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Editors' Introduction

It is our great pleasure and honour to introduce this special issue of the *IAFOR Journal of Education* entitled "Technology in the Classroom". This issue is a selection of papers submitted directly to our journal as well as studies presented during:

1. The European Conference on Technology in the Classroom 2016. ECTC was held at the The Jurys Inn Brighton Waterfront, Brighton, United Kingdom, from Wednesday, June 29 to Sunday, July 3, 2016. Conference Theme: "Convergence & Divergence".
2. The Asian Conference on Education 2016. ACE 2016 was held at the Art Center Kobe, Kobe, Japan, from Thursday, October 20 to Sunday, October 23, 2016. Conference Theme: "Education and Social Justice: Educating for Equality Within and Across Borders".
3. The Asian Conference on Technology in the Classroom 2017. ACTC2017 was held at Kobe Art Center, Kobe, Japan, from Thursday, May 11 to Sunday, May 14, 2017. Conference Theme: "Educating for Change".

The first article, written by Sandor Danka, entitled "CALL to Arms: Generations Clash over Digital Technology in the Foreign Language Classroom", attempted to measure the impact of introducing computer-assisted educational technology into the teaching/learning experience in the multicultural, multi-lingual environment of an international university. The basic premise is that mobile devices (smart phones and watches, tablets and laptop computers) significantly affect not just the relationship between educators and students of Gen Y, the millennial generation, but also the way in which these learners relate to course material and how they expect it to be delivered. Participant reactions were surveyed about the ease of use and perceived benefits of Quizlet, an electronic flashcard application, which they were encouraged to refer to when learning or reviewing academically relevant vocabulary. Final results indicate that Quizlet use appeared to be relatively widespread in the target population and it was seen as straightforward, easy to use. Several students found it so beneficial to their studies that they spread the word, contributing to the ultimate aim of this Quizlet initiative: digitally enhanced foreign language instruction anytime, anywhere, with a smart phone, a 'tool' generally not associated with education.

The second paper, entitled "Competency-Based Blended Learning: Flipping Professional Practice Classes to Enhance Competence Development", is co-authored by Mark Ragg and James Piers. The paper applies inter-professional competence-development principles to blended learning courses. The combination of hybrid and competence-based pedagogies allows instructors to use time more effectively. Data analysis from an implementation study indicates that students are developing competencies and appreciate the ability to increase the time available for observation and feedback.

The third article, entitled "Examining Effects of Two Computer Programming Learning Strategies: Self-Explanation versus Reading Questions and Answers", is co-written by Nancy Lee and Eunsook Hong. The current study explored the differential effects of two learning strategies, self-explanation and reading questions and answers, on learning the computer programming language JavaScript. Students' test performance and perceptions of effectiveness toward the two strategies were examined. An online interactive tutorial instruction implementing worked-examples and multimedia learning principles was developed for this study. Participants were 147 high school students (ages 14 to 18) of a computer introductory course in six periods which were randomly divided into two groups (n = 78; n = 69) of three

periods each. The two groups alternated learning strategies to learn five lessons. Students' prerequisite knowledge of XHTML and motivation to learn computer programming languages were measured before starting the tutorial. Students largely expressed their preference toward self-explanation over reading questions and answers. They thought self-explanation as incurring much more work yet more effective. However, the two learning strategies did not have differential effects on students' test performance. The seeming discrepancy arising from students' preferred strategy and their test performance was discussed in the areas of familiar versus new strategy, difficulty of learning materials and testing method, and experimental duration.

The fourth paper, entitled "Blended Learning and Total Engagement – Posters that Teach", is co-written by Adina Stan, Mahnaz Armat, Elyssebeth Leigh, Elizabeth Rosser and Nikki Hayes. In a blended learning program, hand-drawn posters teach students to critically question knowledge acquired through the use of electronically mediated technology, and collaboratively construct shared meanings through visual literacy. Acting in the role of representatives of real-life organizations, the learners are entrusted with a 'mantle of the expert' which authorises them to investigate and respond to the problems before them as if they were the experts. This paper aims to argue that the role-play contextualization of the poster stimulates active learning by framing collaboration, divergent thinking and convergence of meanings. At the same time, the collaborative hand drawing of the students' response to the issues without any use of electronically mediated technology has a deeper impact on the quality and complexity of student engagement, knowledge construction and originality of expression.

The fifth paper, co-authored by Sultan A. Alkaabi, Peter Albion and Petrea Redmond, is entitled "Social Network Misuse in the Classroom and Its Impact on Male Student Motivation in UAE Tertiary Education". Social networks play an increasingly important part in schools, colleges and educational institutes where learning takes place. Instructors and teachers are increasingly adapting this technology into their teaching curriculum. Students use the technology to collaborate in projects, homework, or to communicate with their instructors and peers as part of their study practices. Research on the impact of social network is an emerging field in education. This study is part of an ongoing scientific effort to understand the relationship between the use of social networks and student learning in the classroom and beyond. Educational research reveals that student motivation is an important principle of learning. The study at hand is part of an investigation of what determinants impact first-year male students' motivation in UAE public colleges. Data analysis of students' accounts and experiences using social networks in the classroom reveals dual impact, positive and negative, on their motivation that affected their learning experience at college. The study discusses the findings of the research and suggests recommended practice for better integration of social networks in the curriculum.

The sixth paper, co-written by Matt Glowatz and Orna O'Brien, is entitled "Academic Engagement and Technology: Revisiting the Technological, Pedagogical and Content Knowledge Framework (TPACK) in Higher Education (HE) – The Academics' Perspectives". This paper further explores academics' perspectives on the use of technology in the classroom and builds on the previous research completed by Glowatz and O'Brien (2013; 2015). Research in this area has previously been informed by the experience of students. Koehler and Mishra's (2009) TPACK Framework (technological, pedagogical and content knowledge) explores the relationship of technology in teaching. This paper explores academics' perspectives on using technology to engage learning, including eLearning and social media usage. A survey was distributed to academic staff in April 2015 to assess the use of electronic learning in higher

education at University College Dublin (UCD) College of Business. Academics are at the centre of learning experience as they are the service provider and content generator very often (Wickersham and McElhany, 2010). Previous research by Glowatz and O'Brien (2013) suggests students' expectations now require the lecturer to have connection with their students, one on one, utilizing innovative and sustainable electronic media. As a result, academics need not only have to be content experts, but be able to engage with technology developments. This research explores the academic experience at UCD College of Business of technology knowledge and reviews the opportunities and the challenges currently presented by technology use in the classroom.

The seventh paper, entitled "Future Primary Teachers' Beliefs, Understandings and Intentions to Teach STEM", is co-written by Premnadh M. Kurup, Michael Brown, Greg Powell and Xia Li. This study looked at future teachers' beliefs, understanding and intentions to teach STEM in their future teaching. This study surveyed 119 preservice teachers from an Australian University. The future teachers had their practicum experience in schools and exposure to subjects such as science, mathematics and technology based on their university program. The study identified future teachers' backgrounds based on their understandings and beliefs and their capacity to deal with STEM in their future teaching career (Intentions to teach). What the study has revealed is that they have a strong belief that STEM is needed for the future lifestyle demands. However, they indicated that they have a limited understanding and ability to teach science, mathematics and technology as they have not experienced many innovative STEM teaching practices in schools. The future teachers are very positive in their intentions to teach STEM and have suggested the need for integrated curriculum programs in schools and their future needs for professional learning in the STEM areas of the curriculum.

The eighth paper, authored by Nastaran Khoshsabk, is entitled "Theatrically Digital: Education and Online Identity". Communication through online interaction facilitates the mutual understanding of societies culturally and historically and such online information exchange influences the identity formation of individuals (Hall, 2003). The notion of "cultural identity" by the sociologist Stuart Hall (1932-2014) is applied in this research to explore the educational and informative role of social media in the identity formation and cultural representation of adult Facebook users. The exploration of online interviews in this qualitative multiple case study is on the basis of participants' personal account of identity and social media use. The 'interactions' and 'presentation of self' have been considered in the Facebook analysis phase of research for the duration of six months. The driven codes and themes were categorised considering self-censorship, place of technology and its role on representation of self. The 'actual self', as described in interviews, was hidden by individuals for different reasons such as its influence on their social status, academic achievements and future careers. It is hoped that this research by offering an increased understanding of the importance of online communities will have implications for education contexts, particularly in countries that are experiencing social media filtering.

The ninth paper, co-written by Aline Fay de Azevedo, Heloísa Orsi Koch Delgado, and Asafe Davi Cortina Silva, is entitled "The Use of Technology for EFL Classes in a Brazilian School: Consolidating Education 3.0". The article aims to address the topic of Education 3.0 and the use of technological tools for EFL classes in a school in the south of Brazil. The authors report how technology has been incorporated into the classroom to achieve interdisciplinary practices and whether it has contributed to students' learning and linguistic competence. Regarding applicability, the paper brings some examples of technological tools and projects that were carried out, using different types of technologies, such as Osmo, smartphones, QR codes, apps

and the like. Regarding evaluation of language improvement, the authors affirm that these technological tools have mainly fostered students' listening and speaking abilities compared to preceding methodologies, which can be seen through the application of Oxford placement tests. They believe that a limitation of this study would be the lack of quantitative data to complement the findings.

The tenth paper, written by Mark Kenneth Camiling, is entitled "The Flipped Classroom: Teaching the Basic Science Process Skills to High-Performing 2nd Grade Students of Miriam College Lower School". This study aims to explore the effectiveness of the Flipped Learning Method in elementary classrooms, a rather under-researched area in the said field. The study was carried out in a special after-school program for high-achieving students with exceptional skills in Science and Mathematics. The author has crafted a unique experimental research design that implements the traditional and flipped classroom methods simultaneously in the two groups of research participants. After comparing the pre- and post-tests results of the two groups through a non-parametric statistical test, it was found that there is a significant difference between the test scores. The results of the study show that the Flipped Classroom Method may be utilized in lower grades for the enhancement of instruction and improvement of student performance.

Please note that we welcome original research papers in the field of education submitted by teachers, scholars, and education professionals, who may submit their manuscripts even though they did not participate in one of the conferences held by IAFOR. We also welcome book reviews, reviews of the literature in the field, and contributions introducing key educational scholars.

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Best regards,

Bernard Montoneri, Lucy Spence, Yvonne Masters and Massoud Moslehpour

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CALL to Arms: Generations Clash over Digital Technology in the Foreign Language Classroom

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Abstract

Is a smart phone a toy or a tool? Students can't get enough of it – after all, social media notifications and viral videos do take time to reflect on – while teachers, quite understandably, are dismayed to see an excellent educational tool used purely for entertainment. This paper posits that these two concepts are not mutually exclusive. It proposes a possible common ground, 'edutainment,' the integration of interactive mobile technology with the classroom for new opportunities to effectively achieve learning objectives in a light-hearted spirit. This research study describes the attitudes and intentions of 121 Thai English as a Foreign Language (EFL) university students towards a playful, competitive smart phone application, its ease of use and perceived benefits to learning. Results of a cross-sectional examination through a paper-based, 4-page questionnaire seem to indicate general acceptance, widespread use and an altogether positive attitude to the software. The paper concludes by highlighting student impressions of its relevance to their studies and offering recommendations for further integration of digital teach-nology into foreign language classrooms.

Keywords: mobile technology; educational smart phone app; computer-assisted language learning; EFL.

