or legitimate peripheral participants (our preferred term), tend to be hard to track in a course because of their near invisibility. We decided to address this issue and to examine the perceptions that lurkers have of their behaviour by looking at one specific online learning course: CLMOOC. In order to do this, we used a mixed methods approach and collected our data via social network analysis, online questionnaires, and observations, including definitions from the lurkers of what they thought lurking was. We then analysed the data by using social network and content analyses and interpreted the research findings using the concept Community of Practice, with the Pareto Principle used to delimit types of learner. Our research findings revealed that lurking is a complex behaviour, or set of behaviours, and there isn't one sole reason why lurkers act the ways that they do in their respective communities. We concluded that for a more participatory community the more active, experienced or visible community members could develop strategies to encourage lurkers to become more active and to make the journey from the periphery to the core of the community.

Abstract in Turkish

Sessiz öğrenenler, gözlemciler, tarayıcılar, sadece okuyan katılımcılar, hayali öğrenenler, bedavacılar, tanık öğrenenler veya bu çalışmada da tercih edildiği üzere çevresel katılımcılar olarak da tanımlanan gizil öğrenenler, neredeyse görünmez olmalarından dolayı bir ders sürecinde takip edilip belirlenmeleri zor olan öğrenenlerdir. Bu bağlamda bu konuya değinebilmek ve gizil öğrenenlerin davranışlarından kaynaklanan anlayışlarını inceleyebilmek için çevrimiçi bir ders olan CLMOOC incelenmiştir. Bu amaçla karma araştırma yöntemi benimsenmiş ve gizil

öğrenenlere yönelik yapılan tanımlar da incelenip çalışmaya dâhil edilerek, sosyal ağ analizi, çevrimiçi anket ve gözlem yoluyla araştırma verileri toplanmıştır. Elde edilen veriler sosyal ağ analizi ve içerik analizi yoluyla incelenmiş, araştırma bulgularının yorumlanmasında Uygulama Toplulukları, öğrenenlerin belirlenmesinde ise Pareto Prensibi'nden faydalanılmıştır. Araştırma bulgularına göre gizil öğrenme karmaşık bir davranış veya davranışlar bütünüdür ve gizil öğrenenlerin ilgili öğrenme topluluklarında niçin bu şekilde davrandıklarına yönelik tek bir sebep yoktur. Araştırma sonucuna göre, daha katılımcı bir topluluk oluşturabilmek amacıyla daha aktif, deneyimli veya görülebilen, belirgin topluluk üyeleri gizil öğrenenleri daha aktif olmaya teşvik etmek ve onların çevresel yörüngeden merkezdeki ana topluluğa doğru yolculuklarını sağlamak için stratejiler geliştirmeleri önerilmektedir.

Abstract in Greek

Οι ενεδρεύων χρήστες, «lurkers» στα αγγλικά, και κοινώς γνωστοί με άλλους όρους όπως για παράδειγμα «σιωπηλοί μαθητές», «παρατηρητές», «περιηγητές», «συμμετέχοντες που μόνο διαβάζουν και δεν συμμετάσχουν», «μαθητές μέσω δοτής εμπειρίας», «παρασιτικοί μαθητές», ή και «θεμιτοί περιμετρικοί συμμετέχοντες» (ο τελευταίος όρος είναι ο όρος που προτιμάμε). Σε αρκετές περιπτώσεις οι ενεδρεύων είναι δύσκολο να ανιχνευτούν σε ένα διαδικτυακό μάθημα ή μια διαδικτυακή κοινότητα λόγο του ότι είναι σχετικά αόρατοι εντός του μαθήματος. Η ομάδα μας αποφάσισε να εξετάσει το θέμα των ενεδρεύων, και να εξερευνήσουμε τις αντιλήψεις που έχουν οι ίδιοι οι ενεδρεύων για τις δράσεις τους εντός μαθήματος. Το συγκεκριμένο μάθημα για την έρευνα μας ήταν ένα ανοιχτό διαδικτυακό μάθημα, το CLMOOC. Χρησιμοποιήσαμε έρευνα μεικτής μεθόδου και συλλέξαμε δεδομένα μέσω κοινωνικού δικτύου, διαδικτυακά ερωτηματολόγια, και τις παρατηρήσεις που κάναμε ως ερευνητές. Τα δεδομένα συμπεριλαμβάνουν και ορισμούς από τους ενεδρεύων για το πως καθόριζαν οι ίδιοι τέτοιου τύπου δράσεις. Αναλύσαμε τα δεδομένα μέσω ανάλυσης κοινωνικού δικτύου και μέσω ανάλυσης περιεχομένου. Ερμηνεύσαμε τα ευρήματα μας χρησιμοποιώντας το πλαίσιο των κοινοτήτων πρακτικής (community of practice) όσο και την αρχή Pareto για να καθορίσουμε τα ώρια μεταξύ διαφόρων τύπων μαθητών. Τα ευρήματα μας παρουσιάζουν μια εικόνα που δείχνει πως οι δράσεις και η συμπεριφορά των ενεδρεύων είναι πολυσύνθετη, και δεν υπάρχει ένας και μοναδικός λόγος για τον οποίον οι ενεδρεύων δρουν με τον τρόπο που δρουν εντός των κοινοτήτων τους. Καταλήξαμε στο συμπέρασμα ότι για να υπάρχει μια πιο συμμετοχική διαδικτυακή κοινότητα τα μέλη της κοινότητας που είναι πιο ενεργά, πιο ορατά, και πιο έμπειρα εντός της

κοινότητας, θα μπορούσαν να αναπτύξουν διάφορες στρατηγικές έτσι ώστε να ενθαρρύνουν τους ενεδρεύων να γίνουν ακόμα πιο ενεργά μέλη και να μεταφερθούν από την περίμετρο της κοινότητας προς το κέντρο της.

Abstract in Chinese

亦被称为沉默学习者，观察者，浏览者，只读参与者，替代学习者，搭便车者，见证学习者或合法的周边参与者（我们的首选术语），因为近乎隐形，往往在课程中难以追踪。我们旨在解决这个问题，并通过调查一个特定的在线学习课程（CLMOOC）**来研究潜伏者**对于其自身行为的看法。为此我们采用了混合研究方法，并通过社交网络分析，在线问卷调查和观察等方式收集了我们的数据（即潜伏者对潜伏行为的定义）。然后，我们通过使用社交网络和内容分析来分析数据，并使用实践社区的概念解释研究结果，使用帕累托法则界定学习者的类型。我们的研究结果显示，潜伏是一种复杂的行为或一系列行为，而且没有单一的原因可以解释潜周边者在各自不同社区的行为方式。我们的结论是，对于一个更具参与性的社区，更积极，经验丰富或可见的社区成员可以制定策略，鼓励潜伏者变得更积极，完成从社区的周边到核心的转变历程。

Abstract in German

Passiv Zuschauende (“lurker”), die auch als stumme Lernende, Beobachtende, Stöbernde, nur-lesend Teilnehmende, indirekte Lernende, Trittbrettfahrende oder legitim peripher Lernende (der von uns bevorzugte Begriff) bekannt sind, sind schwer in einem Kurs zu verfolgen, da sie nahezu unsichtbar sind. Wir haben uns dieses Themas angenommen und die Wahrnehmungen, die passiv Zuschauende des Online-Kurses “CLMOOC” von ihrem eigenen Verhalten hatten, untersucht. Zu diesem Zweck haben wir einen Methodenmix unter Nutzung von Sozialer Netzwerkanalyse, Online-Fragebögen und Beobachtungen verwendet, der auch eigene Definitionen passiven Zuschauens (“lurking”) von den passiv Zuschauenden selbst enthält. Die Datenanalyse erfolgte unter Verwendung von Sozialer Netzwerkanalyse und Inhaltsanalyse. Die anschließende Interpretation der Daten erfolgte auf Grundlage des Modells einer Community of Practice in Verbindung mit dem Pareto-Prinzip, um Lernendentypen unterscheiden zu können.Unsere Forschungsergebnisse zeigen, dass passives Zuschauen ein komplexes Verhalten oder eine Reihe von komplexen Verhaltensweisen ausdrückt, und dass sich das Verhalten

von passiv Zuschauenden in ihren jeweiligen Communities nicht auf einen einzigen Grund reduzieren lässt. Wir schließen aus unseren Forschungsergebnissen, dass zur Erreichung einer stärkeren Teilnahme aktive, erfahrene und sichtbare Mitglieder der Community Strategien entwickeln sollten, die passiv Zuschauende dazu ermutigen, aktiver zu werden und die Reise von Rand der Community zu ihrem Zentrum zu machen.

Abstract in Portuguese

Lurkers, também conhecidos como "alunos silenciosos", "observadores", "navegadores", "participantes que só leem", "aprendizes vicários", "usuários livres", "testemunhas", ou "legítimos participantes periféricos" (nosso termo preferido), tendem a ser difíceis de acompanhar ao longo de um curso devido à sua quase invisibilidade. Nós decidimos explorar essa questão e examinar as percepções que os *lurkers* têm do seu próprio comportamento através da análise de um curso *online*: CLMOOC. Para tal, métodos mistos de pesquisa foram utilizados, e nossos dados foram coletados através da análise de redes sociais, questionários *online*, e observações, incluindo as definições dadas pelos próprios *lurkers* sobre o que eles julgam como *lurking*. Em seguida, análises de redes sociais e conteúdo foram conduzidas, e os resultados da pesquisa foram interpretados utilizando a noção de Comunidade de Prática. O Princípio de Pareto foi utilizado para delimitar os tipos de alunos. Os resultados dessa pesquisa apontam que *lurking* é um comportamento complexo, ou um conjunto de comportamentos, e que não há uma única razão pela qual os *lurkers* agem dessa maneira nas suas respectivas comunidades. Nós concluímos que, para o desenvolvimento de uma comunidade mais participativa, os membros mais ativos, experientes ou visíveis podem desenvolver estratégias para encorajar os *lurkers* a se tornarem mais ativos e a ingressarem na jornada da periferia para o centro da comunidade.

Keywords: lurkers, legitimate peripheral participants, invisible silent learners, peripheral learners, online learning networks, Community of Practice, Pareto Principle.

Introduction

Online networked learning spaces have brought many opportunities for lifelong learners who traverse among and between networks in their quest for information and knowledge. The globally connected, distributed networks host many learning communities in which lifelong learners participate in more or less active manners. In the literature, these learners are categorized based on their participation levels. For

instance, deWaard et al. (2011) categorized them into three categories: "memorably active participants, moderately active participants", and "lurking participants". Kizilcec, Piech, and Schneider (2013) categorized them as "completing, auditing, disengaging", and "sampling" learners. Similarly, Hill (2013) identified these learners as "active participants, passive participants, drop-ins, lurkers/observers", and "no-shows". Building on all of this, we suggest that these learner types can be explained by looking at the following variables: "community ecology, membership/participation, knowledge type", and "individual roles" (Figure 1). Although the related literature provides some explanation about active learners (posters of information in a network) (Walker, Redmond, & Lengyel, 2010; Rafaeli, Ravid, & Soroka, 2004), there is still work to be done analysing lurkers who by their very nature are difficult to observe and quantify.

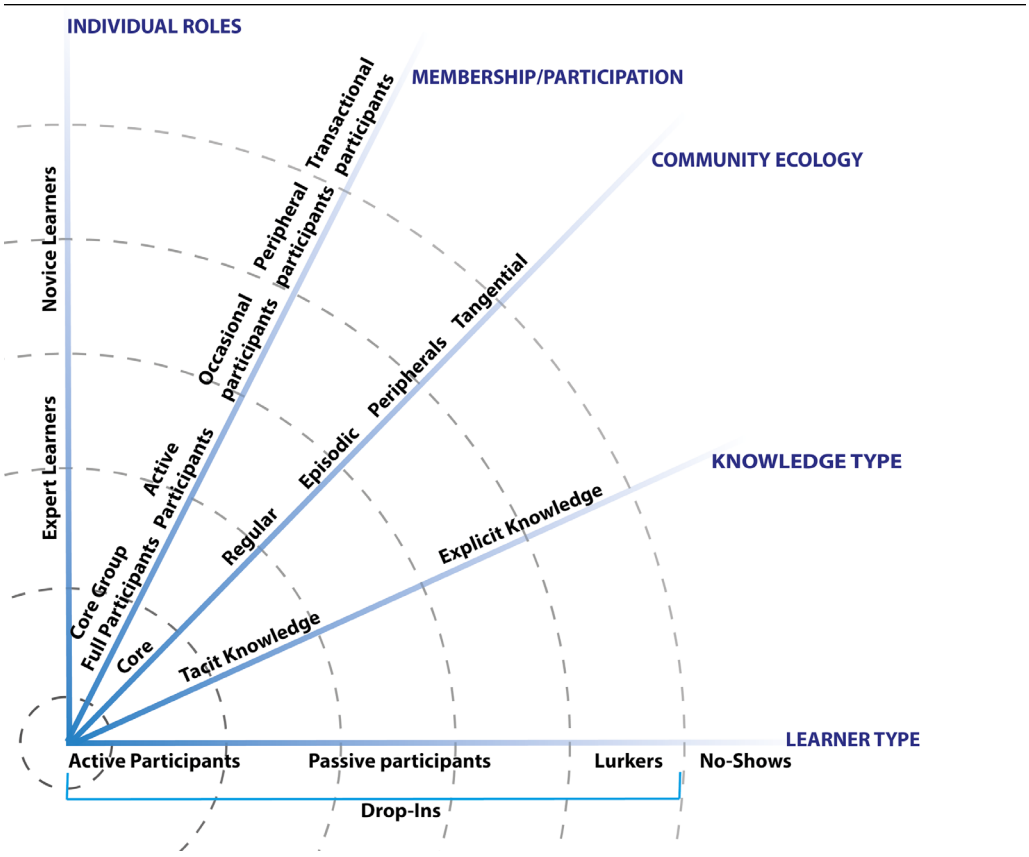

Figure 1. Learners' participation levels and their position in layers of a learning network

The diagram above shows how lurkers hold a peripheral position in a learning network in terms of individual roles, membership/participation, community ecology, and

knowledge type. However, it is also possible that lurking learners can move inwards through the layers and reach the core of the learning network, which means that their engagement in the learning network may transform them from no-shows into lurkers, and from passive participants into active participants.

Research Questions

This paper aims to shed some light on lurkers and lurking in online learning communities. In particular, this study seeks answers for the following research questions:

1. How is lurking perceived by lurkers?
2. How is contribution defined from the perspective of a lurker?
3. Why do people lurk (rather than joining in)?
4. Do lurkers feel part of the community?
5. What might persuade lurkers to join in?
6. Is lurking a lesser experience than participating, or just a different one?

Literature Review

How do we define lurkers? A standard dictionary definition of the term is "to read messages written by other people on the Internet in a newsgroup, chat room, etc., without writing any messages yourself," however the term can also have negative connotations and be defined as "to wait in a secret or hidden place especially in order to do something wrong or harmful" (both from The Merriam-Webster Dictionary, n. d.). A definition of the term in dictionaries that are more technology oriented appears less biased, despite the origins of the term. NetLingo for example defines the term as "a visitor to a newsgroup, chat room, blog, or social networking site" (NetLingo, n.d.), perhaps juxtaposing *visitors* with *residents* who participate more actively in their respective communities. Turning to the academic literature, lurkers are defined by Rafaeli et al. (2004) as persistent, silent, members of a community who are present but, never or rarely contribute to the interactions happening within the community. Similarly, Ridings, Gefen, and Arinze (2006) define lurkers as members of a community who participate in online discussions regularly but interact less frequently.

In their review of the literature on lurkers Walker et al. (2010) have found that different types of names have been suggested for this group of users, names such as Free-Riders (Sweeney, 1973; Kollock & Smith, 1996), Vicarious Learners (Lee & McKendree, 1999),

Browsers (Salmon, 2002), Legitimate Peripheral Participants (McDonald, 2003; Lave & Wenger 1991), Witness Learners (Fritsch, 1997; pp.355-378), and Read-Only participants (Williams, 2004), – to name a few. These terms provide a less judgmental view of the activities of lurkers than in the paragraph above and in some cases the terminology even seems positive, as is the case with Legitimate Peripheral Participants.

Some researchers have attempted to identify the factors that cause individuals to be lurkers or active participants. Focusing on motivational factors, Sun, Rau, and Ma, (2014) claim that the nature of an online community may affect community members' impression of the community, and therefore influences users' willingness to participate and the extent of their participation. Accordingly, online community factors (group identity, pro-sharing norms, reciprocity, and reputation), individual factors (personal characteristics, self-efficacy, goals, desires and needs), commitment factors (affective commitment, normative commitment, and continuance commitment), and quality requirement factors (usability, security, privacy, convenience, and reliability) may affect community members' motivation thus resulting in the differentiations between a lurker and an active participant, or somewhere between these two edges of the continuum. Sun, Rau, and Ma further grouped the reasons for lurking into four categories: environmental reasons (poor quality of messages, bad interaction design, low response rate, and long response delay), personal reasons (introversion, a lack of self-efficacy, and bashfulness), relationship reasons (the attitude or disposition of internet users toward the group modifies their actions), security reasons (community may not satisfy their requirements of security and privacy). Other researchers have also undertaken to identify reasons for lurking (Nonnecke, Preece, & Andrews, 2004), however, it is difficult to provide a complete list of the reasons why one might lurk in a learning community because the structure of a networked learning community is not predetermined, as might be the case with traditional online courses, and in any specific instance there might be many reasons for lurking; reasons that community organizers can't foresee in advance. Lurking is actually a complex, fluid state. A community member that is identified as a lurker can be an active participant in another community, or as stated by Hagel and Arthur (1997), lurkers can become active participants over time.

Munzel and Kunz (2012), speaking from a marketing perspective, provide us with an additional term to consider: multipliers. According to Munzel and Kunz this "group is characterized by high passive activities, active first-order activities, and active second-order activities. Hence, the members of this class have a more balanced portfolio of activities, which multiplies their usage of the web site. [...] By commenting and

forwarding one's own reviews or other authors' reviews, the members of the class multiply and therefore amplify the scope of these reviews" (2012; p.60). Munzel and Kunz were dealing with the concept of electronic word of mouth, hence in their case an active member of a community was one that wrote reviews about products in that community. This provides us with a more nuanced understanding of the activities of individuals in online platforms.

A frequently used rule to describe participation in online communities is the 90-9-1 rule. This rule posits that approximately 90% of the members consume content, 9% participate to some extent by contributing content from time to time, and 1% contribute a lot and regularly (Nielsen, 2006). The idea was articulated by other researchers who reported that lurkers indeed constitute the majority of online communities, that is to say, approximately 90% of participants can be identified as lurkers (Preece et al., 2004; Rafaeli et al., 2004; Ridings et al., 2006; Nonnecke & Preece, 2001). Kushner's essay (2016) traces this rule back to Nielsen whose audience at the time were software engineers and user interface designers. Kushner further draws connections between participation on social platforms and monetization of that content. Media platforms tend to see non-participation, or little participation, as potential lost revenue. However, in educational contexts it is important to question this unquestioned assumption of non-participation.

From another lens, when lurking is examined from a social network analysis standpoint and from a content generation perspective, lurkers are contextualized on twitter as "a rare class of tweeters, who follow many people, but they themselves rarely post or reply any tweets" (Fazeen, Dantu, & Guturu, 2011).

Lurkers have been seen as a net-negative in communities in which they participate (Farzan, DiMicco, & Brownholtz, 2010). Lurkers appear to be in the role of having untapped potential, and hence the goal is to convert lurkers into posters, with consequences of not posting, or not being active at a certain threshold in a community, spelling out a certain concern for the viability of that community (Walker, Redmond, & Lengyel, 2010).

Nonnecke, Preece, and Andrews (2004) stress the importance of knowing how lurking affects the online communities that they are members of, and how one appropriately manages lurkers in a community. This is an interesting point of view because it puts lurkers in a position to be "managed" in communities where they, by and large, volunteer their time and content. It also provides for an interesting philosophical

dilemma, namely: should community members be actively managed? Or should communities emerge out of the spontaneous actions of their members, and hence allow for lurking as a valid form of participation in a community? It also does not help that online *communities* are sometimes conflated with other forms of online interactions, such as online workgroups. To help distinguish online communities from other forms of online interactions, Ridings et al. provide us with a distinction between online workgroups and online communities. They write that "online groups can gather to complete organisational work tasks or short-term projects, virtual communities are longer-term, emergent, and based on personal relationships" (Ridings et al., 2006; p.331). They further elaborate that lurkers have different motivations and behaviours as compared to individuals who are posters in a community.

What do lurkers learn? Beaudoin (2003) suggests that without evidence of visible activity, one might assume that learning is unlikely to occur. However, he argues that learning can also take place when learners are engaged as observers of others' activity. In their review of lurkers, Walker et al. (2010) discuss the differing views, or rather one might say differing beliefs, of how lurkers learn by lurking. Some of the literature indicates that lurkers learn through observation, colloquially one might refer to this as "learning through osmosis," while others assert that lurkers are only learning a small fraction of what they can learn since they are not active; thus missing out on deeper learning opportunities. It strikes as one of those legacies of p-Learning (physical, or face to face, learning) that Dron (2016) mentions. The legacy of the physical classroom, with its spatio-temporal constraints, gives us a particular view of what participation is. However, in an online environment, someone who isn't speaking up (providing verbal postings) isn't necessarily someone who isn't paying attention, and it is not necessarily appropriate to quiz them. This type of assessment, by means of forced participation, is another possible legacy of p-Learning which finds its way into online communities, and hence suggests a negative view of individuals who do not post, regardless of the potential lack of the need for assessment in communities. It is this inherent attitude toward lurkers which juxtaposes them as freeloaders, as compared to posters who are seen as "workers" (Egan, Jefferies, & Johal, 2006). Taking into account the learner's point of view is something that is seen in Dennen's (2008) research. Using self-reports, Dennen (2008) found that students felt that their ability to learn was impacted by both *posting* and *reading* messages and noted that students who posted (non-lurkers) to meet course requirements felt that the discussion activities had a less positive impact on their ability to learn. This might suggest a need for learners to have the freedom to lurk, and to determine for themselves what interactions are valuable, and which ones are not.

Walker et al. (2010) suggest that in order for lurkers to modulate their behaviours and go from not posting to posting in the context of an online class, the instructor, or the facilitators of the class, needs to provide appropriate external motivators, in other words provide an answer to the common question of "what's in it for me?". Relating to this notion of participation is Gourlay's argument that in what we know today as engagement, in Gourlay's case 'student engagement,' there is a "reification of the notion of 'participation' which – although appearing to support a 'student-centred' ethos – may serve to underscore restrictive, culturally specific and normative notions of what constitutes 'acceptable' student practice" (2015; p.403). It is interesting to look at lurking from this angle because of *othering* effects toward lurkers. For instance, Bishop (2011) writes that "for lurkers to be converted into posters, and in order for their untapped contributions to be allowed to be expressed, online community managers need to overcome the lurkers' fears that are preventing them from participating" (p.27) and that the main concern of lurkers appears to be a loss of privacy. This paints lurkers in a mono-dimensional light and to some extent from a lurking-as-pathology angle.

Hrastinski (2008; 2009) indicates that there are different perspectives on how participation in online communities can be conceptualized, and makes the point that participation is both a complex and an evolving process for learners. Lurking is thus seen as a *legitimate* type of participation, and lurking indicates a *potential* for more active participation. One way of conceptualizing a lurker comes from Waite, Mackness, Roberts, and Lovegrove (2013) and their experiences in the FSLT12 MOOC. In this instance, they see lurking, within the context of this MOOC, as a liminal space where lurkers, novice learners, are looking to make sense of the MOOC by observing and practicing skills and behaviours that are associated with active participation. In this case lurking is seen as a type of apprenticeship, which ties into the notion of learning as a community of practice.

Because the term *lurker* is a loaded term with negative connotations, we propose instead that *legitimate peripheral participants* (LPPs) should be used to describe these less active, but still engaged, learners, and that *peripheral learning* instead of *lurking* be used in order to describe these types of behaviour. Accordingly, these are the terms we will use in the rest of the paper.

Theoretical Framework

This research uses *Community of Practice* (CoP) in order to look at the CLMOOC learning community, and the Pareto Principle in order to delimit types of learner in the CLMOOC network.

Community of Practice

A Community of Practice (CoP) refers to the individuals who gather together for common interests, goals, or knowledge, producing something beneficial through their collaborative efforts and mutual interaction across community members. A CoP consists of three elements: mutual engagement, joint enterprise, and shared repertoire (Lave & Wenger, 1991; Wenger, 1999). According to this theory, learning is a social practice and a process of participation that is at first legitimately peripheral but that increases gradually in engagement and complexity (Lave & Wenger, 1991; 2002). Lave and Wenger propose:

> *"a decentered view of the locus and meaning of learning, in which learning is recognized as a social phenomenon constituted in the experienced, lived-in world, through legitimate peripheral participation in ongoing social practice; the process of changing knowledgeable skill is subsumed in processes of changing identity in and through membership in a community of practitioners; and mastery is an organizational, relational characteristic of CoP" (Lave & Wenger, 1991; p.64).*

They indicate the importance of the master-apprentice relationship in CoP (Lave & Wenger, 2002). In other words, they perceive being an apprentice, that is to say being a peripheral member, as a step in the process of moving toward to full participation – that is – being a master. In the context of this study a legitimate peripheral participant (LPP) is viewed as an apprentice.

The Pareto Principle

The Pareto Principle is also known as the 80/20 rule. According to this principle, approximately 80% of the effects come from 20% of the causes (Juran, 1975). From the perspective of a learning network, this principle indicates that roughly 20% of the participants produce most of the content and 80% of the participants consume this content. However, it should be noted that these numbers are arbitrary and that the 80/20

split is not necessarily exact. This can be seen as an organizing principle similar to 90-9-1 referenced in the literature review section.

When the Pareto Principle effect is observed in a network, the distribution pattern will be "Long Tail" (Anderson, 2004). This means that in terms of learners' production and consumption patterns, active learners make up approximately 20% of the long tail distribution and less active participants, in other words LPPs, comprise about 80%. In our research we use the Pareto Principle to delimit active learners from LPPs.

Methodology

Research Context

The LPP data for this project was collected from an event run by the CLMOOC community in 2016. CLMOOC (Connected Learning MOOC) was an originally collaborative offering from the National Writing Project (NWP) network (nwp.org) and was never tied to any specific institution. It first ran in 2013, designed and facilitated by a group of educators from NWP in order to support educators in experimenting with designing and learning using the Connected Learning framework. This framework aims to support learning as an interest-driven, production-centred activity in networked, peer-based, communities. Since the original MOOC there have been other versions, and a community has evolved (the second *C* now stands for *community*, not *course*). The 2016 iteration of CLMOOC was organized by volunteers who were designers and participants of previous CLMOOC iterations and who define themselves as being a part of the CLMOOC community.

Research model and design

This research uses a mixed method methodology in which quantitative data collection and analysis was followed by qualitative data collection and analysis to help explain or elaborate on the quantitative results. (Creswell, 2012). The quantitative data was collected through social network analysis while qualitative data was collected through online questionnaires and observation notes.

Data collection tools and analysis procedure

Social network analysis (SNA) was used to map the structure of the network and to identify LPPs. In order to do this, participants using Twitter in the CLMOOC were tracked by using SNA. Before analysing the data, a link to a questionnaire had been sent to the #CLMOOC hashtag and total of 21 participants responded. However, the responses of 4 of these participants were excluded from this research because they were

identified as active participants with high out-degree values (the out-degree is a metric that demonstrates a node's (participant's) input into a network). Participants lying in the 80% of the network in terms of their out-degree values were identified as being potential participants (LPPs) of our study, and a second questionnaire was sent to these participants. After gathering the responses from these, still further questions were directed to these sampled participants in order that they could elaborate their responses and allow us to tease out a deeper insight regarding participants' views. Thus we interviewed participants at a stage when they were engaging as peripheral learners, whether or not they later became more active learners. One of the researchers tracked all the interactions on Twitter and kept his observation notes in a researcher journal. These observation notes were used for data triangulation.

SNA was then used to analyse the data. Participants' out-degree values were calculated and visualized in a graph to see the distribution of their participation levels (Figure 2). In addition to pure quantitative node metrics, a qualitative sociogram (Figure 3) was created to visualize the network holistically and to identify research participants' positions in the network. This sociogram was created based on local metrics such as nodes and ties, and global metrics such as overall network values. The qualitative data collected through questionnaires and observations were analysed through content analysis. In order to increase reliability, direct quotes are provided in the findings and discussion section.

Sampling

In order to choose our participants, we took a snapshot of CLMOOC in the first week of the 2016 event. A total of 200 potential participants were identified in this first week. The raw data collected from Twitter was analysed and a total of 80 participants with an out-degree value of zero were excluded from the research corpus because they were not actually participants - just people who had been mentioned by actual participants on Twitter. These excluded participants had in-degree values (a metric that indicates interactions consumed) ranging from a minimum of one and a maximum of three (each mention equals to an in-degree value) (Figure 2). After plotting all participants according to their out-degree values, it was apparent that the participants were distributed according to the Long Tail pattern. Having plotted this, we looked to see who were active learners, and who were LPPs. A total of 24 participants were identified as active learners, and thus excluded from the research study, and 96 participants were identified as LPPs and therefore included in the study. We then noted that participants were spread out according to the 80/20 principle. It should be noted that these cut-off

points are arbitrary, which is why this research also used the participants' position according to the SNA of the first week (Figure 3).

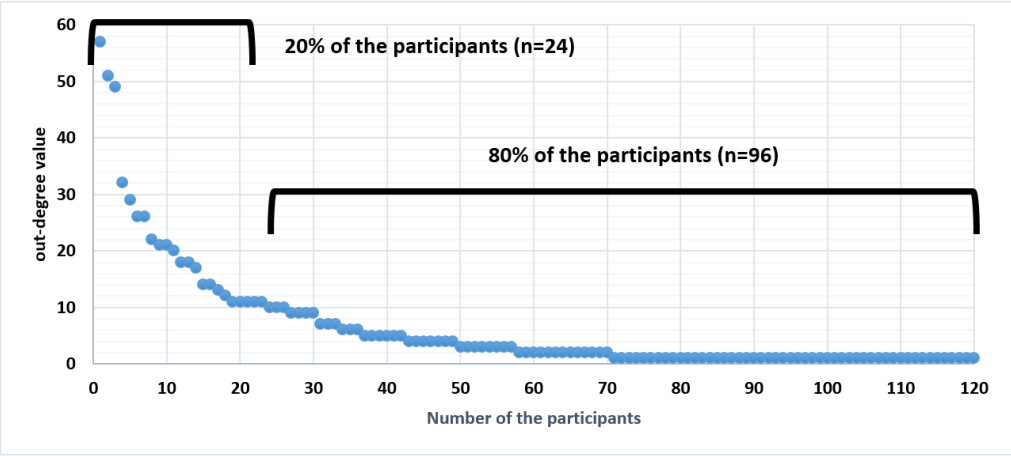

Figure 2. Distribution of learners according to their out-degree values

Findings and Discussion

The first stage of the research explains the LPPs' position in the network structure while the second stage provides a deeper explanation based on the responses from LPPs.

The First Stage

To see the overall network structure a sociogram was created using the Harel-Koren Fast Multiscale layout algorithm. In the sociogram, the 20% (active learners) were marked as blue circles while 80% (LPPs) were marked as red squares. Participants with an out-degree of zero (no-shows) were marked as green diamonds. Those who agreed to join in the research were marked as black squares. Additionally, out-degree values for each participant are shown on the sociogram (Figure 3).

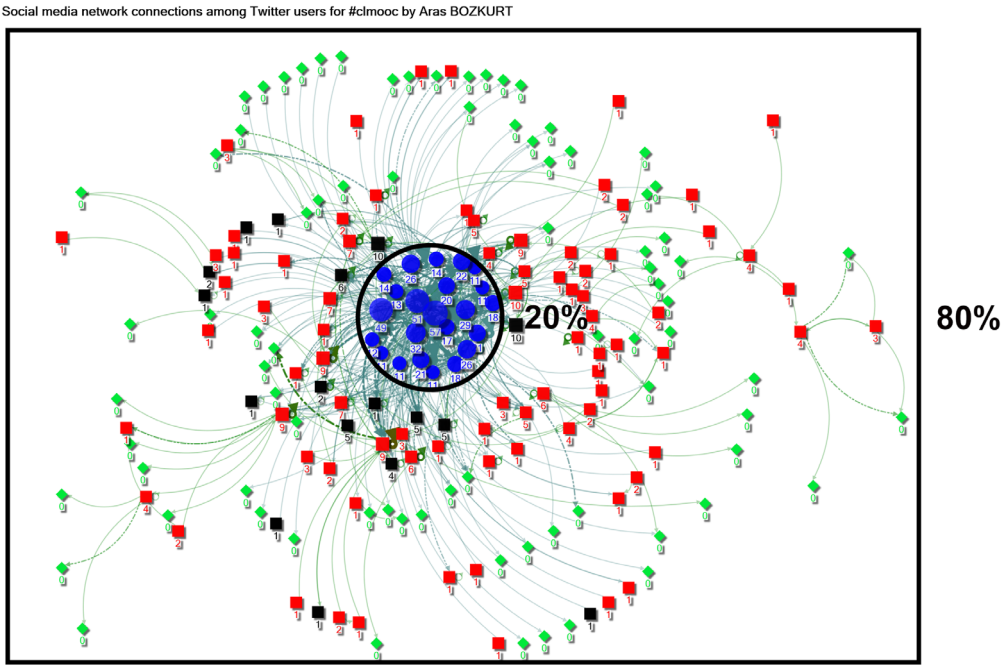

Figure 3. Distribution of participants according to the 80/20 principle

As can be seen in sociogram for the first week, active learners (blue circles) comprise 20% of participants and lie in the core of the learning network while LPPs (red squares) comprise 80% of participants and are peripherals around these active learners. The interaction among the 20% is denser as compared to the 80%. This indicates that one variable about being an active participant or a LPP is related to a participant's production and consumption patterns. These findings also conform to the Pareto Principle.

The Second Stage

After completing the SNA, a questionnaire with open questions was sent with those identified as LPPs so that we could come to a deeper understanding of the phenomenon. The following headings comprise the questions with their original wording.

1. How is lurking perceived by lurkers?

Peripheral learning is usually perceived as a less active behaviour compared to participating, and is generally seen as less desirable, as we saw in the literature above. It is often defined as passive participation or observing. This view was also found to be held by some of the participants in this research. Some of the responses demonstrated

that they saw peripheral learning as a passive method of participation. However, the responses also made it clear that peripheral learning is not simply a matter of being an observer. Rather, peripheral learning is about engaging silently with invisible social ties and ongoing conversations that are happening in the network. This invisible engagement is a type of action, albeit invisible in the network, where LPPs have a hidden potential to become visible, active, participants in the network – to move from being an apprentice to a master. This move from invisible to visible occurs as the conversations in the network continue and there are potentially more possibilities to pique an LPP's interest and enable them to engage with more visible ties. This piquing of interest is a function of time, connection strength between nodes, and a diversity of topics of conversation.