Introduction

Students text, watch videos and update social media. A lecturer facilitates understanding of content through relevant activities. With no overlap, there is no conflict of interest and peace prevails in the classroom. However, teachers resent the recreational use of mobile devices, saying it is detrimental to learning, while learners complain when their instructors prevent them from posting pictures of last night's dinner. Today's students spend their days going from one screen to the next: a TV at home, GPS navigation in the car, a tablet/iPad for fun, a laptop computer for homework, and of course, a smart phone throughout. When in school, however, they get in trouble if any of these "screens" leave their school bags. If they break the rules and have be separated from these devices, even if only till the end of the day, the emotional pain they feel amounts to that of losing a limb – which is essentially what a mobile phone has become for many of them. This paper posits that there exists a common ground, a learning-centred intersection where a digital mobile device is an asset, not a liability. It examines student behavior and perceptions about an interactive multimedia software application in the specific context of an international university in Thailand.

The concept of digital technology integration per se is not new at this institution: every classroom is equipped with a projector and a computer with Internet connectivity. This study aims to document an educational initiative where both parties, teachers and students alike, step out of their comfort zone. Instructors have to accept that they are not the sole educators in the classroom, and students need to take responsibility for their own learning, to realise that a smart phone can offer much more than pure entertainment. This something old, something new approach to education is often called blended learning. While acknowledging the many different definitions of this concept, this paper follows Sharma & Barrett's (2007) interpretation, that of a combination of traditional, face-to-face teaching with a supplementary online component. Its focus, beyond varying the modality of course content delivery, is the efficient and meaningful integration of the technological and face-to-face elements of the teaching/learning experience (see Tucker, Wycoff, and Green, 2017). One of its many pedagogical advantages is that it moves learning beyond the classroom. By providing instant access to authentic material outside the class, computer-assisted language learning (CALL) allows students to benefit from "circumstances that they [generally] do not associate with learning" (Kukulska-Hulme, 2009), i.e., time spent waiting for a bus, for their friends, or to be seated at a restaurant, which would otherwise be lost for studying. Another advantage is that a computer never gets distracted, bored or tired of being asked the same questions, of having to repeat the same explanations over and over again (Nunan & Lamb, 1996). In addition, this indefatigable virtual tutor may provide personalized training or much-needed remedial practice to struggling learners.

Literature Review

This paper uses Davis's (1986) *Technology Acceptance Model* (TAM) as its conceptual framework. Although this model is widely used in social psychology and business management, the author believes it is suitable for computer-related educational research purposes as well. Designed to explain how new technology is received and used, it identifies two specific beliefs, perceived usefulness and perceived ease of use, a combination of which first affects attitudes and behavioural intentions, then leads to actual use (Figure 1).

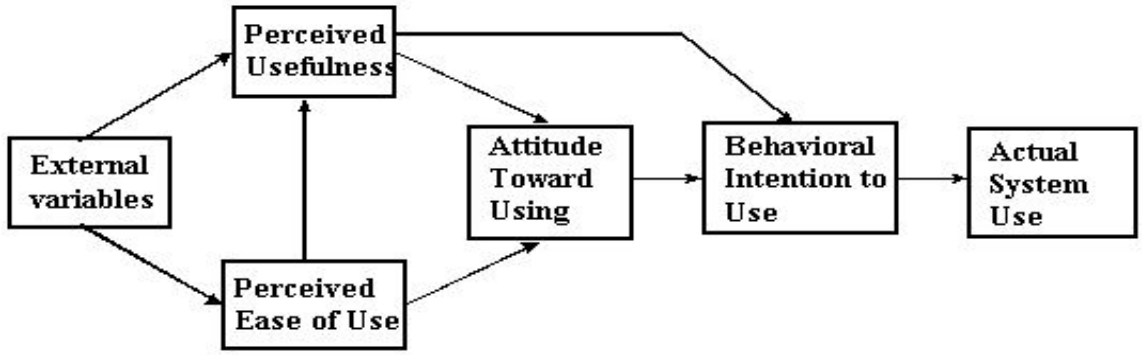

Figure 1: Technology Acceptance Model. Adapted from Davis (1986, 1989).

Davis, Bagozzi and Warshaw (1989, p. 985) defined perceived ease of use as "the degree to which [a person expects a particular] system to be free of effort." The authors also described perceived usefulness as "the degree to which [a person believes that using a particular] system will enhance his or her job performance." External variables include system design, task and user characteristics. These factors were further refined by Venkatesh, Morris, Davis, and Davis (2003), who proposed a *Unified Theory of Acceptance and Use of Technology* (UTAUT). This model extends the scope of intention to use by three major factors: performance expectancy, effort expectancy and social influence. In the current paper, performance expectancy refers to students hoping that the software will help them pass exams; effort expectancy means that it does so without an unreasonable amount of time and effort; and finally, social influence is interpreted as peer pressure, whether others view system use as beneficial or unnecessary.

Perceived benefits are a powerful factor in technology use. As Dörnyei (2007) points out, "it is highly unlikely that every student will do his/her best for a project in which they have little interest and which has no direct bearing on their school grades" (p. 189). In an immediate, often unconscious analysis, the cost/benefit ratio of an assignment is evaluated to decide how much time and effort is needed to complete it (Lankshear & Knobel 2002, as cited in Purushotma, 2005). If a student is not convinced about the ease and usefulness of an activity, they will be less inclined to take part in it. Perceived benefits of using technology in the class include potentially increased efficiency and convenience. Hubbard (2009), for example, posits that the online component improves learning efficiency, learning effectiveness, and is more convenient. Kukulska-Hulme (2009) concurs, stating that computer-assisted tools and teaching methodologies can indeed be very effective, especially for small-group collaborative assignments, e.g., in the case of Quizlet, flashcard design.

The *digital divide*, according to the Merriam-Webster dictionary, encompasses "economic, educational, and social inequalities between those who have computers and online access and those who do not." Warschauer (2002) extended the original scope of the concept and included access to additional resources: issues of content, language, education and literacy. By this definition, all students who participated in this survey were digitally literate. The overwhelming majority had a mobile phone with a wireless or 3G/4G subscription package to the Internet. They were encouraged to learn with the digital version of part of their textbook. All were reasonably fluent speakers of English. Finally, they could reasonably be expected to be familiar with touch-sensitive smart phone screens and swipe/tap navigation within software applications.

Warschauer, however, did not take into account the importance of generations. Today's cohort of young learners is sometimes referred to as the *Millennials*. Born since the mid-1980s, after the emergence of the Internet, they live in a screen-saturated world (Chamberlin-Quinlisk, 2012, p. 152) with the World Wide Web at their fingertips. Their learning styles are significantly different from the generations preceding them (Black, 2010; Eisner, 2011; Nicholas, 2008; Phillips and Trainor, 2014). Through constant access and exposure, their academic skill set, abilities and expectations, even their preferred channels of communication, are mostly technology-based. Not accommodating their learning styles could lead to "a failure to build a bridge between the technological world millennials live in and the classrooms we expect them to learn in" (Considine, Horton, & Moorman, 2009, p. 473). Smart phone use in classrooms has reached a critical mass, a level where restricting it is not just a Herculean effort, but is also counter-productive. This digitally tuned-in expert generation expects a learning experience that is fundamentally different from that of their parents, and when they are refused, they resist and rebel.

Technological innovations are especially susceptible to fads, of getting popular very quickly, then disappearing just as fast. Gartner's *Hype Cycle* (www.gartner.com) graphically describes the expected lifespan and popularity of fresh initiatives. This model is typically used in the business world, but this author proposes adopting it for educational research to highlight and predict potential obstacles to classroom technology integration. The curve begins with a "technology trigger," the introduction of a new product/program/process, often accompanied by bold promises. People are inspired and form "inflated expectations" of what it is rumoured to be capable of. When the product cannot live up to these high hopes, people get discouraged and many of them abandon it altogether. Later, with reasonable expectations and more time spent exploring the program's capabilities, "enlightenment," and finally, "productivity," i.e., widespread use occurs.

Another factor to potentially influence the diffusion of technological classroom innovation is cognitive bias. Coined at least a century prior and used informally in politics, Leibenstein (1950) introduced the term *bandwagon effect* for economics to describe following the example of others, acting or thinking the way they do. The outcome of many political or marketing campaigns revolves around the concept of conformity: the more people think or act in a certain way, the higher the probability that others will follow suit. The successful implementation of educational technology may also be described by the psychology behind Gartner's *Hype Cycle* curve. Millennial adolescents and young adults are very sensitive to fashion, especially if influential peers are perceived as having an advantage by using a certain product. If interest can be sustained among students, if more of them "jump on the bandwagon," and recognize its benefits, this trendy new mode of learning may eventually attract more and more voluntary users to achieve general acceptance and widespread adoption (Aldosari & Mekheimer, 2013).

To sum up, technology acceptance literature seems to agree that integrating a technological component into face-to-face teaching can positively influence student learning. In addition, it could also offer a suitable theoretical background for practical application in the English as a Foreign Language (EFL) classroom. This research paper seeks to present a framework that measures the extent to which CALL is relevant to 121 undergraduate students of the millennial generation and to draw conclusions applicable to a larger population of university-age EFL learners in general. To make digital learning more accessible and attractive to participants, the study was designed to use as its medium a playful software application with custom-made content that it was hoped would serve students' current, real-life needs: academic vocabulary.

Context

Decontextualized coursework (Egbert, Paulus & Nakamichi, 2002, as cited in McMurry, Rich, Hartshorn, Anderson & Williams, 2016) poses a major threat to both motivation and achievement. Awareness of reasons behind course content decisions may facilitate student involvement. To avoid student sentiments that the word lists they find in each unit of their textbook are *ad-hoc* selections of unrelated lexis, it is important they realize that in the context of tertiary studies, success requires knowledge of academic vocabulary. Sun and Yang (2012) provide an in-depth overview of previous studies to support the argument that "for vocabulary acquisition to occur, a certain degree of comprehension must be achieved." This paper argues that it is not comprehension that comes first; quite the opposite. It proposes that for undergraduate academic success in a foreign language environment, the more appropriate sequence is vocabulary first, which in turn will facilitate comprehension.

Schmidt (2010) explains academic vocabulary as "non-high-frequency vocabulary common across academic disciplines." To further elaborate, Nagy, Townsend, Lesaux and Schmitt (2012) add to this definition that it is abstract, can be either oral or written, and is tailored for discussion of "disciplinary content" at educational institutions (p. 92). Assumption University (AU) has an international, multi-cultural faculty and student body; therefore, apart from foreign language courses, the medium of instruction is English. Consequently, familiarity with interdisciplinary phraseology is expected from students who need to interpret, analyse and critically reflect on subject matter areas in faculties as diverse as Communication Arts, Business Management, Law or Nursing.

Academic vocabulary then, by these definitions, has a heavy learning burden (Nation, 2006). It requires explicit instruction and focused, conscious learning, often made more problematic by a lack of context. This inherent difficulty is in stark contrast with the relative usefulness for eventual success at university. In order to avoid guesswork during lectures, foreign language learners need to repeatedly meet a word in context until they can comfortably use it themselves – at least 5–16 exposures, according to Nation (1990). In English for Academic Purposes (EAP) courses of increasing difficulty, AU students acquire the skills necessary to successfully meet their degree requirements. A fundamental criterion for the selection of course content, including vocabulary, is to improve comprehension of scholarly texts and to increase the quality of students' written work and interpersonal communication skills. The majority of these word families come from the Academic Word List (AWL) developed by Coxhead (2000). During mid-term and final exams, a selection from each set of words is checked as part of students' progressive assessment. When they can confidently form meaningful, grammatically correct sentences, they have mastered the lists and can "produce coherently structured written assignments" (Coxhead, n.d.).

This research study used a multi-platform software application called Quizlet to investigate student attitudes towards EFL-related technology. In a separate but related survey three months earlier, students' self-reported digital technology use had been found to be restricted to electronic dictionaries and occasional Google searches for course-related information. By offering a multimedia tool that they could access anytime and anywhere, from smart phones through tablets to personal computers, it was believed that this new approach would provide a significant enough departure from teacher-fronted vocabulary activities, as well as from students' habitual purposes, i.e., leisure and entertainment, of mobile device use.