The responses also revealed that peripheral learning is not merely a matter of being a passive participant, but that it is more about engaging with what is already there rather than creating or starting something new. For instance, one of the participants reported that being an LPP is "being involved in a passive way: following the ongoing conversation and sharing it with without commenting, expressing opinions and actively engaging in the conversation. Basically, just what I did!" [Participant 4B]. This reinforces the findings of Lave and Wenger (1991) – there are rewards for peripheral participation which simply cannot be quantified by the number of posts someone contributes to the overall network. For example, one participant indicated that even though they wanted to be more active in the community, "[they]'ve enjoyed peeking into what people are doing and saying" [Participant 3B] which is something valid to get out of peripheral participation. Another common theme concerned the tools used in the MOOC. Some participants indicated that the more they participated the more they learnt about the educational technology and information and communication technology (ICT) [Participants 7, 13, 20], which is especially interesting considering that the course did not focus specifically on ICT. Pedagogy also formed another theme of interest amongst LPPs. Participant 17, for instance, mentioned that they "learn new ways to teach, think, and, connect". Even as LPPs the participants still felt that they were learning. In addition, the level of authenticity in the interactions is a key element. For example, one participant wrote that:

> *"It depends on the authenticity of your limited interactions with members. Certainly you still learn a lot from conversations, from exploring what others share and their blogs, and from their creativity. I'm happy to appreciate what others create, and to add people to my networks". [Participant 2].*

This is also linked to leisure learning: it is a learning activity that does not involve putting in too much effort or following a schedule. As stated by one participant, "lurking is a great way to learn, albeit by mostly consuming - there is much to read, save and come back to later, without necessarily completing any or many of the activities" [Participant 2B] This comment also justifies the use of one the terms used for LPPs: free-riders.

In summary, the above responses indicate that LPPs do not orbit merely on the periphery, but that their orbits intersect layers of the community ecology (see Figure 1). In contrast to active participants' visible connections, LPPs had more transparent or invisible connections, which permeate different levels of the ecology. Whereas we focus on the *posts* or *contributions* of active participants, with LPPs we can focus on different questions such as "what do they do with what they observe?".

2. How is contribution defined from the perspective of a lurker?

Participants were asked what constituted a contribution in an online learning community. Interestingly, many Web 2.0 types of interaction such as liking, retweeting, and sharing weren't considered as contributions to that community. Rather, contribution is seen as adding value to the content rather than just disseminating it. However, actions such as favouriting, retweeting, and sharing are thought to be an indicator of peripheral learning. One participant indicated that their participation was "mostly liking and retweeting on twitter" but they continue to say that "ideally a contribution is more than that: it means also commenting and adding to the community of learners, bringing something 'in'" [Participant 4B].

One aspect that is important to mention is that notions of what constitutes *appropriate* participation, in a learning context, are already formed in some participants' minds. There seems to be some aspect of comparing this learning experience to what participants have explored before in classrooms. For example, Participant 1B writes that what they consider participation as "posting and interacting with others – [they] teach online often and tell [their] students it must be a substantive contribution. Liking is not enough". Hence, there seems to be a devaluing of activities that are not immediately visible. The mantra appears to be, like in classrooms that are assessed, *don't just like, but tell me why you like it*. In a graded classroom context this might make sense given that the learners are evaluated for credit, however in an open community do these same metrics make sense?

Web 2.0 types of interaction can be seen as an indicator of being socially or emotionally present in a community. For example, one participant says that "Oh, I didn't think about

the like button as a contribution... that still seems like peripheral learning though: if a like button is like a smile, I was smiling, but I didn't create my own posts or comments on others". In another instance, Participant 3B writes that "[they] wouldn't say that what [they]'ve been doing is much of a contribution. Liking is not a contribution, it's just saying 'I'm here', 'I read what you said'," which is an interesting point in that actions such as retweeting or liking are the digital equivalents of paralinguistic features of dialogue, such as nodding your head when you agree. In a traditional, face to face, classroom if we saw our fellow learners nodding in agreement with what we are saying, or providing non-verbal feedback of understanding (such as "uh huh"s) we would most likely count that as some sort of participation because of its context: in a small, time-bound, space-bound meeting of participants it's not economical to have everyone say something for the sake of participation-as-verbal-content-production. Similarly, online, even though there doesn't exist the same space and local-time boundaries, it might not be economical for everyone to produce textual content as time and attention are finite resources and such web 2.0 actions may indicate a more economical approach for members of the periphery to use as a means for a majority of their participation.

In summary, contribution is seen to involve interaction with members of a community, and the perception is that this involves more than just liking, favouriting or retweeting, although these are indicators of being present in a community.

3. Why do people lurk (rather than joining in)?

We researchers tried to explore whether participants lurk because of the type of medium employed in connecting the community. In a connectivist learning space, learning is distributed among the platforms in an effort to meet participants in the diverse digital spaces they inhabit. Though some platforms are spaces where most of the participants gather, those who don't like one of these platforms can be labelled as an LPP of the community when participation is seen in aggregate, but they may be more active in one of the other platforms of the community. Responses show that the platform used can be an identifier of being a LPP. Participants reported that platforms used affect their attitude to be a more or less active participant:

> *"I started out being 80% G+, 18% FB[Facebook] and 2% Twitter. I gradually increased the balance between G+ and FB to where they're about equal. Still hardly any Tweeting…" [Participant 6]*

Following these responses, the researchers tried to explain why particular platforms were preferred by the various LPPs. The reasons for why people used the various spaces

varied by participant. Some strong emotions were displayed for both Facebook and Google+, where some respondents indicated that they hated a particular platform and hence didn't use it. Some of the aspects of usage were user experience related; in these cases, one social media platform was seen as better than another in terms of usability or privacy. For example, Participant 3 wrote that:

> *"Twitter gathers more posts more quickly and I like that, plus the hashtag search is effective. FB is something I already use regularly, so it doesn't take additional time/effort. G+ is hard to follow and awkwardly organized."*

There is also an element of how the social media platform fits into the workflow of participants. For example, one participant wrote that they "typically create on [their] blog to have a central place for the work, then send it out to communities via Twitter, Facebook, and other connections" [Participant 17]. Another participant delineated exactly how they use each platform by writing:

> *"I tend to keep Facebook for personal use, Twitter for PLN and Google+ don't usually use except when something like CLMOOC comes around and that's where the activity is" [Participant 13].*

And likewise another participant stressed that they also use different platforms for different uses and in some cases, they do not want to intersect platforms for personal and professional uses:

> *"Twitter is the space I already use most for connecting with education folks, so that is why I have used it most. The google+ group has a lot of subtopics and I do sometimes go there. It is not as automatic for me. I think I would find more if I did. FB I keep more to personal use and therefore I have not engaged in CLMOOC in that space." [Participant 24]*

Finally, others take a more pragmatic approach to their social media platform usage and, as Participant 4 explained, they go wherever the higher amount of traffic is, where more people are posting their CLMOOC contributions. This pragmatism also seems to lead participants to use multiple platforms for different purposes. As Participant 22 wrote:

> *"Twitter is a crossover space where many communities and hashtags intersect. Twitter is the street; Google+ is an interior, more bounded and focussed space."*

Interestingly, we see in our observations that some participants see peripheral learning as a time-saving strategy. For a call to join in participation, one of the participants responded:

> *"Will try, for sure. Busier then. Easy to lurk!" [Tweet from observation notes]*

Our observations also revealed that the type of message can also lead to participants' behaviour. For example, a message can be a general/one-way broadcast message that does not require reciprocal communication. This raises further questions about how types of learning design can lead to active and passive participants.

In summary, time is a major reason why participants do not actively engage. In addition, some participants have strong feelings about how they engage in using social media and this can result in them behaving as an LPP on some platforms.

4. Do lurkers feel part of the community?

The research further explored whether LPPs feel part of the community. The vast majority of respondents reported that they felt part of the CLMOOC community. However, the feeling of inclusion in the community varied from describing oneself as a peripheral member [Participant 24], to indicating that "the CLMOOC Community is a MAJOR part of [their] life" [Participant 6]. It seemed, from the responses to our questionnaire, that the perception of whether or not a LPP felt part of the community was mostly self-imposed. For instance, one LPP indicated that "[they] think that [they] feel like an adopted child. Feel part [of the community], but [they are] not sure [if they are] worthy" [Participant 16]. Another participant indicated that they "feel as though [they are] on the edge, where there is a central core of people who appear to know each other really well, and an enormous group like [them] dabbling around the edges" [Participant 13].

This seems to indicate that peripheral learning can be a function of connections to the community that existed prior to the current CLMOOC iteration. This raises interesting questions about how to design a community activity in order to welcome in new members, while at the same time accommodating existing members with established

connections who join in. Connections, however, are not the only means of bringing people together and making them feel a part of the community. One notable example of this is expressed by an participant who wrote that they "feel close to this community, although [they] don't know many of the participants, but [they] share their interests and values" [Participant 22]. This sharing of interests, values, and practice is another element that binds LPPs to a community, even as peripheral members, as was suggested by Sun et al (2014).

Finally, another element that is worthy of consideration is the question of 'what does it mean to be part of a community'? One participant wrote that "[they are] not part of the community (no time), but [they] enjoy seeing what they [the community] share" [Participant 5]. It would appear, based on this comment, that LPPs might not consider themselves as part of a community if they are in *read-only* or *consumption* mode. An interesting metaphor that came up was from Participant 16, who compared their participation as a *draft*. They indicated their wish to participate more, but their current peripheral learning behaviour was sort of like a draft of fuller participation. We also saw participants using cMOOC language such as "drop-in" to the course every now and again whenever time allowed [Participant 22], which might indicate that these peripheral learning participants have been involved in some fashion with MOOCs in the past, and are choosing a level of participation that best fits their current needs.

In summary, many LPPs do either feel part of a community or identify with it in some way, although they only engage at the periphery.

5. What might persuade lurkers to join in?

In order to gain deeper insights regarding motivational issues, research participants' goals and interests were examined. From the responses received it appears that the majority of LPPs were interested in being part of the CLMOOC community. One of the participants indicated that they enjoyed CLMOOC 2015 and that had a positive impact on their interest in being part of the CLMOOC 2016 community [Participant 23]. Despite the interest in being a member of the CLMOOC community, and here the assumption is as a *more active member*, work and other obligations appear to be impeding that goal. Despite other competing obligations, these peripheral learning members still joined the CLMOOC even though they knew they didn't have the time, and an example of this is Participant 5 who states that they "knew [they] would not have time this summer, but [they] still subscribed. This seems to indicate that, to some extent, these members still feel part of the community even though they knew that they wouldn't have the time to be part of an actively contributing set of members. One

member, Participant 16, wrote "I do want to be a part. I lurk. I even think and kind of draft" which seems to indicate that peripheral learning is a valid part of community membership. Some other participants also explicitly stated that their intention is simply to lurk: "Actually I've been lurking since the beginning :)". Hence, the question might be not what we can do to persuade LPPs to be more active – they already want to be part of the community – but why are they on the periphery?

Motivations for participation varied from participant to participant, as can be expected. LPPs indicated that their motivations to be part of the CLMOOC 2016 community came from the people who generally participate in CLMOOC. One participant expresses this as being a "big fan of some individuals who are very active in CLMOOC" [Participant 5], and some, such as Participant 24 make mention of specific individuals by name. Another participant makes reference to another MOOC (most likely #Rhizo14 or #Rhizo15) by making mention to Dave Cormier and Cormier's saying that "people are content" [Participant 16]. An individual joined because of a course at university [Participant 18], and previous participation in a previous version of CLMOOC seemed to indicate motivation for keeping up a certain level of participation in CLMOOC 2016. The uniqueness of the course itself was another motivating factor. For instance, Participant 6 writes:

> *"The change from 'Course' to 'Collaboration' for the final C was crucial. Everything that's good in CLMOOC flows from truly embodying the deep meaning of that change. There have been other attempts – DS106, for example – but none were truly open and egalitarian the way CLMOOC has always been..."*

The change mentioned by this participant ties well with a comment by another participant who wrote that "CLMOOC is more of a "public event" than a MOOC, and [they] really appreciate the way they [MOOC participants] use public networks to share what they do!" [Participant 5]. This change in nomenclature does potentially have interesting connotations as far as LPPs go because in a public event not every members of the community is required to participate in order to enjoy the event. One would not call participants/attendants of a public art event as lurkers, for instance, even if there were opportunities to contribute to the event by supplying free art supplied to all who attend.

These broad responses demonstrated that even though LPPs wander on the periphery of the learning community, they had various reasons to be there. These include:

expanding personal learning networks, participating collaborative activities, and learning new skills.

> *"To learn, to play, to expand my PLN, I work with many lovely people and have many teacher friends but not as many playing in that arena before I joined." [Participant 1B]*

> *"I was intrigued by the idea of building knowledge collaboratively and fact that CLMOOC is based on principles of Connectivism" [Participant 4B]*

Following this, things that motivated LPPs' level of participation were investigated. Among many reasons, time appeared to be an indicator of the participation.

> *"The amount of time I have determines my participation." [Participant 13]*

Confirming previous research findings, most of the participants stated that timing is one of the issues that determines the level of LPPs' participation.

> *"If I had more time and was not involved so much in work commitments after hours then I would participate more. I'm not sure what would motivate me to do the suggested makes. Maybe I'm just uninspired at the moment. It happens." [Participant 2]*

Respondents were asked if anything could have been done that would have resulted in finding more time to engage with the learning community. Interestingly, responses showed that LPPs' positions on the periphery would be unlikely to change. The main element that seems to be common for our participants is time, or more specifically lack of time. Participants were balancing family obligations, work obligations, and other educational or professional development activities. A hypothesis could be that LPPs are in part a result of participants multitasking and joining a variety of communities, being involved in them to the degrees that satisfy their own immediate goals.

> *"Only a MIRACLE. I had a lot of family matters requiring my attention this summer; there's only so much time, but since I am at G+ every day (it's my main place to connect online), I was really glad for the active posting at the G+ community, although I did not always*

> *click on the notifications since I really was pressed for time." [Participant 5B]*
>
> *"Timing is such a tricky thing. When CLMOOC is primarily in June it is hard for me as that is active NWP work at our site (camps and institutes and budgets oh my) but extending into August is also tricky as that is when work begins in earnest for school year." [Participant 1B]*

Finally, another motivational aspect comes from the weekly prompts for the community. While some members of the community might be interested in marching to the beat of their own drum, there were members who were interested in more explicit prompts, expecting interactions similar to previous instantiations of CLMOOC. For instance, one participant mentions that what would be helpful is "a post that clarified what happened, what's going on, and where they are heading" [Participant 15]. The same sentiment might connect with Participant 23 who writes:

> *"Last year the weekly emails seemed to have so much more to them in terms of content. This year seems to be about sharing, connecting, reflecting over and over. The topics were so engaging to me last year, gave me ideas to connect, engage, share around. Not so much this year."*

This brings us back to the idea that current interactions of a community are shaped by the expectations that have been formed in the interactions that members had prior to joining such communities.

In summary, lack of time plays a major part in participants engaging in peripheral learning and not being more active, with the need for more explicit information about how to engage also being a significant reason.

6. Is lurking a lesser experience than participating, or just a different one?

We further explored how LPPs interpret peripheral learning. The responses, as mentioned briefly in the answer to the previous research question, showed that peripheral learning is a strategy of learning when learners have insufficient time. When the learner's time was at a premium, decisions needed to be made as to where and how to spend their time, and peripheral learning is a potential answer. In instances where peripheral learning and limited interactions were required, other aspects of interaction

rose as important, such as how authentic those interactions were between and among members [Participant 2], hence we see an aspect of quality of interaction, not just quantity of interaction.

Another interesting theme to consider is learner preferences. One participant wrote that "Whether active or less active, a lot of [their] learning is through reading and listening" [Participant 13] which would imply that they themselves don't necessarily view peripheral learning (read-only or read-mostly) as a bad thing, it is what it is, and it works for them. Some, like Participant 12, seem a little more apologetic by saying "Normally, when I participate in online activities, I am an active participant" which seems to imply that peripheral learning is not normal for them, and this isn't indicative of their typical online learner behaviours. This also seems to draw parallels that what was described above as learners carrying ideas and notions of what constitutes *proper* interaction in an online learning experience from their previous learning experiences, namely those that are designed with assessment and accreditation of the learner in mind.

> *"It depends on the authenticity of your limited interactions with members. Certainly you still learn a lot from conversations, from exploring what others share and their blogs, and from their creativity. I'm happy to appreciate what others create, and to add people to my networks." [Participant 2]*

> *"Normally, when I participate in online activities, I am an active participant. Mostly, I find that I get new ideas or sharpen my existing ideas. I find this question particularly interesting, because I normally don't feel that I am learning when I'm lurking. This past week has caused me to lurk, and even do that infrequently. I need to think about what I learn during these times of less activity." [Participant 12]*

> *"Less active participation is like chatting on the fly, meeting new people quickly and having a say. More active participation enables deeper engagement and allows for more effective learning. Both are useful. I find that after multiple, short engagements with new people, I do, eventually get to know them and their interests and ideas. I think of these relationships spanning various courses, activity and spaces. I'm not too worried about watching from the fringe and missing out. I do dive in at times." [Participant 22]*

Finally, it's interesting to note that some aspects of CLMOOC encouraged peripheral participation, in a sense. Participant 20 writes that what would motivate them more would be "more conversation-driven posts, as [they] tend to avoid "Silent Sunday" and the purely visual posts." (Silent Sunday is a weekly event where participants post an image on the various CLMOOC social media without saying anything about it.) This seems to indicate a preference of some participants for text-driven posts rather than something more multimedia in nature. If participants didn't get the input they were expecting (a conversational post for example), they might use some of those web 2.0 actions (liking, sharing, retweeting) as an indicator of their presence, but wouldn't necessarily partake in creating such original posts.