Quizlet was chosen for reasons of convenience, relevance and interactivity. Although many other similar apps are available, the author had been introduced to it in a conference plenary session by keynote speaker Pete Sharma (co-author of *Blended Learning*, 2007). The software creates a shortcut icon on users' mobile devices, thus providing convenient, instant access to academic lexis saved offline, on the phone's memory card. Drawn from a database originally compiled by their instructor, the program randomly presents and helps users practise the spelling, meaning and usage of target vocabulary from their course book. Secondly, the Quizlet website and mobile app was expected to be compatible with the current generation of learners and their learning styles. Nicholas (2008) points out that millennials expect communication and instruction via technology; therefore, by suggesting a study option that resonated with them, it was hoped that its adoption ratio would be high, i.e., more students would be interested in giving it a try. Short rounds of memory games, sentence completion or spelling bees could turn cyclical, spaced revision into a fun activity. After all, as Burston (2014) argues, outside distractions make mobile-based language learning better suited for short bursts, rather than longer stretches of concentrated attention. Quizlet employs an interactive, almost game-like approach, and the satisfaction of being at the top of the leader board in one of its mini-competitions may perhaps further motivate students to playfully acquire academically relevant English vocabulary. Once students realise its value as a learning tool, this new format of content delivery and review may ease the burden of memorizing long lists of complicated words.

Methodology

Objectives

This study attempts to find positive relationships between students' beliefs and actual use of the target software, Quizlet. It investigates how this mobile application supports educational goals, especially in the context of undergraduate foreign language learners from the millennial generation. Although examining the attitudes of all stakeholders (i.e. learners, teachers and school administrators) may offer a more comprehensive picture, the focus of this paper is restricted to analysing the students' perspective, their expectations, opinions and reflections. Learners' insights were hoped to reveal positive relationships for the research questions and hypotheses of the study, which are outlined below. Instructors and their beliefs concerning the impact of adopting mobile technology, as well as curriculum design decisions and policy recommendations by school administrators are hoped to be explored in a follow-up study.

The present study addresses the following research objectives:

1. Identify the relative significance of factors that lead to Quizlet use.
2. Explore how beliefs, attitudes and intentions predict actual usage.
3. Consider whether access to the software drives actual usage.
4. Actively involve participants in content creation.

Hypotheses

H1: Perceived ease of use positively influences attitude toward use.
Digitally literate millennials expertly handle mobile software that requires them to tap or swipe items on a smart phone screen. Familiarity with navigating within these applications was expected to make Quizlet easy to use. Experience with similar program designs and modes of manipulation, and the fact that learning to use this program requires only a moderate amount of effort, are three factors that were expected to characterize student impressions.

H2: Perceived usefulness determines attitude toward use.
Although a crucial factor in itself, a user-friendly interface does not guarantee acceptance. It is likely that students preparing for examinations focus on end results, on usefulness instead. Expected benefits of educational software must also be taken into consideration when attitude toward use is defined.

H3: Attitude toward using leads to increased intention to use.
Positive beliefs about the ease of use and usefulness of a program, or satisfaction with its demonstrated features will not necessarily lead to intentions. A user may acknowledge the benefits of an activity, but still be unwilling to try it themselves. The next hypothesis posits a close correlation between positive attitudes and a student's intention to use Quizlet.

H4: Intention to use is directly and positively associated with actual use.
Regardless of a user's willingness regarding a specific program, he or she may still not get around to using it. Time constraints, other commitments, or forgetfulness are important factors that negatively affect whether a user launches the app. Conversely, a person will not use a program voluntarily if they are not convinced of its merits.

H5: Satisfied active users will recommend Quizlet to other students.
In a blended classroom, information flows in multiple directions. Students help each other (S2S), and sometimes even advise their technologically less inclined instructors (S2T). In addition, if they are satisfied with a program, they might tell their friends in other classes about it. During Phase 1, they were not overtly encouraged to share their experiences, but two items of the questionnaire in Phase 2 specifically asked about the future likelihood of recommending Quizlet to others.

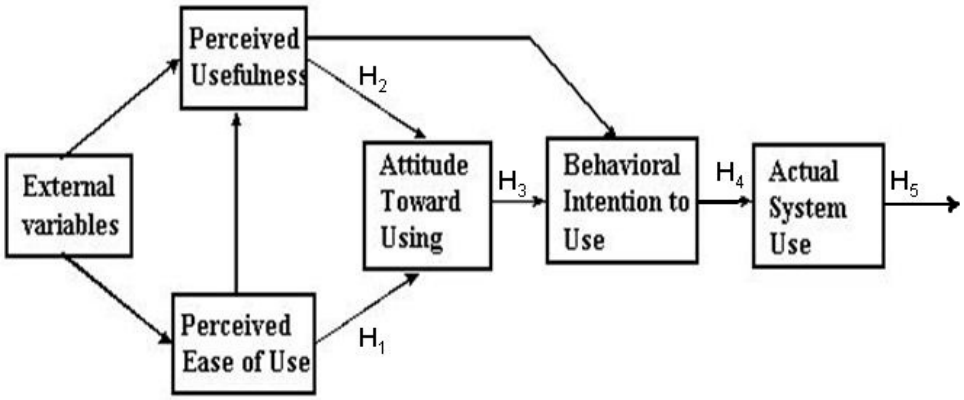

Figure 2: TAM model for Quizlet with hypotheses.

Population Design

A total of 121 first- and second-year EFL learners took part in this study. They were enrolled in an undergraduate, intermediate-level course at Assumption University, Bangkok, Thailand. Participant selection followed a convenience sampling model: the assistance of faculty members was requested, and all the students in these faculty's randomly assigned classes were surveyed.

Data Collection Design

Data for this project was gathered between mid-October and early November 2015. During the initial orientation phase, students took part in a 20-minute live demonstration, were shown the features of the software, and were assisted in downloading, installing and registering the application on their mobile devices. Phase 2 took place about one week later. In compliance with ethical guidelines, each participant provided informed consent by signing a form which outlined the purpose of the study and highlighted its voluntary and confidential nature. Pages 2-4 of this self-completed questionnaire package, which on average took about 15 minutes, contained a total of 35 descriptive, factual, behavioural and attitudinal questions. These questions were in English and responses were expected to be in English. They were organized under the headings: Biographical Information (6 items, structured), Actual Use (9 items, Yes/No), Perceived Ease of Use (6 items, Likert-scale), Perceived Usefulness (4 items, Likert-scale), Attitude toward Using (6 items, Likert-scale), and Intention to Use (4 items, Likert-scale). Two questions in the Likert-scale categories were reverse coded to avoid response bias, and these scores were inverted during evaluation.

Between Phases 1 and 2, i.e., during the one-week experimental period, students were encouraged to freely explore the program and to form opinions about its strengths and weaknesses.

Results

Raw data from the questionnaires was processed using IBM SPSS 23.0 analysis software. Descriptive biographical statistics of the participants are presented in Table 1.

Table 1: Descriptive respondent statistics.

Respondent characteristics	Frequency	Percentage
Gender		
Male	41	33.9
Female	80	66.1
Age (in years)		
17-18	3	2.5
19-20	107	88.4
21-22	9	7.4
23-24	2	1.7
over 25	0	0
Owns a smart phone		
Yes	121	100
No	0	0
Has mobile Internet		
Yes	119	98.3
No	2	1.7
Hours spent online per day		
less than 1 hour	2	1.7
1-3 hours	19	15.7
4-6 hours	52	43.0
over 6 hours	48	39.7

Cronbach's alpha values were all above the recommended benchmark of 0.7, proving the reliability of the model. Exploratory Factor Analysis batteries returned .822 for Kaiser-Meyer-Olkin (KMO) measure for sampling adequacy (checking for variance among variables, with suggested values above 0.5), and 1265.659 for Bartlett's test of Sphericity at the .000 significance level. According to Factor Extraction and Eigenvalues, the eight strongest factors accounted for 62.684 % of total variance overall. Finally, a Multiple Ordinary Least Square Regression sought to identify possible cause-and-effect relationships between dependent variables (Attitude, Intention and Actual Use). Figure 3 shows the results of hypotheses testing, relationships between variables, and their significance.

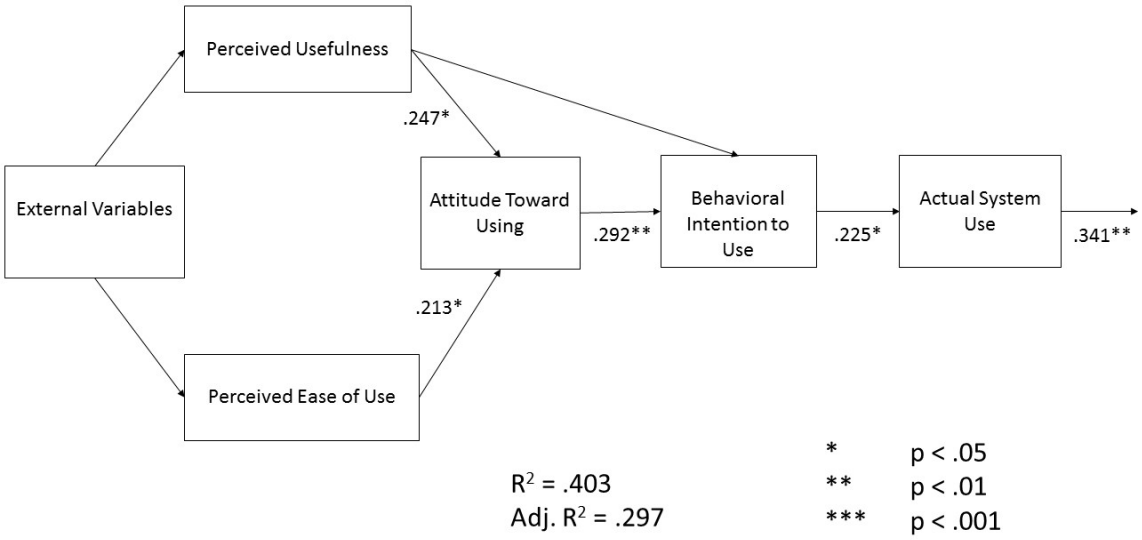

Figure 3: Hypothesis diagram and test results.

Actual Use is a reliable indicator for educational technology acceptance. Tables 2 and 3 summarize the results of the Actual Use regression equation, with statistically significant evidence for both current and projected system use.

Table 2: Regression analysis for Actual use (1).

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.397	1	6.397	8.241	.005[b]
	Residual	92.380	119	.776		
	Total	98.777	120			

Table 3: Regression analysis for Actual use (2).

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.880	.176		10.669	.000
Did you use Quizlet during the past 7 days? (Yes=1; No=0)	.568	.198	.254	2.871	.005

The frequency graph in Figure 4 presents actual system use (by student numbers/percentages) in a visual form, highlighting student groups that are of special interest for long-term success.