In summary, the jury is still out on this question, and we would suggest that this is looked at in more detail in future research.

Conclusions

The existing literature suggested that peripheral learning is a complex behaviour, or sets of behaviours, and that there isn't one reason why LPPs act in the ways that they do in their respective communities. We also see this reflected in our own findings. While certain members in the CLMOOC community only engaged as peripheral learners in this run of CLMOOC, they all did so for a variety for reasons. A common reason for peripheral learning within the community is a lack of available resources, or lack of interest in using a specific resource. One resource that appeared to be at a premium was time, and this lack of time meant that many individuals who were interested in being a member of the community ended up being LPPs. Some members *became* LPPs, meaning that they intended to be more active during the run of the MOOC, while others *started* as LPPs, knowing right from the start that they didn't have the time to invest, but they signed up anyway, perhaps because being on the periphery was better than not being there at all. Hence, one might say that peripheral learning is potentially a *strategy* when there is a lack of time.

Another reason was the use of specific social media platforms. While no one means of social media connectivity was seen as *optimal*, the members' particular outlook on specific social networks, views on privacy, utility, and usage, influenced where they participated. Since the space itself isn't the important factor, but rather the *use* of that space by members of the community, we see that a clash in how different members of the community perceive these networked spaces (Facebook, Google+, Twitter) plays a

role in influencing whether someone will become (or remains) a LPP in that community.

In addition to the availability, and use, of certain resources, interactions of a community are shaped by the expectations that have formed in the interactions that members had prior to joining such communities. If increased engagement is sought by community organizers, it is important to have a set of community norms and values for people to reference. This way LPPs are not left feeling "less than" for being read-mostly members. We saw in the responses that LPPs believed that actions such as liking or sharing were "not enough" or "not a contribution." Some of the constraints of what Dron (2016) calls p-Learning have been translated into the virtual world and it is important to question assumptions of what is *engagement* or *participation* in a community of learners, and what forms of action constitute *engagement* in these new spaces for learning. Peripheral learning is a normal attitude in online learning spaces with learners that come from diverse backgrounds. Active learners and facilitators should develop strategies to allow those LPPs who wish to become more active into the core of the community once engagement has been defined – to help them make the journey from apprentice to master should they desire to do so. Perhaps instead of "pathologizing" peripheral learning, we should instead view peripheral learning as a form of honouring voices from afar, and accepting that as a means of learning.

Finally, we conclude that peripheral learning is a natural behaviour in any online learning space and thus it can be naturally considered in any layer of a community. However, though not a must, there should be efforts to help LLPs to participate.

Recommendations

Based on the findings of this research and impressions gained from our observations, we recommend the following: Peripheral learning can be seen as a potential journey from the periphery to the core of a community and LPPs can be viewed as apprentices observing the masters in any community. Given this, we suggest that facilitators could develop strategies which encourage LPPs to participate more with the community. One such strategy could be encouraging more active learners and experienced members to actively show LPPs that they are welcome in order to encourage LPPs to participate more fully if they so wish.

We asked our LPPs whether they perceived that peripheral learning was a lesser experience than participating, or just a different one. However, their responses were

inconclusive. We therefore recommend that this is followed up as an area for future research.

Authors' Notes

The data was collected from open, public spaces on Twitter. The sociograms were anonymized even though it is not required since the data collected from public spaces. All the participants were provided with a consent form and only those who agreed the terms on the consent form were included in this research. One of the researchers (Sarah Honeychurch) has ethical approval from the University of Glasgow to undertake this research.

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Teaching Environmental Management Competencies Online: Towards "Authentic" Collaboration?

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Abstract

Environmental Management (EM) is taught in many Higher Education Institutions in the UK. Most this provision is studied full-time on campuses by younger adults preparing themselves for subsequent employment, but not necessarily as environmental managers, and this experience can be very different from the complexities of real-life situations. This formal academic teaching or initial professional development in EM is supported and enhanced by training and continuing professional development from the major EM Institutes in the UK orientated to a set of technical and transferable skills or competencies expected of professional practitioners. In both cases there can be a tendency to focus on the more tractable, technical aspects of EM which are important, but may prove insufficient for EM in practice. What is also necessary, although often excluded, is an appreciation of, and capacity to deal with, the messiness and unpredictability of real world EM situations involving many different actors and stakeholders with multiple perspectives and operating to various agendas. Building on the work of Reeves, Herrington, and Oliver (2002), we argue that EM modules need to include the opportunity to work towards the practice of authentic activities with group collaboration as a key pursuit. This paper reports on a qualitative study of our experiences with a selected sample taken from two on-line undergraduate EM modules for second and third year students (referred to respectively as Modules A and B) at the Open University, UK where online collaboration was a key component. Our tentative findings indicate that on-line collaboration is difficult to ensure as a uniform experience and that lack of uniformity reduces its value as an authentic experience. Whilst it can provide useful additional skills for EM practitioners the experience is uneven in the student body and often requires more time and support to engage with than originally planned.

Abstract in Portuguese

A Gestão Ambiental (GA) é ensinada em muitas instituições de ensino superior no Reino Unido. A maior parte dos cursos são estudados em tempo integral em aulas por jovens adultos que se preparam para um subsequente emprego, mas não necessariamente como gestores ambientais, e esta experiência de estudo pode ser muito diferente da complexidade das situações na vida real. Este ensino acadêmico formal ou desenvolvimento profissional inicial em GA é apoiado e reforçado pela formação e desenvolvimento profissional contínuo dos principais institutos de GA no Reino Unido orientados para um conjunto de habilidades técnicas e transferíveis ou competências esperadas de profissionais. Em ambos os casos, pode haver uma tendência para se concentrar nos aspectos técnicos mais manejáveis da GA que são importantes, mas podem revelar-se insuficientes para GA na prática. O que também é necessário, embora freqüentemente excluído, é uma apreciação e capacidade de lidar com a confusão e imprevisibilidade de situações de GA reais envolvendo muitos atores com múltiplas perspectivas e operando com vários objectivos. Com base no trabalho de Reeves, Herrington, e Oliver (2002), argumentamos que os módulos GA precisam incluir a oportunidade de trabalhar na prática de atividades autênticas priorizando a colaboração em grupo. Este trabalho relata um estudo qualitativo de nossas experiências com uma amostra selecionada de dois módulos de GA de graduação on-line para estudantes de segundo e terceiro anos (referidos respectivamente como Módulos A e B) na Open University, no Reino Unido, onde a colaboração on-line foi um componente chave. Nossos resultados preliminares indicam que a colaboração on-line é difícil de garantir como uma experiência uniforme e que a falta de uniformidade reduz o seu valor como uma experiência autêntica. Embora possa fornecer habilidades úteis adicionais para os profissionais de GA a experiência é desigual no corpo estudantil e muitas vezes requer mais tempo e apoio para o envolvimento com o planejamento original.

Keywords: group work, distance learning, e-learning, collaboration, participation, Environmental Management.

Introduction

Achieving authentic group-work experience in an on-line learning environment is problematic. In this paper we describe and review the progress to date of running online collaborative activities within two modules (or courses) in Environmental Management (EM); activities that attempt to replicate some of the competencies often needed by EM

professionals working with different stakeholders in group or community settings. To set the context we briefly review EM as an academic subject and as an emerging profession, as well as the particular form of open, distance and e-learning (ODeL) that The Open University, UK (OUUK) operates. We then describe the two modules and our overall approach to teaching, learning and assessment, before going on to outline the nature of, and discuss our experiences with, the online collaborative activities in relation to the existing best practice in online collaboration.

Background

EM – Generic Skills and Multiple Perspectives

Defining what environmental managers do, and thus knowing what to teach for environmental management, is not straightforward. This is exemplified by the way jobs are described, by what professional bodies and others expect and by the range and nature of environmental courses and qualifications offered by other higher educational institutions and providers. The discussion that follows relates mostly to the UK but we expect that the complexity it reveals is applicable in other countries.

> *"The number of organisations registered under the EMAS standard rose by 50% during the period 2003-2010, while organisations from EU countries certified according to the international ISO 14001 standard more than quadrupled in the period 2001-2009. This indicates that private companies and public institutions in the EU are increasingly engaging in environmental management." (EEA, 2013)*

The past decade has seen substantial growth in the number of jobs or professional bodies with environmental manager/ management in their title across Europe (EEA, 2013). (In the UK there are 3 professional bodies with EM in their title: Institute of Environmental Management and Assessment (IEMA); Chartered Institution of Water and Environmental Management (CIWEM); Chartered Institute of Ecology and Environmental Management (CIEEM)). Equally there is a growing body of knowledge and skills that relates directly to EM that is not drawn from academic disciplines, as set out in the subject benchmark statement from the Quality Assurance Agency (2014), but is reflected in the cognitive and practical skills demanded by these environmental professional bodies up to advanced *Accomplished* and *Authoritative* levels (e.g. see the CIEEM Competency Framework Competence Levels, n.d.). This suggests that there is the potential for divergence between the skills and competencies taught in Higher Education and those outlined in professional bodies' *competency frameworks*. In review

of these frameworks it can be seen that the technical and specialised elements vary according to the main contexts and expectations of those bodies while the more generic and transferable competencies are similar. Nevertheless the professional bodies all claim to provide an integrated and/or interdisciplinary approach to their frameworks (see CIEEM (n.d.), CIWEM (n.d.) and IEMA (n.d.)). Even so, the impression of the various frameworks, specifically at the lower levels of accomplishment, is a focus on systematic approaches to "follow good practice guidelines" (see CIEEM, n.d.), with far less focus on the more self-reflective, flexible, interconnected approach that uses systemic methods and managing skills in contested and challenging socio-ecological and technical contexts. Such methods and skills have often been argued to be essential for dealing with the relationships between specific disciplines and dealing with the major complexities of human activity systems. This includes the differing wants, needs and perspectives of those involved with complex environmental situations and how those wants, needs and perspectives may be expressed and managed through face to face and communication technologies as variously but tellingly indicated in a host of examples such as Loan et al. (2007), Ganoulis et al. (2008), Newig and Fritsch (2009) and Powell and Osbeck (2010).

We suggest that this demonstrates evidence of two tendencies in the teaching of EM. On the one hand, and most obviously represented in the various competency frameworks provided by the Professional bodies, a concentration of HE Institutions and Professional Bodies on specific, detailed and generic, technical skills; and on the other hand (but less evident in the frameworks) a recognition of the value of "soft" and systemic skills needed to integrate specific disciplines and their related methods in many EM contexts where the multiple perspectives of stakeholders ensures a contested socio-technical and biophysical situation.

It is this latter aspect which has been in part the concern of our teaching and research. In this paper we will assess our experience in facilitating collaboration and cooperation between students engaged in applying systemic skills in EM.

Teaching EM at The Open University

EM can be complex and messy. As such, it often requires engaging with and collaboration among diverse stakeholders to progress EM situations – a trend which continues to increase. Systems thinking and practice is one such discipline which both tries to represent and to accommodate different peoples' perspectives on particular situations; and equally it is a discipline that has mostly been applied to managing complex or messy situations in which people are trying to take action (Checkland, 1999;

Reynolds & Holwell, 2010); and unsurprisingly has been extensively applied to managing environmental situations (e.g. Seiffert & Loch, 2005; Ison, 2010; Gundill et al., 2012).

There is a long history at the OUUK of teaching both systems thinking in practice (Bell & Lane, 1998; Lane, 1999; 2013; Ison & Blackmore, 2014); of teaching environmental subjects more widely (Weinbren, 2015; p.210) and of applying systems thinking to environmental situations and sustainability (Berardi, 2011; Blackmore et al., 2015) although it is by no means unique in doing so (Karlsson et al, 2000). However, it is unique in that it has largely been doing so through ODeL. Distance teaching (and learning) of practical skills and doing collaborative work, is challenging in many ways compared to most full-time place based settings.

Firstly, the OUUK is founded upon open entry to undergraduate modules and qualifications, that is, without the necessity for prior qualifications. This leads to a very diverse and distributed student body, of mostly mature students (over 25), studying part-time at the same time as engaging in some form of paid work, perhaps located in several different countries. Secondly, there may be issues of access to, and confidence in using, necessary information and communication technologies (ICTs) for studying online. This can particularly be the case for some practical tasks, such as being able to create, share and discuss diagrammatic representations of complex or messy situations (a key skill for system thinking and practice – Lane, 2013). Thirdly, for distance learners distributed through time (zones) and (geographical) spaces around the world synchronous and asynchronous activities rely on the appropriate and negotiated use of ICTs – with all the limitations of losing non-verbal clues in communication. Lastly, whereas a classroom based cohort in a traditional university largely involves interactions between a single teacher and a relatively small group of full time students taking one, possibly two, related degrees, a distance learning module at the OUUK has a large population in the hundreds, with students taking the module as one component of different qualifications. Groups of 20-25 students are allocated to a Tutor (also known as an Associate Lecturer) who provides direct tuition and marks assignments that supplements and supports the teaching embodied within the module's multimedia educational resources. This teaching structure and environment provides extra challenges in organising and managing group based activities.

In the past the OUUK did rely on optional face to face tutorials and also access to a one week residential school where students could have extensive involvement in group based activities. However, the geographical and temporal availability and accessibility

of such tutorials has diminished in recent years (a point noted with many connotations for module delivery in a recent Newspaper article (Swain, 2015)). Few residential schools are now run due to a variety of student centred and organisationally focused reasons (see Roy et al., 2005; Slade & Mullett, 2010). Equally, from the 1990s onwards changes in ICT began changing the ways in which distributed distance learners could collaborate both synchronously and asynchronously. Indeed, this technological change has led to many modules being partly or wholly delivered online (Caird & Lane, 2015) as is the case for the two modules involved here, and with much effort being put into the aspiration of designing virtual activities to offset the loss of similar or related, possibly more authentic place-based activities.

Collaborative group work online and authenticity – some lessons in the literature

Collaborative working online (whether that is deemed to be authentic or not to actual working practices) has evolved along with the ICTs that support it, although often as part of face to face teaching programmes. Research into what started out as "Computer Supported Collaborative Learning" has looked at both the technological (e.g. see Muuro et al., 2014; Hwang et al., 2014) and educational aspects of it. Our focus is with the educational aspects and the literature provides much detail. In both Module A and Module B we sought to develop effective groups which could deal with complex problem issues. Brindley et al. (2009) look at this noting that:

> *"There appears to be a strong argument for including small group collaborative learning experiences in online courses. The literature reveals a significant relationship between participation in these experiences and deeper learning as well as the development of learning and teamwork skills." (p.15)*

These authors also note the importance of coherent instructional strategies in the success of such group work:

> *"Further, well planned instructional strategies that are intended to improve the group learning experience appear to have a number of added benefits, such as helping students to achieve deeper learning and to build their confidence and skills." (p.16)*

A point amplified in Xu et al. (2015) who sought to understand how students manage group learning activities. Their findings are instructive:

> *"[…] based on the data from 298 students (86 groups) in United States. Data revealed that, at the group level, groupwork management was positively associated with feedback and help seeking. Data further revealed that, at the individual level, groupwork management was positively associated with feedback, peer- and learning-oriented reasons, help seeking, and the number of online courses." (p.195)*

If coherence of instruction and the value of feedback (as both an aid to group work and a virtuous outcome of a positive group working experience) are important (also noted in Rose, 2004) – so are reflections on the experience students have with online collaboration. Baran and Correia (2009) suggest student-led, as opposed to tutor-led, facilitation tends to be favoured by students and can lead to increased student participation and improve learning outcomes. Veletsianos and Navarrete (2015) offer similar endorsement, noting in their study using the Elgg online social network that their findings:

> *"… indicate that learners enjoyed and appreciated both the social learning experience afforded by the online social network and supported one another in their learning, enhancing their own and other students' experiences." (p.143)*

Further, Zhu (2012) notes that a student's self-perception of satisfaction with the online experience is a key indicator of the sustainability of an online group work process and concludes that:

> *"the study indicates that learning with peers may benefit not only the overall individual performance, it may also enhance team performance by increasing the quality of team product. Students can learn to formulate ideas and opinions more effectively through group discussion". (p.134)*

At a theoretic level, Medeiros Vieira et al. (2014) point beyond this to the potential for a form of collective intelligence.

Group experience may also relate to the quality of the collaboration process and the evolution of collaboration – following traditional group formation phases (such as those described by Tuckman (1965) and Tuckman and Jensen (1977)) or less conventional models (e.g. see Gersick, 1991). Variations on these experiences are described in Jahng (2012) and he suggests that the traditional model of collaboration may not be the best

way to assess online groups. Indeed, student focus may well vary across a range of group exercises. Janssen et al. (2012) state:

> *"Our analyses show that group members devote most of their efforts to regulation of task-related activities. For example, by formulating plans or strategies or monitoring task progress. Group members also engaged in social activities often (e.g., disclosing personal information, joking). Less attention was paid to exchange of task-related information (e.g., asking task-related questions) and regulation of social activities (e.g., planning and monitoring the collaboration)." (p.25)*

Group learning also has negative impacts on students' experiences of group work. Capdeferro and Romero (2012) identified a core reason for frustration with online work:

> *"The perception of an asymmetric collaboration among the teammates was identified by the students as the most important source of frustration." (p.26)*

Capdeferro and Romero also noted issues around group organization, lack of shared goals, imbalance in commitment, variations in the qualities of input to the group exercise, differences between collective and individual grades and problems with communication. The instrumentalism of students in terms of focusing on grades rather than the values of collaboration has also been noted elsewhere (Cameron et al., 2009)

The list of benefits and issues outlined above are encouraging and intimidating and clearly a workable design for online learning needs to take into account:

- coherent group instruction;
- application and valuing of formal feedback structures;
- identification of forms of group satisfaction with tasks;
- encouraging discussion and a balanced approach to the range of online tasks;
- avoiding whenever possible asymmetry in group inputs;
- providing support to students (via the Tutor network) when apparent injustices, issues of share of load and contribution of intellectual insight emerged.

These are themes we will return to in considering the development of collaborative work in Module A and Module B.

We should note here that by *authentic* we build on the work of Reeves, Herrrington, and Oliver (2002) around authentic activity. Authenticity does not only mean *genuine and accurate* but we also refer to the more philosophic meaning of the word which relates to or denotes an emotionally appropriate, significant, purposive, and responsible mode of human life (working from the Oxford English Dictionary definition). In this context, the ten characteristics of authenticity set out by Reeves et al. (2002) suggest that authentic activities in student learning:

- have real-world relevance;
- are ill-defined, requiring students to define the tasks and sub-tasks needed to complete the activity;
- comprise complex tasks to be investigated by students over a sustained period of time;
- provide the opportunity for students to examine the task from different perspectives, using a variety of resources;
- provide the opportunity to collaborate;
- provide the opportunity to reflect;
- can be integrated and applied across different subject areas and lead beyond domain-specific outcomes;
- are seamlessly integrated with assessment;
- create polished products valuable in their own right rather than as preparation for something else;
- allow competing solutions and diversity of outcome.

(Reeves et al., 2002; p.564)

Clearly there are overlaps between these ten characteristics and the six themes we have already identified in the literature. Key to the ten points on authenticity is the inclusion of real world experience. Indeed, the module focus on EM in domestic, organisational and community contexts provided flexibility for developing teaching materials covering a range of topics, but most importantly we believed it to enable a connection between EM and the students' own life and possible work experiences. Everyone has some experience of EM in domestic situations (however diverse); everyone has some engagement with at least one organisation at some level; and everyone can relate EM to some form of community context as shaping the places where lives are lived. These lived experiences for mature students will be greater than for students in universities where there is more reliance on *abstracted* teaching of EM as a mostly scientific or technical subject, set apart from the students' limited lived experiences.

The OUUK's Environmental Management Modules

The focus of this paper is on the experiences and perspectives of students, supplemented by those of Tutors, of collaborative activities within two related modules dealing with environmental management studied at the equivalent of the second and third year of a 3 year honours degree (namely Module A and Module B respectively). These two 30 credit modules are core components of a 360 credit BSc in Environmental Management and Technology; but they also have been optional modules within a BA in Environmental Studies, a BEng (Bachelor of Engineering) and also within the OUUK's unique BA/BSc Open degree whereby students are free to choose which modules they take for each level (equivalent to year) of study. Furthermore, as students can choose their study intensity to suit their own situation, some will only be studying one module at any one time while others may be studying two or rarely three at the same time.

The design of the modules was based on four principles:

1. That the students have different work and life experiences to brings to their studies.
2. That the teaching and related learning should be online as much as is possible.
3. That EM would be taught in a manner linking conventional EM approaches with systemic teaching. This is a significant topic in itself but by this we refer to teaching which is student-centred, relational, emergent, adaptive, appreciative of multiple perspectives on any given context, collaborative and integrating diverse communication tools including diagramming and self-reflection. By this means we sought to reinforce the systemic nature of EM concerns (the impact of ICTs on teaching and learning diagramming in these two modules is primarily reported in Lane (2017)).
4. That EM teaching needs to enable and facilitate students to work in groups – recognising that contemporary and future EM is increasingly defined by collaboration and often needs to be community facing if it is to be successful.

The rationale for group work in EM is well established with many examples of collaborative processes providing diverse and serendipitous outcomes as well as more formal and planned results (for example see Berardo et al., 2014).

The two modules have a similar structure and philosophy as well as approaches to teaching, learning and assessment. The 300 hours of study time for each module is broken down into three blocks of 60, 120 and 120 hours respectively, with the modules running for nine months starting in October. The first block looks at issues related to

EM at the domestic or household context; the second deals with EM within organisations; and the third covers EM within community settings. While we teach conventional EM approaches such as life cycle analysis, each module uses systems thinking and practice, including the use of diagramming, as a key toolset alongside an action learning model. (The action learning model is based on the insights of Kolb (1984) and this involves groups working through a cycle of reflecting on past action, considering the nature of the current task, modeling potential means to proceed, acting and reflecting again. The action learning cycle has been a major theme of systems teaching at the Open University for over four decades.) Throughout each block there are a number of online activities, many of which include producing diagrams and sharing them within the tutor group, and at the end of each block there are tutor marked assignments (TMAs), which also require the inclusion of diagrams. The third block, the focus of this paper, requires smaller *sub-groups* within each tutor group to spend 6-8 weeks on a group activity that informs the End of Module Assessment (EMA) (while the activity is done in groups, students produce individual Assignments in the EMA but have to reflect on the group process).

Our pedagogical intent was to broaden the emphasis from a singular focus on *teaching of knowledge* (text based, from teacher to student, limited interactivity) to the *learning of skills* (online, multimedia, activity rich, collaborative, appreciating others' perspectives, different responsibilities taken up in group work) in order to give students the opportunity to appreciate and gain insight into the systemic nature of EM situations and thus the role of environmental managers. Some of these skills are generic to many modules but our concern with developing an appreciation of systems approaches to EM placed more emphasis on engaging with multiple perspectives and our aim of authentic collaboration which we explore in later sections.

In Module A, these contexts of EM were focussed on in terms of domestic energy use and food; organisational concerns with life cycle of IT equipment and also transport; and community issues relating to management of water. In Module B, the same structure was in place, but this time focussing on personal environmental auditing in the domestic context; and then using the example of Heathrow airport to explore how organisations innovate in EM of buildings; and EM of noise in the *community*.

Our research experiences in diverse areas of EM have convinced us of the critical significance of collaborative *group work*, both with people you know and often people you do not know, as part of contemporary approaches to EM situations. *Group work* or working with diverse people as if a group for a defined time and purpose is a key part of

professional practice to enable learning about and integration of diverse ideas, experiences and perspectives on situations in order to manage them more effectively. It is also a key aspect of participatory imperatives in many environmental situations where stakeholders have to be formally or informally consulted about or involved in shaping plans and decisions. Leading on and facilitating such participatory activities is an important skill to have (authorities are numerous but see for example O'Faircheallaigh, 2010).

In a module setting, by group work we mean an online collaboration between members of the same tutor group. This is more than posting/replying to messages (e.g. see Peters & Hewitt, 2010) and includes: careful reading of others' work, purposeful pursuit of shared meaning, asking difficult questions, on-going assessment of what the group does not yet understand, open acknowledgement of confusion etc.

The specifics of the group work in each module were designed to have real world resonance and incremental (from Module A to Module B) relevance to the student.

In Module A, the group work was focused on water issues and community engagement. Taking a recent project based on the island of Malta as an illustration and the participatory approach *Imagine* (as illustrated in Bell and Morse, 2003) as the community engagement approach, students were asked to co-lead on one of four collaborative *Events* which represented each of the four stages of the Imagine process (The Imagine Method is an evolved method, designed specifically to engage local community in EM initiatives (see for example Bell et al., 2013). Furthermore, Imagine lends itself to the systemic teaching pattern of the Open University conforming to an action learning cycle.). The project which they were to work on was very similar to the Maltese example being based on an actual project in Almeria in Spain which was completed in 2012. The leadership expected from the students in this case meant taking a working brief for one of each of the four stages of Imagine and then helping group members to work through the series of tasks each stage required. As each sub-group comprised around ten students, each Event would have 2 or 3 *leaders*. Part of the assignment for this stage of the module was to report back on the leadership results and experience.

In Module B the module team wanted to increase realism and relevance further to the students. Taking airports and the wide range of community environmental impacts which they produce as the basis of the group work, the students again worked in sub-groups of around ten individuals. In Module B the focus was on facilitation rather than

leadership. The shift was to facilitate others in their understanding of the ramifications of group / community work in a complex area using London Heathrow airport as a case study. This was supported by collaboration between the module team and the BBC which produced a three-part documentary called "Airport Live" at the airport in 2014. Many hours of footage from this programme and commissioned interviews with major airport and community figures helped to increase the realism and relevance of the various environmental issues emerging from the airport context. A key value of the London Heathrow case study was the generic nature of many of the environmental issues involved and the immediate and personal experience most of our students have of airports.

The group work in both Module A and Module B was developed towards the end of the second Block, providing time for students to become familiar with their sub-group in Block three. In all cases, a Tutor for each student group allocated them into two sub-groups making about 20 sub-groups on Module A and 12 sub-groups on Module B. The Tutor is assumed by the end of Block 2 to have a reasonably intimate understanding of the 20 or so students under their tutorage. The two *sub-groups* are expected to include a cross-section of the abilities, tendencies and capacities. The expectation of the Module Team was that in the early stages of the group work the Tutors would facilitate the sub-groups by pointing them towards the various on-line resources prepared for them. Experience from previous modules and confirmed from the earlier presentations of Module A and Module B was that the sub-groups would increasingly become autonomous to the extent that the various tasks of the Block could be accomplished with minimal input from the Tutors at later stages.

The student numbers for the presentations reviewed are set out in Table 1.

Table 1: Module student numbers and retention

Module and Pres	Student Numbers at Start of Pres	Student Numbers at End of Pres	% Dropped Out by end of module	% Dropped out before Block 3	% Difference from Block 3 and total
Module A 2014	283	202	28.62%	22.26%	6.36%
Module A 2015	272	189	30.55%	24.63%	5.92%
Module B 2014	135	103	23.7%	21.48%	2.22%
Module B 2015	160	117	26.88%	20.62%	6.26%
Totals/ Overall averages	850	611	27.4%	22.3%	5.15%

Data sourced: Quality Enhancement and Learning Analytics, LTI portfolio, Module Activity Charts 2014-1015, The Open University

As can be seen, the study involved around 611 students as there had been significant drop out prior to Block 3 where the research was undertaken.

An observation that can be made from the data is that the drop-out rate associated with the group work Block which occurs about a third of the way through the module (on average around 5.15%) is not as great as the drop-out rate associated with that prior to the Block (on average around 22.3% across the modules).

Study Method

The research described in this paper is on-going and our observations and conclusions are, at present, subject to revision. The method applied in this paper is qualitative sampling, taking on board Yin's maxim that:

> *"Doing qualitative research means understanding that it is a craft, marked by the challenge of doing original research and pursuing three important objectives: transparency, methodic-ness and adherence to evidence" (Yin, 2016; p.36).*

If qualitative research requires craft skills in face to face research (as emphasised in the work of action researchers (e.g. see Chambers, 2002)), it has a further range of complications for on-line research – particularly in terms of what Yin refers to as key *features* of qualitative research (meaning in people's lives, representing perspective, attending to real world context, contributing explanatory insights and the relevance of multiple sources of evidence). Clearly, researching an online community imposes limitations on the quality of evidence derived from observation at distance and, in an attempt to address such concerns we have adopted a longitudinal assessment seeking what Yin refers to as *overarching concepts* to organise our study.

From August 2014 to May 2016 the module teams have (with assistance from in-built Open University evaluation processes) monitored and sampled the narratives emerging from the group working process and experience in Module A and Module B. Members of the module teams monitored the student online forums over the 30 weeks of the module presentations, (October to May, 2014 – 2015 and 2015 – 2016) paying particular, but not exclusive attention to the student forums provided in the Virtual Learning Environment (VLE). Each student has access to eight forums in each module (café, the three Blocks, Individual Tutor groups, Sub group forums for group work

related to Block 3 and End of Module Assessment) and there were roughly 400 students on the two modules in each of the annual presentations. The entire population was monitored on a daily basis and all forum inputs were read.

What follows is a thematic analysis of qualitative data that we are able to purposefully sample from the very large number of forum posts, emails and open ended survey responses related to the normal running of the modules as well as qualitative data gathered specifically for a separate study on the use of diagramming within the two modules (Lane, 2017). Forum contributions were specifically assessed for themes which were thought likely to impact on the authentic experience of EM group work (features previously noted in the work of Reeves). The research team did not wish to impose their pre-conceived concepts of such themes but rather waited for themes to emerge as clusters of linked and like-minded posts in the forums. This Eductive approach (to be distinguished from inductive or deductive, Eductive: "to draw forth") is consistent with many of the themes of the Action Research and Co-operative enquiry forms of qualitative assessment (e.g. see: Reason, 1994; Moggridge & Reason, 1996; Bargal, 2008). This qualitative data relates to all completed presentations of the modules and not those happening at the time of writing (from February 2016 to February 2017).

A plethora of items emerged but, at a high level of abstraction our findings resulted in three themes or *overarching concepts* as emergent meta-issues specifically arising in the process of Block 3 group work over the two modules. These overarching concepts concern:

- the practicalities of online group work;
- relationships within online group working and
- the value of online group working.

In the next section we review each of these in turn, making use of student quotes to exemplify specific points.

Findings to Date

Our analysis is primarily concerned with student reflections on group work in Block 3 of Module A and Module B. To emphasise the impact of group work on online communication it is important to recognise that group interaction as represented in forum activity noticeably peaks as students begin the group work. Figure 1 and 2 show the increase in VLE activity for a module which contains group work compared to a

more conventional module which does not make use of group work. The data is from the 2014/15 presentation.

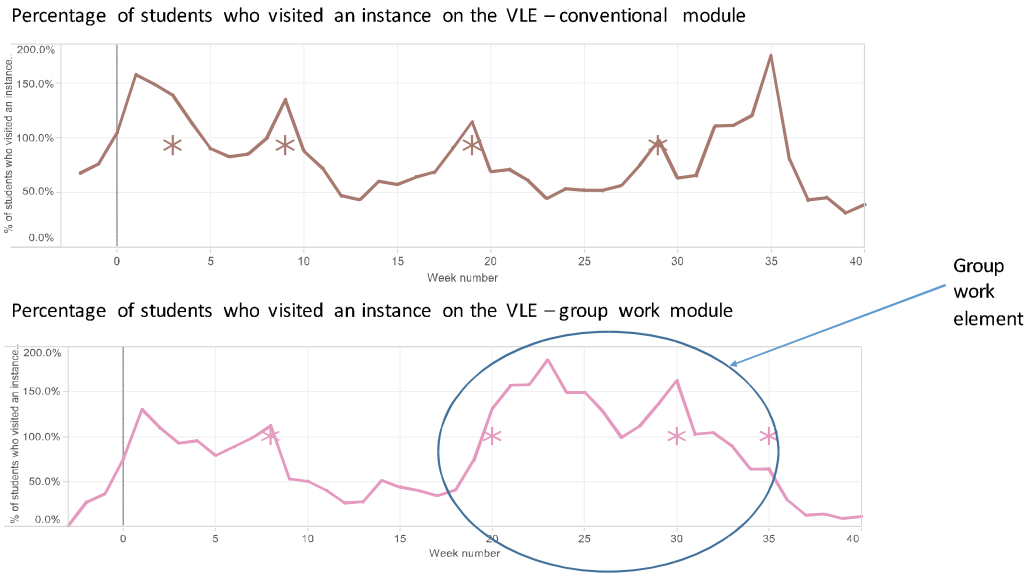

Figure 1. Graphs of impact of group work on VLE activity – comparing non group work module to a module which has group work

While the focus for this analysis is student reflections on collaborative working in small groups, it has to be acknowledged that these perceptions are influenced by the nature of the task as set in the philosophy of the modules. We can point to evidence in both modules that the overall teaching and activities conform to the ten characteristics provided by Reeves et al. (2002), nevertheless, students had differing views, for example, on the relevance and value of systems thinking, of diagramming as a tool or technique used within systems thinking and practice, and of both as being useful for EM as a subject:

> *"Systems thinking was more difficult for me than environmental management. I found the diagrams straightforward to draw, and I understood what they represented. But what took time and effort to master was applying the module's systems thinking approach to environmental management."*

> *"I found it quite difficult at times to know what the course wanted. I thought at times the course didn't know itself what it wanted, whether it wanted to be sort of technical in terms of the environmental action*

> *plans and LCAs [Life Cycle Analyses] and what have you, and the technical side of the various systems diagrams or whether it wanted more of the what I call the flowery waffle language in terms of thinking about thinking and putting honest philosophical viewpoints across."*

These comments underline the additional difficulty for students taking the modules, the practical and intellectual challenge of applying a systemic approach to EM whilst making use of diagrams and group work. Each might be considered to be a challenge to conventional face to face EM teaching. Combined in online modules they can be expected to provide combinatorial outcomes which may prove tricky to separate.

What follows is a segregation of examples of student responses in line with the three main overarching concepts dealing with the perceived practicalities of the modules, understanding relationships within groups and assessing the value of the group working activity in both modules.