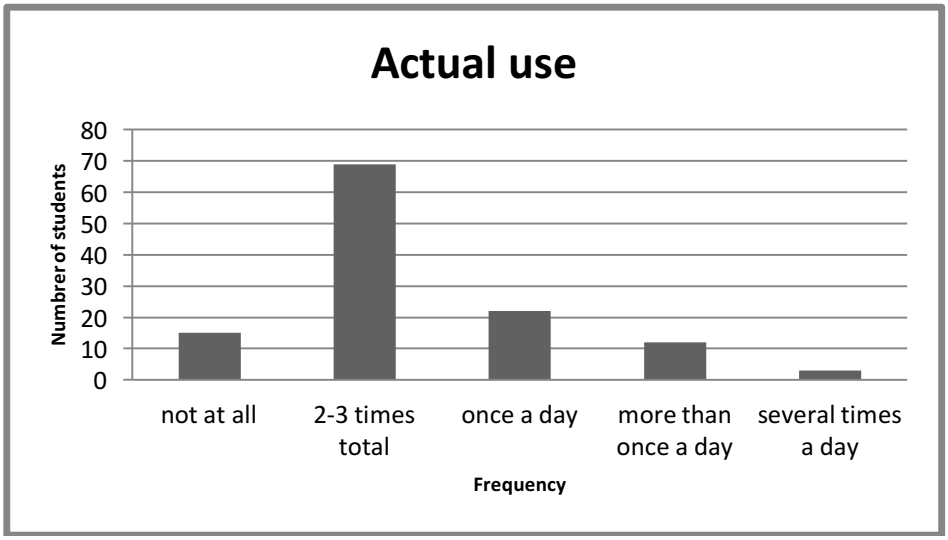

Figure 4: Actual use.

Actual use data is presented in Tables 2 and 3, as well as in Figure 4. The p-value for F is .005 (very significant), which means that no sampling error occurred during the procedure. The unstandardized β value of .568 (at the p = .005 significance level) suggests that the slope of the equation for Quizlet users is positive. In other words, the more often a student uses the software, the more likely it is that he or she is going to return to it.

Quizlet allows registered users the freedom to create card sets in any language. Another reliable and perhaps slightly more accessible indicator for Actual Use data is if students design their own word lists, especially if they do so without being prompted by their instructor. Several participants figured out how to modify the original English input, generating personalized sets in their mother tongue. As computer text-to-speech and an auto-play feature are both available for several languages, a smart phone and a pair of Bluetooth headphones were all they needed for a hands-free audio dictionary to review the target vocabulary lists without their mobile ever having to leave the school bag. Several students reported using, but not necessarily insisting on this audio feature, perhaps indirectly implying that computer text-to-speech synthesis is not yet advanced enough for learning English pronunciation.

Discussion

Over 98% of participating students had a mobile internet package, and by their own account, 43% spent between 4-6 hours a day online, with almost as many (39.7%) admitting to regularly spending over 6 hours every day on the World Wide Web. Since Quizlet is free to download and use, by having a phone with Internet connectivity, today's language learners can overcome the single most important obstacle to technology integration—access. Although the Quizlet websites and students' target word lists can also be accessed on a personal computer, one of the implied objectives of the study was to focus on mobile devices that students never seem to part from. Consequently, it appears that schools no longer need language laboratories, or to invest in expensive IT infrastructure: every student comes to school with a mobile device that can facilitate informal language learning both in and outside the classroom – even in cyberspace.

Summary of Hypothesis Testing and Research Objective Outcomes

- Hypothesis 1: Supported. Regression analysis found a strong correlation between perceived ease of use and attitude.
- Hypothesis 2: Supported. Findings confirm a strong correlation between perceived usefulness and attitude.
- Hypothesis 3: Supported. Results indicate a strong correlation between attitude and intention to use.
- Hypothesis 4: Supported. Participants' intention to use the software was measured at the $p < .05$ significance level.
- Hypothesis 5: Supported. Satisfied, active users would tell others about the software.

Research objective 1 sought to identify the relative significance of factors that lead to system use. This investigation used two core variables as its starting point, Ease of Use and Perceived Usefulness. Of the two, Perceived Usefulness proved to be stronger, suggesting that even when students struggle, they willingly tolerate a steep learning curve if they can expect benefits at the end.

Research objective 2 addressed how beliefs, attitudes and intentions predict actual usage. Results indicate that except for a small minority, slightly over one-tenth of users, if students find the software easy to use and have positive attitudes toward it, they will indeed use it for vocabulary study before exams.

Results for research objective 3 seem to suggest that it would be a mistake to equate access with success. Students do not use educational software just because it is available to them. Constant motivation and encouragement are needed, as are teacher efforts to monitor that when in the classroom, phones are used for educational purposes only.

Research objective 4 set out to actively involve students in materials design. The threat of disciplinary action is a poor, short-term motivator. Being creatively involved in content creation, on the other hand, may instil in students a long-term perspective, getting them one step closer to their future goals with English. Encouraging students to participate in making Quizlet sets on their own may result not only in a sense of ownership, but also in increased willingness to actively learn, rather than passively consume content that is tailor-made for (and by) them.

Conclusions and Limitations

This paper sets out to explore student beliefs, intentions and behavioural attitudes toward a multimedia software application called Quizlet. It focuses on perceptions of undergraduate EFL learners regarding the contribution of a specific digital educational technology tool to the curriculum and to their learning objectives. There exist, however, several pedagogical and procedural limitations that need to be acknowledged when interpreting the findings of this study. First, its cross-sectional methodology implies a strictly exploratory focus. Without a pre- and post-test or comparison/control groups, it does not claim to evaluate or enhance the effectiveness of digital learning within its context. Therefore, it is possible that a quasi-experimental research design with a follow-up round of data collection may offer a complementary perspective.

Next, the study made a few assumptions about its participants which may not be valid universally. For example, it expected learners with smart phones (100% of the population) to have constant access to the Internet, which, except for two students, they all did. However, it would be potentially misleading to assume that constant, instant access means unlimited time that students would be willing to devote to educational purposes. A teacher can, at best, encourage independent learning and provide engaging content that students find useful for their studies. Moreover, the fact that every student can afford the costs of buying a mobile device or the expenses of a monthly Internet subscription was taken for granted. In other contexts, however, these financial burdens may be important constraints that influence final results.

Lastly, Figure 4 identifies 12.4% of the target population that reported no use whatsoever. Reasons for use/non-use were not part of the original survey; therefore, the motives of this group of under-motivated students are unclear at the moment. Future investigations of student resistance would be a possible complementary study to fill the gap in understanding left by this research project. In addition, there are three occasionally overlapping factors that may also affect Quizlet use: deadlines, scope and logistics. Firstly, students are less inclined to practice if the exam is weeks away, but a test the following morning may provoke a last-minute effort, despite knowing that cramming the night before rarely results in long-term retention. A quick flip through cards or a mini-game in Quizlet, on the other hand, takes but a few minutes, and these regular, cyclical review sessions may bring about long-term benefits.

The second area that would benefit from further scrutiny is scope. This research project involved 8 out of a total of 91 classes in the English II program offered in that semester. There were 121 respondents, covering 5.49 % of the target population, thus satisfying requirements for external validity. At first glance it would seem that results obtained here could be generalized for the entire English II student body. However, a shift in learner and teacher attitudes and behaviours cannot be expected to come about overnight, nor without help from faculty and administrators – most likely through a relatively large investment of energy and enthusiasm. Gartner's *Hype Cycle* begins with a sharp rise; if this surge could be sustained with the help of the bandwagon effect, if Quizlet could become both trendy and popular, seen as an effective contributor to long-term academic success, this positive image would probably support its widespread adoption.

Finally, the logistics of integration must also be considered when proposing changes to curricula. Following institutional guidelines, teachers will have to make decisions about the extent to which they wish to make Quizlet a part of their classroom routine. Should they use the official academic word sets or create their own? In an otherwise tightly packed syllabus,

how often and for how long should they let students "play around" on their phones? Should they devote valuable class time to Quizlet games at all, or assign vocabulary learning as homework and count on students being responsible enough to do it? These are all questions that will need to be answered during continued evaluation and improvement of the Quizlet initiative.

Recommendations

Offering instant results, creating inflated expectations among students, faculty or school administrators would be unrealistic, unwise and probably untrue. Quizlet integration should be perceived as an extension to the current AU teaching/learning framework where technology-assisted language teaching is already expressly emphasised. Giving students an option to take English language learning into their own hands – literally speaking – making allowances for their personal digital devices and the resulting attitude shift, on the other hand, may yield positive effects. Pedagogical implications that point towards recommendation to adopt should include learner autonomy, interactivity, automatic error correction, immediate feedback, and the fact that the rationale behind the activity (acquiring academic vocabulary) is never in doubt for anyone concerned.

Results of this study may be interpreted as that of a needs analysis, with findings that seem to support a move toward adoption. Its subjects are members of the millennial generation who are empowered to create and encouraged to be responsible for their own learning. Working in teams on academic vocabulary fosters interpersonal skills; networking socially offers a chance to creatively and collaboratively approach problem-solving, while having a degree of control over subject matter, however small, inspires them because they feel their input is valued, that they are taken seriously.

Heterick and Twigg (2003) assert that a blended learning experience is mutually beneficial for both students and their *alma mater*. Reporting on the findings of a survey of student performance and achievement carried out in 30 academic institutions in the United States, they indicate "increased course completion rates, improved retention, better student attitudes toward the subject matter, and increased student satisfaction." This paper makes no such bold claims; it does contend, however, that Quizlet integration has the potential to make a modest contribution to the efficiency of teaching/learning English. The ultimate question is not *whether* Thai academic institutions should augment existing blended and online curricula, but *when*. A methodology that incorporates multi-modality and self-directed learning reaches students anytime, anywhere and can also convince previously resisting faculty of its value. As everybody in the classroom becomes aware of its benefits, this personalized, constantly updated training platform can help prevent a conflict of interest, a clash of generations: effectively engaged Millennials will feel that teachers finally speak their language.

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Competency-Based Blended Learning: Flipping Professional Practice Classes to Enhance Competence Development

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Abstract

In the past decade, health and human service educational programs have transitioned to competence-based outcomes to enhance the quality of graduating professionals. While such outcomes are a critical step in ensuring professional quality, they require curricular and pedagogical adjustments that do not fit easily within university environments. Technology has eased many problems of fit through the development of hybrid and flipped courses that allow on-campus time to be better focused on developing professional skills. This study explored the question: Can flipped delivery improve competence-based outcomes in social work practice classes? The study assessed pedagogical adjustments that integrated competence-based learning principles with flipped classroom delivery. Principles of organizing the class to maximize competence development are explored and illustrated. Improved competence development and student satisfaction were demonstrated in three flipped practice courses with a combined sample size of 269 Bachelor of Social Work (BSW) and Masters of Social Work (MSW) students. Researchers concluded that using flipped-classroom methods enhanced the students' capacity to apply concepts and develop skills. In particular, the ability to receive and process feedback on applied skills was improved.

Keywords: competence-based learning; professional education; flipped course delivery; hybrid learning.

Introduction

Education in health and social service professions has transitioned to competence-based outcomes (Berdrow & Evers, 2010; Bogo, Mishna, & Rehger, 2011; ten Cate & Billett, 2014). The impetus for competence-focused outcomes emerged in response to decades of societal pressure for medical and behavioral-focused professions to better control the quality of graduating students (Collins & Bogo, 1986; Gockel & Burton, 2014; Lester, 2014; Nelson, 2007). While developmental trajectories and language varied across nations and professional groups, the global demand for accountability in professional education spurred significant change in professional educational systems (Boateng & Sarpong, 2001; Lester, 2014; Wilson, 2013). The transition to competence-based outcomes presents challenges to educational programs because competence requires students to simultaneously think, perform, and act with integrity (Shulman, 2005). This is a more complex set of outcomes than acquiring knowledge through completing a set number of educational experiences. Almost every profession, in the transition to competence-based outcomes, discovered a need to retool the curriculum, organizing the educational sequence around developing and demonstrating cognitive and interactive skillsets (Albenese et al., 2010; Berdrow & Evers, 2010). Such retooling requires pedagogical adjustments to classroom activities to enable observed student skill performances and feedback (Carraccio, Wolfsthal, Englander, Ferentz, & Martin, 2002; Martinez, Phillips & Harris, 2014; Nathwani, Law, Witt, Ray, DiMarco, & Pugh, 2017).