Practicalities of Online Group Working

The experiences of students in running the various Events and taking particular roles was influenced by many things. The first of these was their *previous experience* of group working in any form:

> *"I would say the group work [is most enjoyable] because the first couple of blocks were very new to me and I didn't do quite as well as I expected to do in terms of the marks of the TMAs although it was a bit of a learning curve for me. I learnt a lot from those but the group work was much more enjoyable because I am quite used to working within teams and also leading teams so a lot of it came fairly naturally, especially some of the personality types."*

A second issue was about preparation and catching up with the *workload*:

> *"Thanks for pushing on with the workload, I appreciate what you're doing. If you don't mind, would you please copy me in on what you've done so far. So far I haven't caught up with the reading to week 3, which means I don't understand what you're doing yet but I hope to be up to speed by the weekend."*

Part of the reason for the need to catch up was balancing workload on this module with other modules and within an already (often) congested life. Many students were taking more than one module at a time and this can cause significant problems in terms of study time. The theme of workload relating to studying multiple modules was to recur over the group work Block. Another catch up message is on the same theme but looking forward to Event 2 in week 5:

> *"I think we are close to being on track at the moment I have a day off on Thursday in which I will dedicate the whole day to event 2!! I've finally caught up on my other assignments so all eyes on this one for the future!"*

Another practical difficulty was that some students found it *hard to participate* in the group work. The reasons varied between other commitments, being in places remote to the other students (time zone) or being away from internet connections. Here is one comment:

> *"Hi I will continue to sit on the outside looking in because I have had so little involvement and I feel I cannot justifiably get involved with things at this stage not having gone through the entire process. However I hope you do not mind me contributing the occasional comment. I think X's summation is spot on; ….."*

This contradictory lack of practical *commitment* yet at the same time evidence of desire to commit was often repeated by different students and could be seen as part of the work achieved by Block 3.

This contradiction over commitment might be because the process of Block 3 was a change from many students' previous experience of distance learning. This was made evident in a number of complaining posts:

> *"it is difficult for all of us to be around at the same time - this course doesn't really suit the normal OU study methods for students who have families and work. At present X is terminally ill, so in the last week I've not contributed anything. To catch up – simply review and comment on events 1 and 2 then anyone who hasn't facilitated yet need to volunteer to facilitate at event 3. The rest of us will be around to help."*

> *"this is very much a module where you have to be bang up to date with it virtually every week a) because of the amount of material in it and secondly because of the amount of group work, which when you get to the group work stage you need to do, the time tabling of the group work is very very tight and our tutor acknowledge that, which I think was a good point to make right at the outset, that you haven't go much time to do this and when you are doing it by distance learning that makes it even more difficult."*

The Blocks were written assuming that students would have space to stand back and not be engaged in all aspects of all weeks. But, if not all members of sub groups participate and life events catch up, then clearly students can find themselves under considerable pressure.

A further practical issue was the *limitations of ICTs*:

> *"We, our group, approached this from the view of asynchronous communication, in other words we communicated our ideas and thoughts on the work that we had to do. The tasks were set by adding threads to posts. This to me is a very unwieldy way of doing this particular kind of work. It is almost as if what you are trying to do is… what you are trying to do with environmental management in this particular exercise is that you are pretending that the students are to some extent the stakeholders in this scenario. For the communication to be effective you need to be able to talk to people synchronously. In other words at the same time. I found the whole thing became very disjointed; it was very difficult to keep with people's thoughts or the thread of other people's thoughts in context which was actually vital."*

Relationships within Online Group Working

Related to the practical difficulties that might inhibit students' engagement in and with the group working activities is how different students viewed their fellow students in the group. The role of the Tutor, their e engagement with the Events and with support for the sub groups was also a recurring theme. In one presentation, a Tutor resigned mid-module and the implications of the disengagement prior to and following the resignation is particularly clear in that Tutor's sub groups' dynamic. They found it hard to jell in the first place and subsequently were constantly chasing to catch-up, led by one or two particularly committed individuals.

One Module B student – a member of the group which had Tutor issues – provided the following excellent, amusing and telling Rich Picture and description of the experience – See Figure 2.

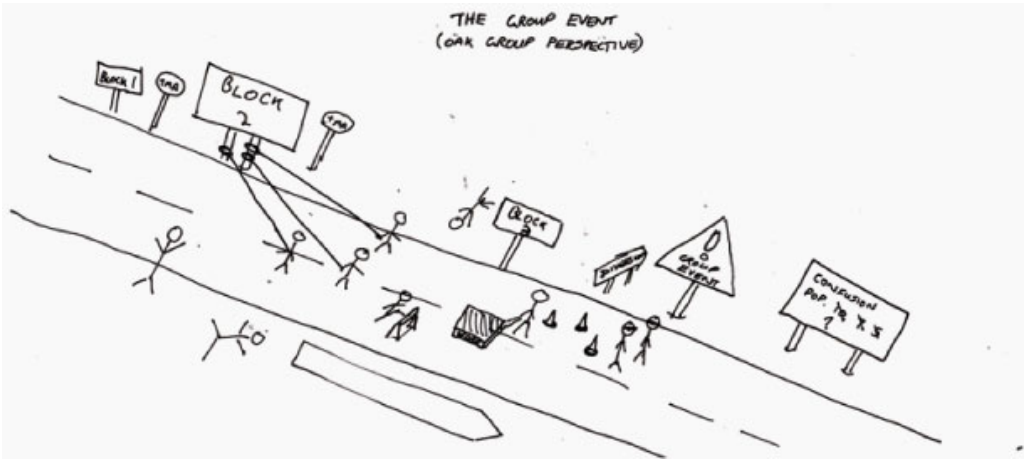

Figure 2. Student Rich Picture of the Module B process

> *"We're all on the Module B road. Some have fell by the wayside: some are tied to the huge volume of work in block 2 while others are negotiating obstacles around work/personal commitments and technical problems. While all this is going on the ones who've reached the 'group event' sign have absolutely no idea that nobody's following them."*

Clearly the issue of who is actually in the sub group and who is carrying the load of the work is an anxiety. Module texts make it clear that a positive module outcome can be achieved even when issues develop in the sub group but this is an on-going concern thread and something the Module Team needs to consider further. And yet some students in other groups had more positive and supporting perspective. For example, a very late comer to a sub group received this comment:

> *"Sorry to hear about your difficulties. Judging from the lack of recent input I think our work is done here; time to move on to the TMA. Everything we did was kept here, on this forum (we did not use any of the other tools) and therefore the entire process can be followed in chronological order. All you should need to complete TMA 3 is there, including all the debate and conclusions and the various outputs.*

> *There were only 2-4 people sporadically available throughout (very occasionally up to 6), so this lack of numbers meant that all the facilitators contributed to the debate and tasks (rather than remaining impartial) and the overall facilitation was supported by us all. The process was overall a great success, a good team, I believe we all enjoyed it."*

The importance of the forum as the mechanism and place to archive the work of the group is clear. The power and ability of this small group to sustain its work load and an empathic willingness to share are also notable. The final, positive message despite the lack of engagement by some students is also interesting:

> *"I have felt disappointed at times with the way we seemed to have been left to our own devices on line at different times but really this is what a remote community or on line debate is about. Parts of events I particularly enjoyed was drawing rich pictures and influence / spray diagrams. I found contribution to debate a real struggle. Honestly this course has helped me a lot at work, as I stopped getting frustrated and think of the bigger picture and others point of view a lot more."*

> *"I enjoyed looking at others work to get ideas to aid my own diagrams, and I was happy for people to look at mine and gain the same insight."*

> *"I found this very beneficial often alleviating any doubt relating to my understanding of the course requirements. More importantly during group work provided discussion opportunities and was essential in reaching any consensus."*

This spirit of cooperation and inclusion was wide felt and often repeated among the groups and is evidence of the spirit of the facilitation needed in Block 3. This continued even with people emerging from the online shadows and joining groups effectively when the group work was finished.

When the group work progressed well it elicited high praise of the relationships formed:

> *"Your skills in presenting our collective thinking has again proved invaluable and provides an interesting insight into each of our thinking of the issues and tasks and how we perceive them in the grand order of priority."*

> *"Here is to a big celebration for all of our efforts. It has been wonderful working with you. I think we have developed a great bond and energy. For me, this has been the strongest link I have had with fellow students over my 5 years of OU study."*

Again:

> *"I have never experienced such bonding within a group over my 6 yrs with the OU, even when the courses had monthly face-to-face tutorials. You have all been such great people to work with and to get to know. I have really enjoyed this last two months with all the challenges that it has presented to us and the feelings of satisfaction as we conquered them along the way. I would really like to keep in touch and would definitely like to make our airport meeting reality."*

But equally there were some who were much less happy with their experiences of relationships in online group working:

> *"The sharing diagrams with fellow students is a very good idea, but of course is only as good as the students that take part. I cannot say that this vehicle assisted my studies particularly, because really I didn't receive much feedback during the module from other students. If I'm honest I would say that my sharing of diagrams tailed off during the module, due largely to lack of any feedback. So yes it's a great idea, if we can get students to participate more fully."*

> *"sorry, but really didn't enjoy the student interaction aspect of this module. I think we were unlucky as a group for Block 3 and some of us found that it actively hindered our studies and actually put the outcome of TMA 3 and the EMA at risk due to either the late submissions or lack of submissions from other students. I could see that it would be good if it worked though re: different insights but unfortunately, for me, it just didn't."*

Further study would be needed to fully understand the dynamics behind any particular group's perceived "failure", but the extent to which any online group is able to develop a shared identity and sense of responsibility to each other seems to be central to success.

Value of Online Group Working

The value of online group working has already been touched upon above. There appears to be two parts to this perceived value. The first part is to do with the relationships and ways of achieving a group task:

> *"I am enjoying participating in these events in any capacity, it's fantastic that we are all working as part of a great team despite the lack of tutor support! Absolutely fine by me that you are assisting in our progress throughout these tasks!"*

> *"I found it extremely helpful to share diagrams with students with which I was participating in collaborative exercises. Eventually I was sharing diagrams in online forums and chat rooms with my collaborators, whether called for by module activities or not, as this helped to focus discussion and distil group understanding of the topics at hand."*

The second part is to do with appreciating how the online student group activity could replicate doing it for real and how it is part of EM practice:

> *"I enjoyed the group work as I felt it simulated as closely as possible diagramming in a real situation. I didn't appreciate until the 'water stories' how diagramming can convey information to a wide group of people, enabling them to work together."*

> *"However by the time we got to the group activity I could really appreciate the benefits of rich pictures as a way of making sense of an environmental management situation. The way we pulled our individual rich pictures to produce one collective vision was invaluable throughout the task."*

One of the Tutors summarised these key issues of gaining value from the online group exercise and the module as a whole:

> *"1. Active ... students are interested in taking the process further somehow with tutor/ course team members. Some students want to actually visit Heathrow and create further connection with us in this process -dates in August have already been proposed! There seems to*

> *be an interest in a 'space' where post ... students can continue a pragmatic discourse on the transformational aspects of being an 'environmental manager'."*
>
> *"2. I am personally looking at the theme of an 'environmental manager' ... 'coming out' … Addressing Wicked problems and coping with integrating multiple new personal discoveries about the Self/ competencies. I have noticed so many transformations/ transcendences of individuals via [the module] ... 'a coming out' that I don't think I have experienced else where, so rapidly or radically, even magically ... individuals letting go of certain masks and personas, ways of being in order to become. I think it would be valuable to discuss this unique space created by [the module] ... it has wider implications."*

An implication is that the modules have, for some students at least, been experienced as different, innovative and career/life enhancing, but clearly the journey was not easy or even.

Discussion and Conclusions

At the outset of this paper we noted that achieving authentic group-work experience in an on-line environment was problematic. We also noted that the EM context provided for specific challenges both in terms of harmonizing teaching with professional requirements and providing students with both generic / conventional skills and more advanced, systemic understandings. Prior to setting out our experiences with Module A and Module B, we had noted in the literature that authentic online learning should be based in real world experiences. It should also take into account coherent group instruction, application and valuing of formal feedback structures, identification of forms of group satisfaction with tasks, encouraging discussion, balancing the range of online tasks and avoiding whenever possible asymmetry in group inputs. The experiences of students described above tend to endorse and amplify most of these points.

A significant student concern seems to be linked to what we can think of as *polarisation* of the student body towards the module and aspects of it, including the group work. This polarisation is seen in the comments of the students who stayed with, and completed, the module and their comparison of the on-line modules to other OUUK modules which are print based. The polarity extends further. Students drew a distinction

between well-established and well understood modules of print plus some limited online distance learning combined using a more knowledge based, instructivist approach compared with the fully online modules included in this research which make use of a more skills based, constructivist approach and which also have substantive collaborative activity combined with the technique of diagramming. Despite these challenges to the on-line EM modules both also received some students' satisfaction at co-learning with others, including two key transferrable skills – group leadership and facilitation – and a richness in learning experience which one Tutor in particular found *unique*.

Looking beyond this polarisation of views around the module presentations as a whole, a number of observations can be made regarding the responses of students to systems diagramming and the wider group-work experience.

In so far that diagramming is a key feature of the group working students are equally polarised between those that hated them and those who found them useful. Even those finding them useful noted that they provided a demanding workload, that the use of ICT was more a hindrance than a help in undertaking this skill and that face to face working would be preferable. These same issues extended into how well and how helpfully fellow students and particularly their tutors could comment and give feedback on their diagrams (tutors also remarked on the challenges involved in marking and commenting on diagrams in assignments).

Similar trends are apparent in student responses to the group work.

On reflection, five observations emerge as a conclusion (so far) to the experience of Module A and Module B in terms of the group work component:

Firstly, the importance of the tutor and clear instructional strategies (as noted by Brindley et al., 2009) to the student participative experience is vital. Tutor engagement with groups seems key to motivation, inclusion and quality experience. This raises an issue about the changing role of the Tutor. In conventional distance teaching this role is centrally concerned with assessment. Student pastoral care is very much a supplementary and minor aspect. With on-line modules the role of the Tutor is transformed by potential for real-time and asynchronous relationship building. The Tutor has a real capacity to "make" the module. Outward going, charismatic Tutors who are familiar with VLE technologies can increase student retention, can ease learning

difficulties and create a buzz around learning. This potential in the Tutor role is not really understood or accommodated in current training.

Secondly, in much of our teaching module teams tend to assume that no other modules are happening at the same time. It would be useful to look at a way of balancing load between modules being taken at the same time. One of the most continuous complaints in Block 3 was the comment (paraphrased): "I am still trying to finish TMAxx in [other module name]. Sorry I cannot collaborate right now". Improvement might be achieved if module teams intending to include group work in their teaching were aware of distinct time periods when module load elsewhere is less acute. However, this would require a degree of control over module selection by students, and detailed control over other module content and timing which is at present simply impossible.

Thirdly, and again echoing Brindley et al. (2009), students certainly provide copious examples of learning by doing, even if they are not aware that they are. The online group work learning process is immersive and even negative experiences are experiences of the process. Often this is consciously understood later in the Block. A good example of this kind of elevated experience is set out in this comment by a student:

> *"As a very anxious person in general, I was very disheartened to see that group work was part of this course. As more time passes I am finding it easier to communicate with the group and take part in the group work as a whole. As a Co-Leader of the first event I definitely have taken a backseat in comparison to others due to strong personalities, ideas and work ethics. I felt it quite difficult to do much to drive the group forwards as the ball was always rolling, but always did my best to meet deadlines agreed upon in our discussions and have input when necessary."*

If not a regular experience, this reflection – that learning by doing can help a student transcend personal issues and push on to new levels of self-awareness suggests that there are elements of the Module A/Module B model which provide highly fruitful areas for further development.

Fourthly, time to engage with group work. Group work is the core of Block 3 in each module and can take significantly more time than may have been appreciated in the initial module design and the module teams are working on ways to lighten other loads in the Block content and assessment in line with Cameron et al.'s (2009) observation

that a focus on grade can reduce quality of learning. Students should have the necessary time to focus on emergent learning qualities arising from experience of group experience. It should be noted that, students studying Module A and Module B are prepared for the group work and, as with Brindley, the group work occurs in the last third of the module "after students demonstrate that they have sufficient mastery of the subject matter" (ibid; p.11).

Fifthly and finally, asymmetry of effort (Capdeferro & Romero, 2012), is clearly an issue. An urgent area for further module development relates to the need to provide a means whereby a student can know who is contributing to their sub group and initiate processes to ensure that task load is more evenly spread.

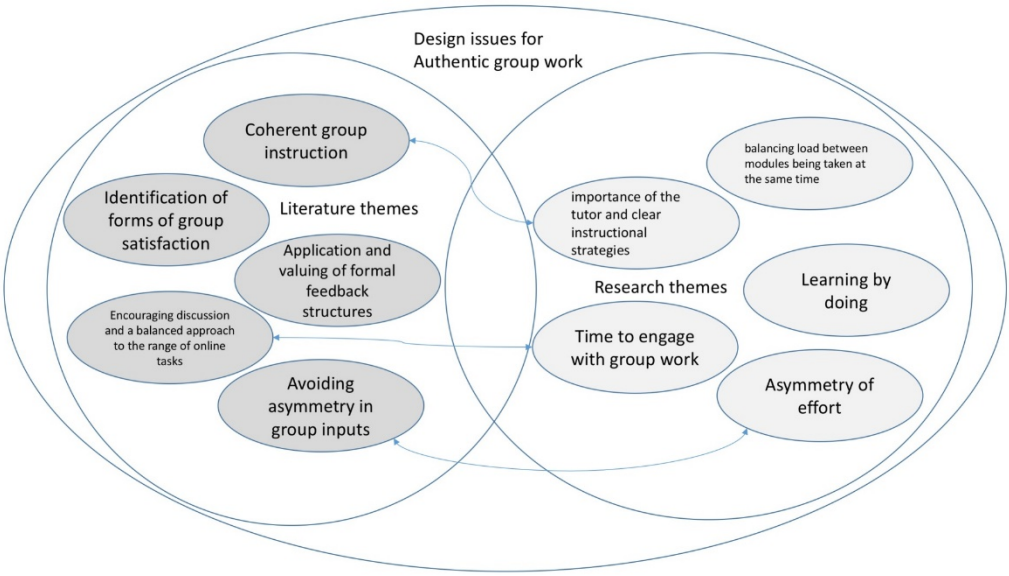

Figure 3. Influence diagram of the design issues for achieving authentic group work

We set out the main themes emergent from the experience of Module A / Module B as related to the dominant themes in the literature on authentic activities in general and collaborative group work online in particular in Figure 3. Our goal remains to provide students with as authentic as possible an experience of EM practice. While we feel that our modules "tick the boxes" for Reeves et al. (2002) ten characteristics for authentic activity, achieving truly collaborative online work is challenging while technical and pedagogic issues remain and, as can be seen from the sets of issues and concerns set out in Figure 3, our work provides some clear overlap (specifically in three cases) and there is considerable room for comparison in all cases.