Literature Review

While professional organizations initiate the transition to competence-based outcomes, universities are largely equipped for on-campus, face-to-face, knowledge-transfer activities (Robbins, 2013). Within this larger educational mission, universities have developed facilities and systems to maximize tuition-based income (Murray & Aymer, 2009; Regehr, 2013). Within the transition to competence outcomes, professional schools require unique learning environments for observing student performances, assessing competence and providing formative feedback, however, the larger systemic priorities are not structured for competence-related educational work (Belcher, Pecukonis & Knight, 2011; Murray & Aymer, 2009).

Concurrent with unique space requirements, competence-based teaching requires individualized faculty time with each student (Williams et al., 2014). A successful transition to competence-based outcomes consequently exerts demands beyond the traditional organizational and faculty commitments (Nissen, 2014). These shifting demands coincide with a larger social environment of revenue challenges that have shifted pressures onto faculty to teach larger classes, while simultaneously seeking funded projects (Anderson & Slade, 2015; Belcher, Pecukonis, & Knight, 2011). In the current academic environment, educators in professional programs lack time to work closely with students (Murray & Aymer, 2009; Prober & Heath, 2012; Strayer, 2012). There is a convergence of pressures for all university-based professional schools that are not easily resolved. Many competence-focused professional educators have responded to university-based challenges using hybrid learning technologies to free up instructor time for competency-focused teaching (Regehr, 2013; Gerbic, 2011; Salter, Pang & Sharma, 2009).

Flipped Course Delivery – A Solution to University Challenges

As professional schools consider the promise of online learning, findings on fully online teaching has raised doubts about the efficacy of developing practice competencies in a purely

virtual learning environment (Jones, 2015). Increasingly, however, hybrid and flipped approaches are showing promise for developing interpersonal professional skills (Bodie, Powers, & Fitch-Hauer, 2006; Bristol, 2014; Dimeff, Koerner, Woodcock, Beadnell, Brown, Skutch, & Harned, 2009; Pregot, 2013; Regehr, 2013). A recent survey of social work deans and directors found that most directors endorse hybrid professional practice courses as having a strong potential, providing that sufficient face-to-face time is focused on practice competence-development (East, LaMendola, & Alter, 2014).

The findings that hybrid course delivery can enhance interpersonal professional outcomes is promising given that traditional programs often struggle in developing specific interpersonal competencies in the fields of education (Jennings et al., 2017; Wahlgren, Mariager-Anderson & Sørensen, 2016), medicine (Ens, Janzen, & Palmert, 2017), evaluation (Galport & Azzam, 2017), social work (Sage & Sele, 2015), counseling (Moran & Milson, 2015), nursing (Ehrenberg, Gustavsson, Wallin, Boström, & Rudman, 2016), and medical care (Ehrenberg et al., 2016). As professional programs seek to develop broad competencies with integrated critical thinking, ethics, wisdom and interpersonal competencies (Levitt & Piazza-Bonin, 2017), alternative methods of teaching and learning are being adopted.

The hybrid educational model attracting current interest is the flipped-course. This hybrid-format advances competence development by requiring students to advance knowledge on their own time and perform specific skill-building activities in the online environment prior to attending the on-campus session (Dimeff et al., 2009; Sharma, 2013). Ideally, the online activities are applied, succinct and engaging (Khanova, Roth, Rodgers & McLaughlin, 2015; Nemtollahi, St. John, & Adamas-Rappaport, 2015). Such elements tend to enhance engagement and learner autonomy (Grossman, Grosseman, Azevedo, Figueiró-Filho, & Mckinley, 2015; McGowan, Balmer, & Chappell, 2014; Muzyk, Fuller, Jiroutek, Grochowski, Butler, & May, 2015).

The pre-learning of critical content prior to attending the on-campus session allows for increased application of material in the on-campus elements of the course (Khanova et al., 2015). In most flipped classes, the on-campus session focuses on applying and integrating skills through applied simulations, coaching, and feedback (Gerbic, 2011; Salter, Pang & Sharma, 2009). Such shifts in time investment allow for more focused use of instructor time with smaller groups of students, since they are no longer required to attend class as a large group. The nature of a flipped course also allows for the broader distribution of learning materials increasing educational efficiency (Lockhart, Capurso, Chase, Arbuckle, Travis, Eisen, & Ross 2017).

While professional schools have readily embraced the flipped classroom (Rockich-Winston, Gillette, Koc, Wolcott, Blough, & Broedel-Zaugg, 2015; Tømte, Enochsson, Buskqvist & Kårstein, 2015), historically online learning has tended to be stronger at transferring knowledge than promoting competent practice (Ens, Janzen & Palmert, 2017). Consequently, some comparative findings indicate that there is no significant difference between the two conditions (Rockich-Winston et al., 2015). Some findings indicate that one problem is the creation of flipped courses in professional programs do not tend to pursue professional competence development, rather they tend to serve program stakeholders and other agendas (Kan, Harrison, Robinson, Barnes, Chisolm, & Conlan, 2015; Tømte et al., 2015).

Current competence-focused findings indicate that interactive, simulation-based learning activities can engage students and enhance competence development (Brubacher, Powell, Skouteris & Guadagno, 2015; Nathwani et al., 2017; Nuzhat, Salem, Al Shehri, & Al Hamdan,

2014). Students respond best when the online component uses authentic, emotionally evocative, and applied learning activities rather than simply providing information (Cooner & Hickman, 2008; McNaught, Lam, & Cheng, 2012; Neo, Neo & Tan, 2012). While student preferences have an evidentiary base, more research is needed to understand how to flip a course to maximize competence development.

This study explores an application of the current research to developing a competence-based flipped course covering interpersonal competency development in a social work program. The study is structured to track the transition from a competence-based, on-campus course to flipped course delivery. The transition retained all content and evaluation systems, allowing for a consistent competence-based assessment system across both conditions. It was anticipated that by transferring some learning activities to an online environment, time would be freed up for increased observation and feedback, strengthening the competence development due to an increased ability to engage in observation and feedback.

The Critical Presence Domains

The research on online delivery, competence-based learning and feedback provide guidance for developing a competence-focused flipped-course. The online literature identifies social presence, teaching presence and cognitive presence as critical course features (Anderson, Rourke, Garrison, & Archer, 2001; Anderson & Rourke, 2002; Hosler & Arend, 2012; Rourke, Anderson, Garrison, & Archer, 1999; Savvidou, 2013; Szeto, 2015). While these critical online domains emerged from text-based online challenges, the issue of presence remains a critical consideration in developing a constructive online learning environment. The importance of these domains expands with competence-based learning, as a learning alliance and competence-focus must accompany the social, teaching and cognitive presence (Albanese, Mejicano, Anderson, & Gruppen 2010; Myers, 2008).

A ***social presence*** refers to establishing the instructor and community of learners as people within the learning environment (Ke, 2010; Savvidou, 2013). Social presence emerges from facilitating genuine exchanges that reflect appropriate social interactions within the class (Rourke et al., 1999; Szeto, 2015). Sung and Mayer (2012) identified five factors associated with social presence: respect, sharing, acceptance, social identity and intimacy. With clear goals and expectations, it is possible to extend the social presence to create a learning community or work groups allowing students to learn from each other concurrent with instructor-focused facilitation (Akcaoglu & Lee, 2016; Hoffman, 2015; ten Cate, 2013; Topor, AhnAllen, Mulligan, & Dickey, 2017).

The ***teaching presence*** highlights the importance of active instruction and facilitation in the online condition (Anderson et al., 2001) and in the face-to-face course elements. This requires instructors to develop well-focused, organized and relevant online learning resources (Hosler & Arend, 2012). Activities should be engaging for individual students as they progress through relevant experiences and activities that cover and apply the course content (Szeto, 2015). Visually rich and engaging activities appear to be most effective for engaging the students (Chen & Wu, 2015; Ke, 2010; Szeto, 2015). The instructor must also facilitate learning by responding to student questions, concerns and resolving impediments (Hosler & Arend, 2012; Ke, 2010).

A ***cognitive presence*** is enhanced by keeping online activities focused, vital to learning, engaging, and well integrated with other activities (Katernyak & Laboda, 2016). Instructors

also develop material and engage students to help them apply learning concepts (Szeto, 2015). In the area of application, instructors often structure content to break-down concepts into applied skills (Grossman, Wouda, & van de Wiel, 2009). To prepare students for applying course concepts, it is helpful to provide prompts or springboard phrases that promote skill-level applications (Sleep & Boerst, 2012).

The ***alliance presence*** requires three elements in the learning environment: clear goals/outcomes, relevant course activities, and a facilitative instructor-learner relationship providing goal-directed feedback (Farrell, Bourgeois-Law, Ajjawi, & Regehr, 2016; Myers, 2008). Given that goals and relevant activities are part of the teaching presence, a facilitative relationship is critical to developing a learning alliance (Telio, Ajjawi, & Regehr, 2015). A facilitative relationship involves motivating students to identify with, and find relevance in, the learning outcomes (Kirby & Lawson, 2012). This requires instructors to monitor student progress and provide feedback while engaging students in application-based discussion (Ke, 2010; Szeto, 2015). In the online environment, the alliance requires timely responding and immediacy to ensure that students engage while the material is still fresh (Rogers, 2015; Szeto, 2015).

The ***competence presence*** structures the above elements so that students progressively transition from understanding professional roles and activities to applying skills in increasingly complex professional simulations (Albanese et al., 2010; Larsen, Sanders, Astray, & Hole, 2008). Feedback is provided after each student performance of these skills, allowing for integration, adjustment, and repetition (Hattie & Timperley, 2007; van de Ridder Stokking, McGaghie, & ten Cate, 2014; Shute, 2008; Stark, Kopp & Fischer, 2011). As such, feedback uses professional standards of performance contrasting the student's performance to this accepted standard (Carraccio, Wolfsthal, Englander, Ferentz, & Martin 2002; van de Ridder et al., 2008). Feedback should be timely so that students can understand the gaps between their performance and the standard and make rapid adjustment to the skills (Ke, 2010).

In online environments, exercises and simulations with decision trees and embedded feedback can help students begin mastering skills (Nathwani et al., 2017, Wilkening, Gannon, Ross, Brennan, Fabian, Marcsisin, & Benedict, 2017; Wojcikowski & Kirk, 2013). In face-to-face environments, practice simulations with individualized feedback can promote the development of interpersonal competencies (Albenese et al., 2010; Grossman, Compton, Igra, Ronfeldt, Shahan, & Williamson 2009; Wouda & van de Wiel, 2014). In the courses implemented as part of this research parallel, online cyber role-plays and on-campus role-plays were used. The cyber role-plays used branching and a cartoon supervisor to provide feedback based on 32 potential ending points. The on-campus simulations were based on the same case situations allowing for learning transfer across the two conditions.

Learning Scaffolds in the Competence-Focused Flipped Course

The critical presence domains identified in the literature require the creation and integration of learning activities in the online and face-to-face conditions in order to promote competence development. Online learning has long been associated with using case materials to help focus students (Rourke & Anderson, 2002). Flipped classroom technologies have expanded the early online pedagogy to included online lecture materials and using role-plays during on-campus learning (Hack, 2016). This course builds onto these principles by integrating feedback into the online condition concurrent with on-campus feedback sessions. Learning scaffolds refer to supports that are structured into the course that help students learn skills and advance their

competence (Woolfolk, 2007). Research on blended or flipped courses finds that learning scaffolds help integrate learning activities and promote skill development (Anghileri, 2006; Yeh, 2012). Effective scaffolds promote engagement, simplify learning, maintain clarity, and provide feedback to guide the next steps of learning (Hoffman, 2015). Scaffolds developed for the flipped practice classes are provided below (see Table 1). As the practice courses transitioned from face-to-face to flipped delivery, the above scaffolds were adapted to promote knowledge application, skill development and skill integration in the flipped delivery. This study tracked the transition of foundation-level group work practice classes and individual practice classes from an on-campus lecture/active-learning course to a flipped format. Initially the courses were scheduled as three-hour lecture blocks in rooms that accommodate 25 students.

While initially established as lecture and discussion-based courses, instructors inserted role-plays for observation and feedback. Role-plays were formalized through standardizing the role-plays and setting up a laboratory system. The goal of the labs was to ensure that each student would perform the same skill-sets and receive feedback. The group work skill-sets included: activating the group, scanning group interaction, using appropriate interactive skills, tuning into dynamics, focusing the group, timing interventions, responding to dynamics, and positively influencing the dynamics. The individual-focused skill sets included developing a working alliance, motivational enhancement, and changed-focused intervention skills. The labs involved groups of about 8 students engaging in videotaped role-plays of practice. Role-play content was structured to reflect stages of professional intervention: 1) starting the group/individual engagement, 2) activating mutual aid/working alliance, 3) managing tension/mistakes, 4) deepening relationships, and 5) promoting work/change-focused intervention. In the role-plays, each student was required to play the worker role for 5–7 minutes. After videotaping the role-plays, student performances were reviewed with feedback provided by the instructor. In the status quo condition, time only allowed for completion of about three taping and review sessions in the typical semester. Even with few feedback opportunities, the role-play-related feedback was consistently identified as a critical element of student learning in the student course evaluations. The transition to a blended learning platform was initiated to increase the number of taping and feedback sessions.

Methodology and Methods

This study involves a cross cohort comparison of three courses that had transitioned to flipped delivery. The study focused on Bachelor of Social Work (BSW) Group Work students at the senior level and a foundation Masters of Social Work (MSW) course focused on individual practice competencies. Both courses were a direct transfer of all course elements from face-to-face instruction with video labs and instructor feedback to flipped delivery using the scaffolds as described above. Each course had similar scaffolds adapted for the specific competence outcomes associated with the practice method.

Table 1: Scaffolds developed to structure in critical presences.

Critical Presence	Associated Learning Scaffolds
Social Presence	***Online*** 1. Instructors share videotaped role-plays of themselves engaging in identical situations provided in student role-plays. 2. Instructors monitor student activity and reach out during periods of inactivity to provide support. ***Face-to-Face*** 1. Instructors share examples from their professional practice as exemplars of practice. 2. Full class debriefing sessions punctuate the transition from online work to applied face-to-face activities. 3. All application exercises involve a stable group of students with support-provision and mutual aid expectations.
Teaching Presence	***Online*** 1. All content presented through interactive, structured and engaging (visual plus voice over) online presentations. 2. Use of case materials that thread through all learning modules. 3. Use of interactive applied exercises with immediate feedback. ***Face-to-Face*** 1. Conceptual debriefings provided after the online content provision and before applied simulations. 2. In role-play viewing/feedback cross-references back to the module content are used to highlight conceptual applications.
Cognitive Presence	***Online*** 1. Online modules began with information provision, followed by examples and culminating with application. 2. Practice examples provide subtitles to help identify concepts in action. ***Face-to-Face*** 1. Students apply the concepts in videotaped role-plays which are later reviewed. 2. In review discussions the course concepts are applied to the practice experiences.
Alliance Presence	***Online*** 1. Assertive outreach based on course analytics and student presence. ***Face-to-Face*** 1. Ongoing discussion of the instructor and student roles in the context of the identified outcomes and learning activities. 2. Applied working occurred in small groups.
Competence Presence	***Online*** 1. Applied interactive activities with structured immediate feedback and opportunities to repeat the performance. ***Face-to-Face*** 1. Clearly articulated competence-outcomes with descriptions of socialized, beginning professional and advanced skills. 2. Simulated videotaped role-played simulations with individualized feedback.

Sample

The BSW group cohorts contained 47 students from the face-to-face condition and 159 students attending the flipped delivery courses. All students had the same instructor from both conditions. The MSW student sample included 42 students from the face-to-face condition and

23 from the flipped delivery classes. In the MSW cohort, 12 students had a new faculty member working closely with the instructor that taught all of the other students.

Measures

To assess the transition to flipped delivery, an evaluation of between condition differences was initiated. The main measure of competence was the feedback sheets used during the feedback sessions. Students turned in their best feedback sheet at the end of the course to include as part of their final grade. If students achieved the standard, they received 100 points. Failure to achieve the standard on each continuum resulted in point reductions. These feedback sheets were the core competence measure used in practice courses to assess competence development and program effectiveness. Forms were available covering about three semesters before the transition, and four semesters post-transition. The second measure was student evaluations that are distributed by the university for every course. The forms are uniform for all classes allowing for comparison of student satisfaction differences in the same time frame as the signature assignments. In addition to the standardized institutional evaluations, students who attended the flipped courses were invited to complete additional evaluation questions to get focused feedback on the flipped-course delivery. This was an anonymous online survey emailed to all students taking the course. The survey was linked to a second survey to capture identifying information because students received 5 extra credit points.

Results

The signature assignment grades were taken from the past grade books and compared using an independent t-test procedure to assess the mean grade differences across the cohorts. The descriptive results (see Table 2) indicated improvements between condition 1 and 2 in all courses. The t-test results indicated that these differences were significant in both the group and individual courses.

Table 2: Signature assignment differences between condition face-to-face (F2F) and flipped conditions.

	Cohort	Mean Score	Std. Deviation	T Value	2 tailed Sig
Group Practice	Condition 1 N=47	92.805	4.957	-5.125	.000
	Condition 2 N=159	96.495	4.805		
Individual Practice	Condition 1 N= 42	93.048	2.802	-2.205	.037
	Condition 2 N= 23	95.762	5.281		
Combined	Condition 1 N= 89	92.843	4.067	-6.940	.000
	Condition 2 N= 180	96.683	4.655		

Qualitative verbal feedback from the students illuminated these results. More than half of the students in the courses stated that they never bought the assigned textbooks for previous classes, and an additional 30% stated that they did not typically do all of their readings. Students

in the flipped courses stated that they felt compelled to cover the material because their progress was monitored automatically and points were added to their participation grades. There was consensus among the flipped course students that the course was more work for them because they felt accountable for covering the online material, whereas they were seldom held accountable for reading their texts or engaging in class discussions in previous face-to-face courses. The satisfaction differences were considered critical for students in the group work classes because they were not informed that their courses were flipped because of university policies about online percentages for hybrid and online course offerings. These were the only online designations allowed, so students were unaware of the online expectations until the first class meeting. Students were provided an option to change to a face-to-face section. In one semester, three students took the option and left the flipped course. The evaluation data from the group courses were entered into SPSS and subjected to an independent samples t-test analysis. The results indicated significant differences in all but one evaluation item (see Table 3).

Table 3: Flipped vs. face-to-face evaluation differences for the group course.

	Delivery Method	**Pre-test Mean**	**Pre-test Stan. Dev**	**t- value**	**p**
Overall rating of the teaching effectiveness.	F2F	4.29	.854	-2.954	.003
	Flip	4.58	.699		
Overall rating of this course	F2F	4.12	.927	-3.106	.002
	Flip	4.45	.747		
I understand easily what my instructor is saying	F2F	4.37	.891	-3.017	.003
	Flip	4.63	.567		
The instructor explains experiments/assignments clearly	F2F	4.23	.947	-2.502	.013
	Flip	4.48	.746		
The instructor seems well-prepared for class	F2F	4.46	.774	-3.211	.001
	Flip	4.70	.484		
Many methods are used to involve me in learning	F2F	4.39	.809	-2.883	.004
	Flip	4.65	.654		
The instructor returns papers quickly enough to benefit me	F2F	4.35	.910	-3.422	.001
	Flip	4.66	.580		
I understand what is expected of me in this course	F2F	4.30	.863	-3.509	.001
	Flip	4.62	.658		
The amount of material covered was reasonable	F2F	4.47	.703	-2.049	.042
	Flip	4.62	.509		
The instructor develops classroom discussion skillfully	F2F	4.43	.729	-3.341	.001
	Flip	4.71	.618		
Grades are an accurate assessment of my knowledge	F2F	4.42	.856	-2.635	.009
	Flip	4.65	.583		
Assignments are related to the goals of this course	F2F	4.58	.614	-2.089	.038
	Flip	4.72	.518		
The instructor respects students from diverse backgrounds	F2F	4.72	.485	-1.979	.049
	Flip	4.83	.379		
The instructor respects students regardless of sex, age or race	F2F	4.69	.580	-2.242	.026
	Flip	4.83	.381		

A review of Table 3 indicates that the evaluation scores; rated on a scale of 1 to 5 with five indicating the highest level of satisfaction, all reflected increased satisfaction in the flipped condition. No face-to-face mean scores fell below 4 points indicating a respectable level of

satisfaction; however, the consistently higher scores in the flipped condition indicate that students rated the course and the instructor at a higher level of satisfaction. While students at times expressed frustration with the online course shell functioning, items indicating clear understanding of expectations and satisfaction with communication all yielded significantly higher scores.

In the MSW individual practice course, only six items yielded significant differences (see Table 4). There are two themes evident in the significant differences. First, mean scores on items reflecting the instructor organization, respect, and clarity with students were all significantly higher in the flipped condition. The second pattern indicated that mean scores on items focused on the applicability of the assignments and variety of learning experiences were more satisfactory than the comparable mean scores in the face-to-face condition.

Table 4: Flipped vs. face-to-face evaluation differences for the MSW individual practice course.

	Delivery	Pre-test Mean	Pre-test Stan.Dev	t - value	p
The instructor displays a clear understanding of course topics.	F2F	4.37	1.098	-2.558	.012
	Flip	4.74	.449		
The instructor explains experiments/assignments clearly	F2F	4.22	1.069	-2.401	.019
	Flip	4.61	.583		
The amount of material covered was reasonable	F2F	4.05	1.242	-3.448	.001
	Flip	4.61	.499		
The assignments are related to the goals of this course	F2F	4.29	1.140	-2.698	.008
	Flip	4.70	.470		
The instructor respects students from diverse backgrounds	F2F	4.52	1.114	-2.223	.028
	Flip	4.83	.388		
The instructor respects students regardless of sex, age or race	F2F	4.56	1.104	-2.276	.025
	Flip	4.86	.351		

In addition to the institutional evaluations, students in the flipped condition were asked to complete additional feedback on which scaffolds contributed most to their learning and competence-development. Findings indicated that both online and face-to-face elements were identified as helpful. In the group work classes, the role-plays and feedback were most highly rated, with the video examples and enriched presentation materials also being highly rated. The MSW student feedback followed a similar pattern. Both cohorts identified working together as a group as least helpful (see Table 5).

Table 5: Student feedback on scaffold contributions to learning.

Item Content	**Helped a Lot /Helped**	**Hindered a Lot /Hindered**
Group Work Students N=96		
Doing the role-plays	99.0	1.0
Getting feedback on role-plays	98.9	1.1
Watching video practice examples	98.9	1.1
Using video-based presentations	94.7	5.4
Doing online exercises	87.5	12.5
Working in the small groups	87.4	12.2
Individual Practice N=23		
Doing the role-plays	100	0

Getting feedback on role-plays	100	0
Watching video practice examples	100	0
Using video-based presentations	100	0
Doing online exercises	100	0
Working in the small groups	87	12

Discussion

The findings indicate some improvement in the signature assignment grades. This was the program's measure of competence based on the highest grade on the videotape feedback. The mean score differences achieved significance, which may be due to the increased number of role-plays and feedback rather than the online content. The flipped condition permitted at least four feedback sessions, while the status quo condition tended to result in three feedback sessions.