As both modules progress from inception to maturity (in the University presentation lifecycle) there is pedagogic and methodological potential emerging to improve upon current online module development. In this paper we have seen how issues around practicalities, relationships and values feed into and emerge in concepts of tutor support, module schedule, learning pedagogy, workload and asymmetry of effort. Clearly there is a growing necessity to build into online presentation greater awareness and contingency in terms of these emergent properties.

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Transactional Distance Dialogic Interactions and Student Satisfaction in a Multi-Institutional Blended Learning Environment

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Abstract

This study explored the impact of transactional distance dialogic interactions on student satisfaction in an international blended learning master's degree program. The program examined was collaboratively delivered by three European universities to a cohort of students residing on several different continents. Students reported experiencing transactional distance for learner-learner and learner-teacher dialogic interaction elements and dissatisfaction in the online components of the program but reported a sense of community and satisfaction for the in-person elements of the program. Transactional distance for the dimension of learner-content dialogic interaction was highest for elements of the program that were impacted by its multi-institutional nature, but students reported general satisfaction for the program overall. This study has practical implications for distance educators, administrators, instructional designers, and policy makers concerned with student satisfaction in blended courses and programs, and it contributes to the literature on student satisfaction and multi-institutional programs.

Keywords: transactional distance, blended learning, multi-institutional collaboration, student satisfaction.

Transactional Distance

The theory of transactional distance was conceptualized by Moore (1993) to describe the psychological and communicational distance that may arise in any instructional context and which needs to be minimized to increase student understanding, outcomes, and satisfaction. Distance is conceived to be of a psychological rather than a geographical nature, and the degree of interaction amongst learners, teachers, and their environment determines the perceived distance (Mbwesa, 2014). Although distance is primarily conceptualized to be psychological, Moore's (1993) definition of transactional distance does refer to locational considerations in the sense that the theory focuses on

"the universe of the teacher-learner relationships that exist when learners and instructor are separated by space and/or time" (p.22). While this theory is applicable to all educational settings, it is most often contemporarily applied to distance education. This is especially the case as the theory becomes more pertinent following the evolution and proliferation of distance education in the past few decades (Mbwesa, 2014).

Researchers such as Goel, Zhange, and Templeton (2012) and Kassandrinou, Angelaki, and Mavroidis (2014) point to many studies which have been conducted to explore the empirical validity of the theory of transactional distance (Bischoff, Bisconer, Kooker, & Woods, 1996; Chen & Willits, 1998; Chen, 2001a; 2001b; Zhang, 2003) but which have failed to yield consistent support for the theory. Kassandrinou et al. (2014) assert that although several such study results do not converge, they nevertheless confirm that the theory is important and useful as a framework to analyse distance learning. Goel et al. (2012) report that the theory appears to have high face validity and the reason for the lack of consensus in empirical support is due to how the testing of the theory has been approached rather than the theory itself. These researchers sought to test the theory via learners' perceptions and intention to return for another e-learning experience – which they argue is consistent with the theory's focus – and claim to have achieved empirical validity of the theory.

There are three main components of transactional distance. The first two are dialog and structure – which relate to teaching procedures – and thirdly, autonomy, which relates to student behaviours (Moore, 1993). Transactional distance is thought to increase when there is greater learner autonomy, more structure or less dialog (Ekwunife-Orakwue & Teng, 2014). Ekwunife-Orakwue and Teng acknowledge conflation of transactional distance components and cite Garrison (2000) when they state that there is "a lack of clarity on the interrelationships among structure, dialog, and autonomy, and whether these constructs are clusters, variables, or dimensions of transactional distance" (p.415). Dialog, however, has been identified as the least controversial dimension of transactional distance (Ekwunife-Orakwue & Teng, 2014). Researchers have also stated that, "Dialog is the predominant determinant of transactional distance" (Goel et al., 2012; p.1123). For example, it is posited that the level of course structure is associated to the degree of dialog facilitation and that the amount of dialog that one partakes in is related to the level of learner autonomy (Goel et al., 2012). The component of dialog is hence central to the theory of transactional distance, and it is therefore this dimension of transactional distance under consideration in this study.

Dialogic Interaction

Moore (1993) defines dialog as positive interactions between learners and teachers and between other learners that enhance the learner's understanding. Increased dialogue is argued to reduce transactional distance. In an online environment, this dialogue must be mediated by way of computer-based communication. Smith, Smith, and Boone (2000) explain that online teaching approaches may either impede or foster course dialogue depending on various factors such as course structure and teacher and student responsiveness to online communications. Dialogic considerations in an online environment are multifaceted.

The theoretical constituent of dialog can be broken down further into elements of learner-learner, learner-teacher, and learner-content interaction (Moore, 1993; Ekwunife-Orakwue & Teng, 2014; Kassandrinou et al., 2014; Mbwesa, 2014). Although Moore (1993) did not mention it, other researchers have conceptualized a broadening of the dialogic scope to encompass elements of learner-technology interaction (Strachota, 2003; Ekwunife-Orakwue & Teng, 2014). This may be understood as a student's computer literacy, defined by Strachota, as computer self-efficacy. Chen (2001b) posits a learner-interface transactional distance defined as "the degree of user friendliness/difficulty that learners perceive when they use the delivery systems" (p.462).

Several researchers have examined the role of dialogue in transactional distance across the considered dialogic continuum. Although not explicated as transactional distance, Strachota (2003) investigated student satisfaction in online courses by analysing the impact of the dialogic components of learner-teacher, learner-learner, learner-content, and learner-technology interactions amongst 849 students in 101 online courses. A valid and reliable survey instrument was developed to measure student satisfaction in distance learning, and this survey instrument was later adapted by other researchers to explore transactional distance in both online and blended learning environments (Ekwunife-Orakwue & Teng, 2014). Strachota's (2003) study found that learner-content was most important in influencing student satisfaction with learner-teacher interaction as second and learner-learner interaction as third. Analysis in this study also revealed that students in courses with either voluntary or mandatory discussion groups were more satisfied than students in courses with no discussion groups.

Ekwunife-Orakwue and Teng (2014) and Mbwesa (2014) explored learner-learner, learner-instructor, and learner-content interactions. While both of these studies approached dialogic interactions, they each sought to explore slightly different questions. Mbwesa (2014) studied 168 students studying in the online BA program at

the University of Nairobi, Kenya to explore how predictive perceived transactional distance was of student satisfaction, and this research found that the perceived transactional distance of learner- learner, learner-instructor, and learner-content interactions were predictive of overall student satisfaction. Ekwunife-Orakwue and Teng (2014) found that dialog impacted on student satisfaction but not on student grades. Chen (2001b) also conducted a multi-faceted study on elements of dialogic interaction and found that all factors considered were positively correlated, although not highly. The highest correlation was learner-teacher and learner-learner interaction, so that "the more distant the learners indicated learner-instructor distance, the higher was the reported learner-learner transactional distance" (Chen, 2001b; p.468). While Chen (2001b) states that components of dialogic interaction may be positively correlated, "one form of transactional distance can occur to some extent without the others also occurring" (p.469).

Learner-learner Interaction

Many researchers have focused on a specified facet of dialogic interaction. For example, Kassandrinou et al. (2014) specifically studied learner-learner interactions and sought to explore if perceived learner-learner transactional distance impacted the learning process. Semi-structured interviews were conducted with twelve postgraduate Hellenic Open University students, and this research found that perceived student-student transactional distance had a negative effect on the learning process

Studies that have incorporated other dialogic components, such as Lewis (2011), found learner-learner interaction to be a significant predictor of perceived learning. This aligns with the assertion made by Ekwunife-Orakwue and Teng (2014) that while the literature presents no conclusive evidence that student learning outcomes are impacted by learner-learner interaction, the research does suggest a relationship between learner-learner interaction and student satisfaction or perceived learning (Jung, Choi, Lim, & Leem, 2002; Lewis, 2011; Kassandrinou et al., 2014).

Learner-teacher Interaction

Regardless of physical proximity, teachers are important for guiding and reinforcing student understanding, and this may be why researchers report that learner-teacher dialogic interaction is the most researched component of transactional distance (Mbwesa, 2014). Investigative focus on this dimension of transactional distance has led Ekwunife-Orakwue and Teng (2014) to state that there is consensus on the role of dialogue in transactional distance as measured via learner-teacher interaction in

impacting on outcomes such as perceived learning and student satisfaction, an assertion that is supported by Lewis's (2011) finding that learner-teacher interaction was a significant predictor of student satisfaction as well as perceived learning. Ekwunife-Orakwue and Teng (2014) report, however, that learner-teacher interaction has not been found to impact on student grades.

Swan (2001) reports that psychological distance between learners and teacher may be lessened – and thus learning increased – by a teacher's giving praise, asking for viewpoints, use of humour as well as non-verbal responses such as eye contact and facial expressions, all of which may manifest differently in an online environment. Capella (2015) conducted research that resulted in recommendations for instructors to incorporate frequent communication with learners into instructional design as well as keeping learners apprised of their performance via timely and clear feedback. The former is an interesting recommendation given that Moore (1993) does not focus on the frequency of interaction but rather on the quality. Mbwesa (2014) found that learner-teacher transactional distance was experienced by most of the students in her study, and as a result, Mbwesa recommends increased opportunities and frequency of interaction between learners and teacher. One challenge that Mbwesa found facing teachers is that many of them are simply expected to begin teaching distance education courses without any training on how to effectively transfer courses to the digital environment and may therefore be unknowledgeable about how to compensate for the absence of face-to-face interaction.

Learner-content Interaction

Moore (1993) does not elaborate on learner-content interaction but acknowledges that course designers and their applied educational philosophies, resulting course design, and overall content determine both the quality and quantity of dialogue. It is worth noting that the facet of dialog/dialogic interaction designated as learner-content (Ekwunife-Orakwue & Teng, 2014; Mbwesa, 2014) is described by Xiaoxia et al. (2015) as a structural rather than a dialogic component of transactional distance. It seems that there may be some ambiguity in the literature about how some components of certain elements of transactional distance are classified and considered by researchers. Chen (2001b) defines learner-content interaction as, "the distance of understandings that learners perceive as they study the course materials and the degree that the materials meet their learning needs and expectations to the course" (p.462).

Ekwunife-Orakwue and Teng (2014) looked at both student satisfaction and student outcomes for 342 online and blended learning students and found that learner-content

interaction had a larger impact on student satisfaction than other types of dialog, but that dialog in general did not contribute to students' final grades. Congress (2015) recommends that each student have personalized and timely technical support, which could be argued to facilitate interaction with content and learning management software that allows consistent access to the online learning environment. It is also suggested that the course content and associated tools be easily self-guided (Congress, 2015). Although these are technical considerations, they hew to conceptualizations of learner-content interaction in that technology enables the access and navigation of course content as well as influences how that content is arranged and presented. By contrast, Strachota's (2003) framing of learner-technology interaction is fundamentally different in that it delineates an individual learner's computer self-efficacy. These considerations could, however, also be classified under Chen's (2001a; 2001b) concept of learner-interface interaction

Blended Learning Environments

Transactional distance is often understood to happen in online courses, and as such, it may be applicable to the online component of blended learning courses, which are characterized by having both online and in-person elements. Five of the sources included in this literature review considered blended learning programs in their research (Horzum, 2011; Wengrowicz & Offir, 2013; Ekwunife-Orakwue & Teng, 2014; Fullwood, 2015; Kassandrinou et al., 2014). The studies by Ekwunife-Orakwue and Teng and Wengrowicz and Offir combined online and blended courses together while the studies by Horzum (2011), Kassandrinou et al. (2014) and Fullwood (2015) were conducted solely with blended learning courses.

Ekwunife-Orakwue and Teng (2014) did not seem to make much comparative distinction between traditional, online, and blended environments. Ekwunife-Orakwue and Teng (2014) do, however, specify online and blended courses "with few face-to-face meetings" (p.425) as potentially benefitting from archived lecture capture, which intimates that this would be in contrast to blended learning formats with more face-to-face meetings. Thus, there seems to be a distinction for course formats that have less in-person meetings.

Kassandrinou et al. (2014) found that very few students met one another face-to-face outside of classroom meetings, mainly due to geographic distance. In the program studied by Kassandrinou et al. (2014), five in-person group sessions over a 10-month period were offered, but the in-person sessions were not mandatory. The researchers found that students who did not attend these sessions reported greater student-student

transactional distance than the students who did attend these sessions. This suggests that in-person components of a program foster learner-learner interaction and lessen this type of perceived transactional distance.

The study conducted by Fullwood (2015) centred on an undergraduate blended learning course and sought to investigate perceptions of transactional distance and student satisfaction stemming from uses of online communications media. This research found that utilizing online communication platforms in an effort to mitigate transactional distance was less influential than who was involved in interactions. Restricting communication with the instructor was also found to detrimentally affect student satisfaction by negatively impacting on levels of student enjoyment. The fairly limited research on blended environments seems to suggest that blended programs may be able to lessen the impact of transactional distance throughout a course or program. This is difficult to definitively state due to the fact that some of this research did not specify how frequently – or for what duration – these blended programs had in-person sessions. This is important because both Ekwunife-Orakwue and Teng (2014) and Kassandrinou et al. (2014) seem to suggest that frequency of in-person meetings may lessen transactional distance.

Other researchers have focused solely on student satisfaction in blended learning programs without specific focus or reference to transactional distance. Bothwell (2016) reports that the *Times Higher Education*'s U.S. student survey found that in a study of 100,000 students at U.S. universities, students in blended learning courses reported feeling less challenged by the teaching, less able to apply learning to the real world or make connections between things they learned, and would be less likely to recommend their university to a friend or choose it again themselves.

The studies above show that the frequency or duration of the in-person sessions were not definitively quantified. The categories for the latter study included course offerings which were completely face-to-face but possibly supported by digital tools, mostly face-to-face with substantial online activities, completely through an online platform but possibly with face-to-face faculty check-ins, or primarily through a digital platform with face-to-face faculty interactions (Bothwell, 2016). Students on mostly face-to-face courses reported feeling more engaged than those on mostly online courses, but both groups reported less satisfaction than students who were taking completely online or completely in-person courses. Of note is that when students were asked in an open text question on the survey about how their institution could improve, many mentioned the

quality of teaching and requested professors who were either more experienced or just better teachers (Bothwell, 2016).

Multi-Institutional, Multi-National Programs

Examples of multi-institutional collaborations are scarce. Moore (1999) predicted that this type of cooperative delivery might grow. Grosjean and Sork (2007) studied a multi-institutional program and reported that such programs are rare with few published examples. One such program is explored via the perspective of the instructional designers and the cooperative process that took place between four universities on four continents to develop and deliver a Master of Education program (Larsson et al., 2005; Grosjean & Sork, 2007). In examining this venture, Grosjean and Sork (2007) focus on the nature of the cooperative process and the challenges of converting an existing face-to-face course to the online environment and for international delivery. This program was delivered entirely online, and challenges faced included cross-cultural considerations, different ways of funding programs for different universities, academic differences in what determines a master's degree, and differences in approval processes for new programs. In a publication examining the same program, Larsson et al. (2005) sum up the main barriers that had to be overcome in order to establish the program:

1. Local decision-making processes.
2. Systems for examinations and grading.
3. Financial conditions.
4. Information technology—in particular, the realities and possibilities for accessing the web. (p. 65)

This gives valuable insight into the challenges involved with establishing a multi-institutional, international program. In an age of increasing globalization, these types of programs may become more popular (Moore, 1999). Such programs offer useful insight into processes and standards at institutions of higher education in other countries and provide opportunities for international collaboration. Programs may be open to a wider, more diverse range of students, and this has the added benefit of allowing students to develop useful skill sets such as cross-cultural awareness and communication in addition to those which are specific to the academic area of study.

Given the rarity of multi-institutional collaboration, this study seeks to offer additional insight into this type of program delivery. It also aims to enhance understanding of how perceived transactional distance may impact on student satisfaction.

Methodology

Case Description

Examining specific cases in distance and technologically facilities education may garner interesting and useful insights (Bernath & Rubin, 2002). In Fall 2013, the second cohort of a European collaborative initiative commenced. This Master's level, multi-institutional program was created and delivered by three universities, one each in Scotland, Finland, and Germany. The program culminated in a European Master's of Science degree in Interpreting. Students accepted into the program were from several European countries as well as from further afield, including the United States and Africa. Students were all professional interpreters and worked with a variety of language combinations. The language of the program, however, was English, necessitating that all program participants be proficient in English to access content and complete program requirements.