In the flipped condition, the findings from the evaluation indicate that both face-to-face and the online scaffolds are experienced as useful by students. In particular, role-plays and feedback, the primary on-campus activities, were identified as the most useful elements in the course. Similarly, the availability of video examples prior to engaging in the role-plays was highly rated. These videos, while available in the traditional delivery course sections, were most often cut short due to limited time in the class.

The online delivery methods appear to contribute to satisfaction. In particular, the student feedback indicates that they appear to like the multimedia and engagement scaffolds that allow them to take time covering material. The material was also presented in a media-rich format that is also parceled out into 2-5 minute segments. The materials are organized into a logical order that can be repeated as needed. This is in contrast to the traditional course delivery which involved longer presentations interspersed with class discussions. While discussions are useful, they often acquire a life of their own and can interrupt a logically ordered presentation of material.

Within the transition to the flipped condition in the group class, handouts that supplemented the material replaced reading expectations. Students consequently used a series of brief handouts that supplemented the online presentations. Students reported that this was more useful than the traditional system of assigned reading. In this discussion, students further reported that they very seldom completed the required reading in traditional classes. It is likely, however, that there is great knowledge acquisition because the coverage of material is monitored in the online shell. Evaluation findings indicate that the organizational aspects of the flipped class, such as clear expectations, are more satisfying than reliance on verbal discussions. This may in part be due to verbal discussions about expectations and graded material, to generate multiple self-interested questions that cause discussions to diverge. In online communication, the combination of clearly written communications and individual emails may improve the clarity for students. A learning scaffold that was unique in the online environment was the immediate provision of feedback in the online application exercises. In the face-to-face condition, students were required to complete exercises prior to attending class. These exercises were then discussed as the foundation for lecture and discussions. In this condition, the feedback was embedded in the discussion, making it generalized rather than individualized. The online feedback was more immediate in response to decisions made in the exercises. Students also have opportunities to incorporate the feedback and repeat the actions.

Conclusions

While early in development, the move to flipped course delivery appears related to competence improvements in foundation-level students. Flipped delivery allowed for a larger range of formative feedback opportunities and more individualized, rather than general, feedback. By focusing the on-campus sessions on lab-based simulations, students were able to receive individualized feedback on their skill performances five times during the course. This reflects an increase from 2-3 feedback sessions in the lecture plus lab condition. Students identified the role-plays and feedback as providing the most benefit to their skill development, so it is probable that the increases are associated with this increase.

Based on the current data, it appears that shifting some course elements to a virtual learning environment may make it possible to better use on-campus time to employ competence-based teaching methods, without having to advocate for institutional changes to accommodate professional program requirements. As such, blended learning may allow for continuous assessment and formative feedback to be provided through multiple forms of feedback. Ongoing research will remain necessary to identify the components that best respond to the formative-feedback needs of professional students.

Moving forward, it will be important to continue testing competence-based flipped learning in professional contexts. With mounting pressure for professional programs to achieve an online presence, it is critical that programs do not forsake their commitment to competence-based outcomes. More testing is needed to identify which online and on-campus elements contribute to competence development.

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Examining the Effects of Two Computer Programming Learning Strategies: Self-Explanation versus Reading Questions and Answers

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Abstract

The study described here explored the differential effects of two learning strategies, self-explanation and reading questions and answers, on learning the computer programming language JavaScript. Students' test performance and perceptions of effectiveness toward the two strategies were examined. An online interactive tutorial instruction implementing worked-examples and multimedia learning principles was developed for this study. Participants were 147 high school students (ages 14 to 18) of a computer introductory course in six periods which were randomly divided into two groups (n = 78; n = 69) of three periods each. The two groups alternated learning strategies to learn five lessons. Students' prerequisite knowledge of XHTML and motivation to learn computer programming languages were measured before starting the tutorial. Students largely expressed their preference toward self-explanation over reading questions and answers. They thought self-explanation incurred much more work yet was more effective. However, the two learning strategies did not have differential effects on students' test performance. The seeming discrepancy arising from students' preferred strategy and their test performance was discussed in the areas of familiar versus new strategy, difficulty of learning materials and testing method, and experimental duration.

Keywords: learning strategy; self-explanation; computer language; JavaScript.

Introduction

Computer programming has historically been difficult and frustrating for novice learners (Kelleher & Pausch, 2005). Studies show that 40 to 50 percent of first year programming students either had a below C grade or dropped out (Schuyler, 2011). Therefore, exploring effective instructional strategies is of prime interest among computer programming educators (Kert & Kurt, 2012; Renumol, Janakiram, & Jayaprakash, 2010). Teaching novice JavaScript learners is an even more intriguing undertaking because they are Web design enthusiasts coming into the new realm of computer programming mostly without prior knowledge. The supposed foundation of having learned Web design, along with the confidence it brings, could have falsely promised learners the same ease with learning JavaScript, which, on the contrary, presents a sudden surge of intrinsic cognitive load.

In the current study, a computerized interactive tutorial was developed to help students learning Web design tackle the challenges they are faced with learning JavaScript. The tutorial provided a multimedia learning environment that implemented multimedia learning principles (Mayer, 2009, 2011) and worked examples (Sweller, 2006). Online multimedia instructional tutorials that implement a worked-example strategy have been evidenced as effective (Kapli, 2011). In an online learning environment, the built-in interactive feature could afford students many opportunities for practising to acquire schema and encode it to long-term memory (Lee, 2008). Utilizing learning strategies to achieve desired learning outcomes is also important for learners (McNamara & Magliano, 2009). Even intrinsically motivated learners should be guided with learning strategies because they do not necessarily have an adequate strategy repertoire (Renkl, 1997).

The specific interest of this study lies in the added effect of utilizing self-explanation (Kalyuga, 2009; van Merrienboer & Sluijsmans, 2009) and reading questions and answers (Kinniburgh & Shaw, 2009; Pappa & Tsaparlis, 2011), two known learning strategies that have demonstrated positive effects in a variety of academic subjects, to determine which is more effective in learning JavaScript. This is the first study that sought differential effects of these two strategies in learning computer programming.

Self-explanation

Self-explanation takes place when learners explain concepts to themselves and verify their own understanding. Cognitive load theory proposes that self-explanation is effective because it generates germane cognitive load, which contributes directly to learning (Kalyuga, 2009; van Merrienboer & Sluijsmans, 2009). Self-explanation is a domain-general constructive activity that directs learners' attention to the learning materials while checking on their understanding (Roy & Chi, 2005). Its process has been evidenced as helping learners comprehend unfamiliar text (McNamara, 2009; McNamara & Magliano, 2009) and developing computer programming concepts (Kwon & Jonassen, 2011).

Self-explanation engages learners to use their background knowledge to interpret the given instructional texts and examples (Chi, Bassok, Lewis, Reimann, & Glaser, 1989; Pirolli & Recker, 1994). Renkl (1997) observed that learners, drawing from their own background knowledge, used the self-explanation strategy to explain to themselves the solution steps in worked examples. Self-explanation techniques used alongside proper instructional support can improve transfer; for example, when combined with direct instruction, self-explanation became

more effective and facilitated transfer with persisting benefits over a delay (Rittle-Johnson, 2006).

Self-explanation can be carried out in different formats such as thinking-aloud (McNamara, 2009; McNamara & Magliano, 2009) or typing one's thoughts (Muñoz, Magliano, Sheridan, & McNamara, 2006). Less-skilled readers are able to make more frequent bridging inferences with typing self-explanation text than with speaking their self-explanation when they are dealing with science texts (Muñoz et al., 2006).

Research on self-explanation has been conducted on academic subjects like physics (Fukaya, 2011; van der Meij & de Jong, 2011) and mathematics (Durkin, 2011). However, studies examining effects of self-explanation on learning computer programming have been sporadic. The few studies consist of text learning of LISP in the early to mid-90's by Bielaczyc, Pirolli and their associates (e.g., Bielaczyc & Pirolli, 1995; Pirolli & Recker, 1994), an experiment on the controlled self-explanations with learning Structured Query Language (Yuasa, 1994), and recently one study regarding reflective self-explanations with learning JavaScript (Kwon & Jonassen, 2011). These studies demonstrated positive effects of self-explanation on learning computer programming.

Based on these previous works, this study required students to type their answers to the guiding questions and provided appropriate instructional support throughout the lessons. For example, after learners submitted their self-explanation answers, a window popped up with suggested answers as instructional support for the learners to verify their understanding.

Reading Questions and Answers

Reading is a prevalent learning method across subjects, such as English and mathematics, and across platforms, like textbooks and online tutorials. Conventionally, students have learned computer programming by reading materials from textbooks or electronic sources. Reading questions and answers helps students focus their attention (Raphael, 1982) and keep them on the right path of learning (Benito, Foley, Lewis, & Prescott, 1993; McIntosh & Draper, 1995, 1996). A similar, established learning strategy called question-answer relationship focuses on understanding the relationship between questions and answers derived from the learning materials. The effects of question-answer relationship approaches have been widely evidenced to be positive (e.g., Kinniburgh & Shaw, 2009; McIntosh & Draper, 1995, 1996; Ouzts, 1998; Pappa & Tsaparlis, 2011; Raphael & Au, 2005). The question-answer relationship leads students to identify sources of information (Raphael, 1984; Raphael & Wonnacott, 1985). Reading questions and answers on a Web page is a variation of question-answer relationship. Learning by reading questions and answers on a Web page, as the current study called for, is comparable to reading printed questions and answers in a paper textbook (Tillman, 1995) and should achieve comparable result.

The application of question-answer relationship has positive results with diverse learners such as skilled adults (Ouzts & Palombo, 2005), young children (Lawrence, 2002; Soptelean, 2012), older children in secondary education (McIntosh & Draper, 1995, 1996), and students with learning disabilities (Gavelek & Raphael, 1982). Examples of its effects included science instruction in which students' reading comprehension of science texts was enhanced, and consequently, students' test scores improved in both subjects of science and reading (Kinniburgh & Shaw, 2009) and a mathematical instruction in which students' increased ability to identify the question-answer relationship improved their mathematical reasoning skills and

also expanded upon their existing strategies of successful test-taking (Mesmer & Hutchins, 2002).

The Study

The project is the first to study the effects of self-explanation on novice learning of JavaScript, differing from the study by Kwon and Jonassen (2011) which focused on students' prior JavaScript knowledge and reflective self-explanations after taking a test. The present research is also the first to examine the effect of reading questions and answers compared to self-explanation, and compares the effects of the two strategies, on learning computer programming.

Students' prerequisite knowledge of XHTML and academic motivation to learn computer programming were used as covariates to increase precision of results. Motivation is essential for learning computer programming because it imposes high intrinsic cognitive load (Garner, 2002) and requires extensive practice (Law, Lee, & Yu, 2010). Motivation change is positively related to change in students' achievement in learning computer programming (Su, 2008). For the purpose of the study a composite score of the following motivation variables showing strong, positive relationships with learning, were included: students' self-efficacy belief, effort investment, and task value (Bandura, 1997; Usher & Pajares, 2009; Zimmerman, 2008).

This study examined two research questions: (a) is there a significant performance difference in the end-of-lesson test scores between the two groups of students provided with instructions for self-explanation versus reading questions and answers strategies; and (b) which learning strategy is perceived by students as superior for achieving a better understanding of JavaScript? To capture student perceptions, both quantitative and qualitative analyses were conducted.

Methods

Participants

Participants (N = 147) were students at a high school located in a large, metropolitan school district of the southwestern United States. They were from diverse ethnic backgrounds with the vast majority being Hispanic-American (65% vs. school district average 42%) and African-American (17% vs. school district average 12%). The subjects were students of six periods of an introductory computer course with approximately equal numbers of students from freshmen to seniors. The ages ranged from 14 to 17 (n = 143) and 18 years old (n = 4) with the median age 16. Each group was randomly assigned three periods resulting in 78 students in group 1 and 69 students in group 2. The participating students had little to no previous computer programming knowledge. Earlier in this introductory computer course, all students were introduced to coding Web pages in XHTML. They were informed of this research study, and given the option to participate.