The program was held over 2.5 years and was comprised of five semesters, with the fifth semester devoted to completing a research-based thesis. Students were required to travel for in-person block seminars held at the three universities. The first semester required one week at the university in each country: Scotland, Finland, and Germany, totalling three weeks of in-person block seminars for the first semester. The following three semesters required a two-week block seminar at one of the universities, resulting in a total of three weeks spent at each university by the end of the program. There were also two long weekends at another location in Europe in the fourth and fifth semesters where students presented preliminary and final research findings, resulting in about 10 weeks of total in-person time during the program. These in-person weeks typically featured full days of lectures and course work and often included optional evening activities.

Lecturers at each university worked in collaboration to create and deliver various modules of the program with staff members traveling to the specified university to teach during block seminars. The program was administered via technology using a learning management software and email between the in-person block seminars. Students were expected to complete both individual and group assignments and online discussion posts. Facilitation of course delivery was provided through Moodle, which one university took responsibility for establishing and maintaining.

Course documents such as module and assignment requirements, readings, and other relevant information were available on Moodle. Online interaction via Moodle was both voluntary and compulsory. Students were encouraged to use the LMS to voluntarily

engage in discussions with one another, although there was little uptake. Students were also required to post their answers to certain discussion questions; however, there were no guidelines or requirements for engagement with classmates via these posts. The instructions were simply to post one's answers to questions and/or reflections on specified topics. The posting requirements varied for each module. For example, one module required students to submit reflective journal entries that they could choose to make viewable by all on the course or only by the teacher, while other modules presented questions to answer. These questions were posted by teachers per module rather than, for example, per week. There were no requisites regarding frequency of posts or number of posts, so long as a response to the prompt was posted before the end of the module.

Students enrolled through one of the three universities, and this enrolment was irrespective of their residential status. For example, even though the program was run by universities in Scotland, Finland, and Germany, very few of the students were actually citizens or residents in any of these countries. Although the program offered exactly the same education for all students in the program, there were practical differences for students depending on which university they registered through. For example, the Finnish university did not charge any tuition fees while the German and Scottish universities required tuition payment. Students only had access to the university library of the institution they registered, resulting in students sometimes having access to different materials for research purposes. Similarly, the final degree granted upon successful completion of the program had the same program name but a different university name depending on which university the student was admitted.

Method

This study sought to answer the following research question: To what extent did perceptions of transactional distance dialogic interactions impact on overall student satisfaction with the multi-national blended program? A survey approach was used to collect data from learners regarding their perceptions of transactional distance in dialogic interactions. The survey was created using Qualtrics software and was based on Strachota's (2003) survey exploring student satisfaction in online courses with regard to the four dimensions of dialogic interaction (learner-learner, learner-teacher, learner-content, and learner-technology), which was adapted to blended learning environments to explore transactional distance by Ekwunife-Orakwue and Teng (2014). Considering that Strachota (2003) found that learner-technology interaction framed as computer self-efficacy was negligible, learner-technology interaction was not explored in this study. Although technological considerations could be considered under Chen's (2001a;

2001b) conceptualization of learner-interface interaction, for the purposes of this study, technological navigation and access of course content was considered under the realm of learner-content interaction.

Goel et al. (2012) report on the relevance of meaningful patterns arising from collective learner subjectivity, resulting in the "primacy of the learner in understanding transactional distance" (p.1124). Hence, the students who participated in this program formed the sample pool. The program admitted 24 students from 10 different countries in Fall 2013. The attrition for the duration of the course was four students; three students had not yet completed the program at the time this research was undertaken. Surveys were sent to the graduates of the program, of which 13 students (76.5%) responded to the survey.

Results

Participant Demographics

The composition of the cohort was primarily women. Of the 13 survey respondents, 84.6% of respondents were female; 69.2% were between 36-45 years old with the remaining participants between the ages of 26-35 years old; 84.6% were employed on a full-time basis while the others worked on either a part-time basis or were not currently employed. The majority of participants (92.4%) agreed to some extent that other types of technology (other than Moodle) allowed them to communicate with other students during the program. When asked what other types of technology or platforms were used to communicate with other students, twelve participants left feedback. The most popular technologies utilized included Facebook, WhatsApp, and Skype, all mentioned with equal frequency (named by 66.7% of those leaving a response), and email as a close second (58.3%).

Learner-learner Interaction

Moodle was largely seen as ineffective in facilitating communication between students. Respondents reported that the language of the Moodle homepage was that of the university responsible for administering Moodle, a language which none of the students knew, although the course page was in English. In response to the statement, "In this program the online discussion board (Moodle) provided opportunity for problem solving with other students," 92.2% of participants said that they disagreed. Similarly, when asked if Moodle provided opportunity for critical thinking with other students, 77% disagreed. Furthermore, most respondents, 92.4%, agreed that Moodle was a waste of time in this program. It is worth noting that on all of these questions, no one answered

on the opposite end of the spectrum; rather, those that did not fall into the majority answered as neutral.

The in-person block seminars of the program were felt to create more of a sense of community among students than the online components of the program. All participants agreed that the block seminars created a sense of community while feelings regarding the online component of the program garnered a more diverse range of responses: 46.2% of respondents disagreed that the online component of the program created a sense of community among students, 30.8% were neutral on the matter, and 23.1% felt that the online component did create a sense of community among students.

The program was seen to enable sharing of viewpoints with other students (91.7%), enabling clarification from a fellow student when needed (92.3%), and encouraging students to discuss ideas and concepts covered with other students (92.4%). An area which received less consensus was on receiving timely feedback (within 24-48 hours) from others students in the program: 30.8% of participants disagreed with this statement while both those in agreement and those who were neutral totalled 23.1%.

Learner-teacher Interaction

Most respondents (69.2%) disagreed that teachers were active members of the online discussion group offering direction to comments and questions. The majority of participants (69.8%) disagreed with the statement that they received timely feedback (24-48 hours) from teachers. Many of the participants felt frustrated to some degree by the lack of feedback from teachers (46.2%), although others (38.5%) were neutral on this topic. Most, however, felt that they were able to get individualized attention from a teacher when needed (61.6%). When asked if teachers functioned as facilitators of the course by continuously encouraging communication, most participants (30.8%) were neutral with those in agreement with the statement equating to those in disagreement with the statement at 23.1% each. Participants were asked whether they could always feel the presence of the teacher, even though they could not always be seen in this program. An equal number of participants either disagreed with this statement to some extent (46.2%) or responded neutrally (46.2%). The program was administered by many teachers with different universities in charge of different aspects, but the majority of students reported that they knew which teacher to ask for questions about a particular module with 61.6% agreeing with this statement.

Learner-content Interaction

Most of the students felt that the program documents – lecture notes or lessons – used in the program facilitated their learning with 84.7 % in agreement. Most respondents (95.5%) also agreed that program assignments or projects facilitated their learning. Likewise, most agreed (67.3%) that the learning activities in this program required them to apply problem-solving skills, and the learning activities required critical thinking (92.3%), all of which facilitated learning. There were differing viewpoints on whether or not the assignments given by the different universities tied in well together: 30.8% of participants responded neutrally to this topic while 23.1% agreed and 23.1% disagreed. There was also a diverse range of answers given when asked to rate agreement with the statement that, "The teachers from the different universities worked together in a way that made the content easy to understand," with most – 38.5% – disagreeing with this statement, 30.8% in agreement and 23.1% neutral.

Student Satisfaction

When asked to rate agreement with a statement expressing satisfaction with the online portion of the program, 46.2% disagreed while 30.8% were neutral. In contrast, the in-person block seminars of the program garnered far more satisfaction with 84.6% in agreement and with no participants expressing disagreement with satisfaction for the in-person block seminars. Students were very satisfied with the program overall with no respondents disagreeing with the statement of overall program satisfaction and 69% in agreement. The majority (46.2%) said that the online part of the program did not meet their learning needs, and a high percentage (69.3%) disagreed to some extent with a statement saying that they learned as much in the online parts of the program as in the face-to-face part of the program. In comparison, 61.5% disagreed with the statement, "The in-person block seminars of this program did not meet my learning needs." Despite dissatisfaction with the online component of the program, most agreed (46.2%) that they would take another program like this, and the majority (69.3%) would also recommend this program to others.

Multi-Institutional Aspects of the Program

An open-ended question at the end of the survey asked for perceptions on the multi-institutional aspect of this program: 76.9% of participants left responses to this prompt. Four main themes emerged: differing academic standards between universities; one group identity but separate institutional structures; a preference for other technology for communication rather than Moodle; and overall appreciation for and perceived benefits of the multi-institutional approach.

First, an overriding theme was a perceived inconsistency in teaching and academic standards between the three universities with the viewpoint that one university in particular presented a less academically rigorous approach. Hence, although the same program was delivered, there were differences in the institutional structures. These differences were perceived as a lack of consistency in academic standards between the universities, and this led to student frustration. As one respondent explained:

> *"The problem was, that the levels of teaching were rather diverse; one institution was less academic than the others which was reflected in the (level of) teaching."*

Others echoed these sentiments with comments such as those left by another respondent:

> *"Some institutions are very qualified and have qualified and structured teachers, whereas others do not."*

Another theme that emerged was that participants felt that there was one group identity for students in the program, but the differences of the institutional structures sometimes created some dissonance. One respondent stated:

> *"The only time I did in fact feel that the group identity was in question was towards completion when groups of students had a graduation at [Scottish university] and some had the option to just receive a degree certificate through the mail. I would strongly recommend that a joint graduation ceremony be held…On the fees issue this makes the perception of quality glaring. With [one] offering free tuition and [another] being the most expensive, there is an underlying perception that the quality of being a [name of university that charges high tuition] student is better."*

Differences in institutional structures creating fissures within the group dynamic were commented on by others as well, as another student stated:

> *"[S]ome students had benefits that others hadn't (because of the institute where they were enrolled); this was not always fair or convenient."*

Third, several students expressed a preference for technology facilitated communication other than Moodle. This preference is supported by the reports of different types of technology utilized for communication.

Fourth, although there were challenges with the multi-institutional aspect of the program, it was generally considered to have added something beneficial to the experience. As one respondent said:

> *"It caused several issues, but it also lent a unique aspect to the program that, in the end, outweighed the frustrations."*

Others left similar comments such as that contributed by this respondent:

> *"It was interesting to have the three institutions together, each one provided a different perspective on the topic and on learning issues."*

Discussion and Future Research

While multi-institutional programs are rare, this particular study is distinct even in comparison to extant publications on similar endeavours. For example, the four-university-on-four-continents master's degree program reported on by Larsson et al. (2005) and Grosjean and Sork (2007) was different in that it was delivered entirely online. Larsson et al. (2005) and Grosjean and Sork (2007) did not investigate student satisfaction. This study, however, utilized a blended learning approach and explored student satisfaction. The blended learning approach was beneficial to the overall satisfaction of students in the program, as many reported satisfactions with the in-person block seminars and with the program overall but dissatisfaction with the online component of the program.

Although the online component of the program was not seen to enhance or facilitate learner-learner interaction, the program overall was perceived to offer opportunities for learner-learner interactions by enabling the sharing of viewpoints, enabling clarification from fellow students when needed and encouraging students to discuss ideas and concepts with other students. Participants also felt that the block-seminar portions of the program created more of a sense of community among students than the online components of the program. Kassandrinou et al. (2014) found that students who opted to participate in face-to-face sessions reported less perceived learner-learner transactional distance compared to those who opted not to participate. The findings of this study taken in conjunction with those of Kassandrinou et al. (2014) seem to suggest

that in-person opportunities for interaction may mitigate perceived learner-learner transactional distance.

Other research has suggested a relationship between learner-learner interaction and student satisfaction (Jung et al., 2002; Lewis, 2011). This aligns with the findings of this study, which found that, although students were generally dissatisfied with the online parts of the program (where there was perceived learner-learner transactional distance), there was high satisfaction with the in-person block seminars of the program (where respondents reported feeling more of a sense of community) and with the program in general.

This study found that there were elements of perceived learner-teacher transactional distance in this program. For example, students generally felt that the instructors did not facilitate online learning and discussions. This may, to some extent, be due to reported problems with ease and/or preference of use of the Moodle platform. Future research with instructors might elucidate instructor experience with the online learning software and if this impacted ability to facilitate online interaction.

The majority of respondents were neutral when asked about teacher presence. There were several instructors involved in this program, and future research could delve into this finding on perceived teacher presence more deeply. Capella (2015) recommends that instructors incorporate frequent communication with learners into learning design and provide timely feedback. Most respondents in this study reported that they did not receive timely feedback from teachers (within 24-48 hours). While Capella (2015) and Mbwesa (2014) also recommend frequency of learner-teacher communication, Moore (1993) focuses on the quality of interaction rather than the frequency. This study did not explore either frequency or perceived quality of learner-teacher interaction. Importantly, however, this study found that participants were able to get individualized attention from a teacher when it was needed and, moreover, despite the multi-institutional aspect of the program and the several instructors involved, most participants reported that they generally knew which instructor to contact for certain questions. Lewis (2011) reported that learner-teacher interaction was a significant predictor of student satisfaction, and although participants in this study were largely neutral on perceived teacher presence, respondents did report overall satisfaction with the program. Elements to tease out in future research might include how the dialogic interaction component of learner-teacher interaction is impacted by course delivery by multiple instructors from several institutions.

A limitation of this study is that it did not uncover exactly why students were so unsatisfied with the online components of the program. The original survey (Strachota, 2003) on which the survey for this study was based did not delve into several factors which, had they been incorporated into this survey, perhaps through more open-ended questions, could have yielded valuable insights. For example, it is not known if transactional distance for the online components of the program were perceived because of the content of the assigned discussions, the design of the discussions, the LMS used, the online skills of teachers, or if several of the factors combined to produce the resulting dissatisfaction. Some of the comments in the open-ended question of the survey did mention problems with navigating the LMS, and so the problems reported with Moodle in this study may align with Chen's (2001a; 2001b) conceptualization of a learner-interface transactional distance, which was classified in this study within the learner-content dimension. This survey revealed that respondents experienced frustrations with Moodle and preferred other technology for communication, but it only revealed limited information as to why this was the case.

Other variables regarding the quality of the online interaction may also have impacted on perceptions of the online component of the program. It is worth noting that structure and expectations for online participation varied between modules and did not include any requisites for numbers of posts, frequency of posts, or responding to fellow students' comments and observations, all of which are factors that could have either alone or in synergy impacted perceptions of transactional distance. Although there was a notable variation in student demographics, the students did report communicating with one another via other forms of technology such as email, Facebook, Skype and WhatsApp. Therefore, designing future research in a way that would more precisely illuminate the causes of the transactional distance in the online component would be useful.

Aside from the issues participants reported with Moodle in this program, respondents to this survey indicated agreement on most aspects of learner-content interaction in the survey, indicating low learner-content transactional distance. Ekwunife-Orakwue and Teng (2014) found that learner-content interaction had a larger impact on student satisfaction than other types of dialog, and this may influence the overall program satisfaction reported by students in this study. The elements of learner-content interaction that seemed to tend toward increased perceptions of transactional distance were those that related to the multi-institutional aspects of the program, such as assignments given by different universities tying in well together or teachers from different universities working together in a way that made content easy to understand.

Interestingly, like the findings of the *Times Higher Education*'s U.S. student survey in which an open ended question found that students in blended programs desired better quality teaching, participants in this study also expressed similar sentiments. In this study, the desire for better quality teaching seemed to centre on just one of the three universities involved and therefore appeared to stem from the comparative disparity in teaching standards across the three institutions rather than an overall issue with the quality of teaching offered in the program as a whole.

One limitation of the study is the fact that the sample size was small. This is, however, a specific case, and as such it is limited by the number of individuals involved. Furthermore, given the rarity of blended learning, multi-institutional programs, sample size is necessarily limited. This study could, however, form the foundation for larger subsequent studies. Also, this study only focused on student perceptions of dialogic interaction dimensions of transactional distance. The case examined by Larsson et al. (2005) and Grosjean and Sork (2007), by comparison, was an intercontinental program analysed from the angle of program formulation and delivery, while the case examined in this study was an international program involving only European-based universities and sought more of a student perception. The students that formed the program cohort came from several continents. Some of the challenges mentioned by Larsson et al. (2005) and Grosjean and Sork (2007) may have also arisen in the development of this program and may have potentially impacted on some of the factors under consideration in this study. It would, therefore, be insightful to explore the establishment and delivery of the program with program instructional designers, administrators, and instructors in future research.

Conclusion

Dialogic interaction dimensions of transactional distance can impact on student satisfaction (Jung et al., 2002; Strachota, 2003; Lewis, 2011; Ekwunife-Orakwue & Teng, 2014; Mbwesa, 2014; Fullwood, 2015). It is therefore important for distance educators, administrators, instructional designers, and policy makers concerned with student satisfaction in online and blended courses and programs to have actionable information on how to mitigate transactional distance through addressing components of dialogic interaction. Although multi-university programs are still rare, examination of these types of programs offers unique insight into collaborated course delivery and impacts on perceived dialogic interactions. This study found that the technology utilized to deliver content is important in facilitating meaningful interactions and fostering a sense of presence, both among students and between students and teachers. The blended

learning environment in this course fostered an overall group identity and contributed greatly to overall student satisfaction with the program, although fissures in that group identity emerged due to differences in institutional structures. While the multi-institutional nature of the program led to some perceived transactional distance in learner-content interaction, it was generally felt to have added a dimension to the program which participants felt was beneficial and outweighed any of the potential drawbacks. Although generally dissatisfied with the online components of this program, students in this study were satisfied with the face-to-face block seminars of the program and satisfied with the program overall. The causes of the perceived transactional distance in this program may be due to various factors impacting the quality of the online component, the technology utilised, or a combination of variables. This study can serve as a foundation for future research into online components of blended programs and how they work in conjunction with in-person elements of programs in order to shape overall perceptions of transactional distance and student satisfaction.

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