Materials

An online interactive multimedia tutorial with five JavaScript lessons was designed by utilizing worked examples and the cognitive principles of multimedia learning including the spatial and temporal contiguity, coherence, redundancy, and image and personalization principles (Mayer, 2009, 2011). The multimedia learning principles and worked examples were constant while the experimental variable was learning strategy.

To examine the second research question, all students were exposed to both learning strategies. After learning the first two lessons, group 1 self-explained to answer the guiding questions, whereas group 2 read the questions and provided answers. For the 3rd and 4th lessons, the two groups switched their learning strategies. For the 5th lesson, each group went back to its original learning strategy. As the first two lessons were the easiest and the fifth was the most difficult of the five lessons, this design configuration allowed materials of similar difficulty to be presented to each group.

The tutorial was hosted on an Internet Website but students had only restricted access from a classroom to control the place variable. The study took care to ensure that only eligible users were accessing the tutorial, all individual user received appropriate training materials intended for his or her group, and the learner activities (self-explanation narrations and testing) were recorded through the server.

Figure 1 is the flowchart of the instructional design. Each lesson was structured into five Web pages. Learners of both groups saw exactly the same pages except page 4. Each learner logged on through page 1, selected a lesson of interest on page 2, studied a demo and practiced on page 3, then practiced further on the upper part of page 4. The only difference appeared at the lower part of page 4. Students of the self-explanation group typed an answer to each of the guiding questions in the format of self-explanation then could compare it with the suggested answer in a pop-up window after submission. Students of the reading questions and answers group read a same question with its answer provided simultaneously in a pop-up window. Then all the learners encountered the same end-of-lesson test on page 5.

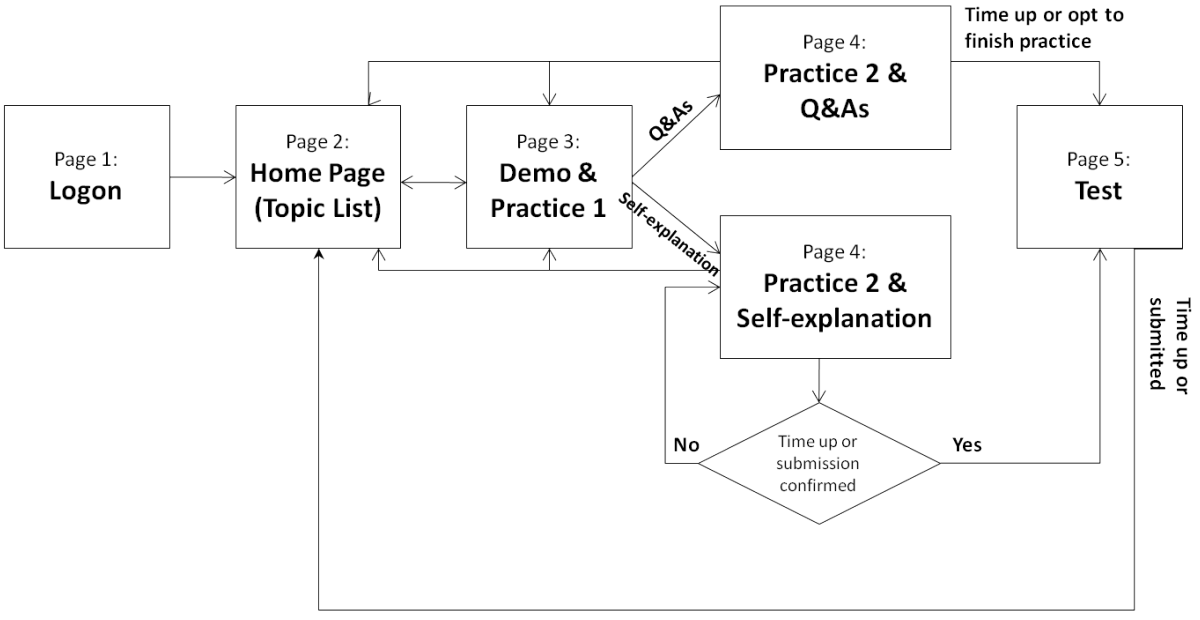

Figure 1: Overview of the instructional design in the format of a flowchart.

At the completion of all five lessons, students took the end-of-study questionnaire to express their learning strategy preference and provide reasons for the choice.

Measures

XHTML pretest. An XHTML test was administered to students before they were introduced to the online tutorial to evaluate their Web design background knowledge. The reliability estimate (Cronbach's alpha) was .85.

Motivation questionnaire. A 23-item questionnaire was used to assess students' motivation levels in self-efficacy, effort expenditure, task value (attainment, utility, and intrinsic value) regarding computer language learning, and distractor items. A modified version of the Self-Assessment Questionnaire was utilized. Items in this questionnaire were modified to accommodate the current study from a well-established instrument on motivation and metacognition (see Hong, O'Neil, & Feldon, 2005, and O'Neil, Sugrue, Abedi, Baker, & Golan, 1992, for the history of instrument development and validation results). The reliability estimate was .90.

End-of-lesson tests. The tests at the end of the lessons were developed to assess the level of a student's acquired topical and procedural knowledge. Students' answers were rated on a 5-point grading scale. The reliability estimate was .76.

End-of-study questionnaire. The six items in the questionnaire inquired students' perceptions about the effectiveness and preference of either learning strategy and to explain why. The reliability estimate was .73.

Procedure

Participating students and their parents (if students were under age 18) signed a consent form provided in both English and Spanish. The study was conducted during regular school hours with 50 minutes in each period. A period was devoted for one lesson. Data were collected on an XHTML test and a motivation questionnaire prior to starting the tutorial. During the study, the answers to the end-of-lesson test questions from both groups were collected. The responses to the end-of-study questionnaire were collected after all lessons were completed.

Data analysis. To examine the first research question, two analyses of covariance were conducted with a between-subject factor (group) and two covariates (XHTML test scores and motivation scores). Practical significance (η^2) was reported, along with statistical significance for each statistical test. Before testing research hypotheses, data was screened and statistical assumptions were tested. For end-of-lesson test scores, skewness of lessons 1, 2 and 5 and of lessons 3 and 4 were smaller than |1|, approximating normal distribution. Individual z-scores were all smaller than |3|. Homogeneity of variance/covariance assumption was met, $p = .71$, for end-of-lesson test scores of lessons 1, 2 and 5. For lessons 3 and 4, although the probability level for the test of homogeneity of variance/covariance assumption was .032, the slight departure from the homogeneity assumption would not pose a problem on the robustness of the hypothesis testing as the group sizes were similar and the data approximated normal distribution. The assumption for the homogeneity of regression coefficient was met, with p values ranging from .34 to .82 for two dependent variables for the two groups.

Students' preference choices were counted and frequency differences were examined with chi-square tests. Students' narrative responses were analyzed to elicit categories using the following procedure: (a) listing and compiling participants' responses; (b) category elicitation by judging, tentatively labeling, and inspecting tentative labels to determine common

categories; (c) mapping all participants' responses onto the tentative categories and inspecting categories for further revisions; (d) re-evaluating responses and mapping onto the final categories as necessary.

Two coders independently conducted category elicitation and mapping students' responses. An inter-coder agreement for elicited themes yielded an acceptable rate of 92.3%. After discussing the coder discrepancy, students' individual responses were remapped. For each theme elicited, students' reasons for their preferences were counted.

Results

To determine if student performance at the end-of-lesson tests were significantly different between the two groups, two analyses of covariance (ANCOVA) were performed. One on the mean end-of-lesson test scores of lessons 1, 2 and 5, and the other on lessons 3 and 4, and both with two covariates, XHTML and motivation scores.

The means, standard deviations and adjusted means and standard errors for students' end-of-lesson tests scores are presented in Table 1.

Table 1: Means and adjusted means of end-of-lesson tests by two groups.

Lessons	The Self-explanation Group	
	M (*SD*)	Adjusted *M* (*SE*)
Lessons 1, 2, 5	2.30 (1.24)	2.31 (0.13)
Lessons 3, 4	2.28 (1.32)	2.28 (0.17)
	The Q&A Group	
	M (*SD*)	Adjusted *M* (*SE*)
Lessons 1, 2, 5	2.50 (1.19)	2.49 (0.14)
Lessons 3, 4	2.37 (1.52)	2.36 (0.16)

n = 78 (self-explanation); *n* = 69 (Q&A).
Q&A = reading questions and answers.

There was no statistically significant group difference in the adjusted means of end-of-lesson test scores for lessons 1, 2 and 5, $F(1, 143) = .940$, $p = .334$, $\eta_p^2 = .007$. Neither were those for lessons 3 and 4, $F(1, 143) = .105$, $p = .746$, $\eta_p^2 = .001$.

The end-of-study questionnaires were analyzed for students' perceptions on the two learning strategies. Although students consistently selected self-explanation (SE) over reading questions and answers (Q&A) as their preferred method of learning throughout the six items, the statistically significant difference was found only in Item 6 (Which method of learning helped you learn JavaScript better?), $\chi^2 = 6.37$, $p < .02$. Elicited themes and sample student reasons for their preference choice are presented below.

Item 1: Which method helped you understand JavaScript concepts better? Fifty-eight percent of group 1 students, who had started learning the first two lessons with the self-explanation method, chose SE, while the rest 42% chose reading Q&A. Students in group 2 also preferred

SE (55%) over Q&A (45%). Sample responses are presented in Table 2. Due to space limitation, tables are provided for the first and last items. For Items 2 to 5, summarized results are presented (request for tables for these items can be directed to the authors).

Table 2: The elicited themes and sample reasons of students' preference for Item 1.

Elicited Theme	Sample Student Reasons for Preference	
	SE	**Q&A**
It shows me what to do exactly	(None)	"… I understand better when someone is telling me what to do"; "…when I don't know the answer, it shows and I learn it" (and 18 additional answers).
It helps me think	"To think about it"; "It made me think harder about the information from the lessons"; "It made me have to understand it enough to be able to explain it" (and 3 additional answers).	"Q&As helped reiterate what I already learned and tested me on the depth of my JavaScript knowledge"; "Because I can read the question and try to answer then I check if I got it right."
It provides more information	"Because it explains more of JavaScript."	"… when I don't know the answer, it shows and I learn it."
Doing nothing /easier than typing	(None)	"Because I understand better when someone is telling me what to do."
It is easier to understand	"I say self-explanation because it is way easier to follow along than to just read Q&As"; "I understand better," (and 5 more).	"Well if I do it and it shows me how to really do it, it helps me understand something"; "Reading questions and then reading the answer helps me the most because it's logical"; "I know how to learn by reading it" (and 12 more).
I learn better with examples	"The way it helped me understand is because the example and display examples help me then I try" (and 1 more).	"Because the way I learn is very unique. I learn by looking at examples."
It affords (allows/forces) me to take the initiative to learn and express my knowledge	"…you can explain it on how you learned it"; "… because being able to learn on our own by answering questions let us understand the concepts more comfortably"; "It made me have to understand it enough to be able to explain it" (and 1 more).	(None)
It helps me remember better	"It helped me remember some of the JavaScript concept by using self-explanation." (and 2 more).	"Helps me remember more."
I get to learn and practice on my own / challenge myself	"…because being able to learn on our own by answering questions let us understand the concepts more comfortably"; "It made me have to	(None)

	understand it enough to be able to explain it" (and 9 more).	
New, interesting, less stressful	(None)	(None)
The prompted answers enlighten me	"I was getting my question answered by the prompted answers"; "Self-explanation because when information was given, I could read it and know what I am doing."	(None)
"Just because"	"It was better"; "It's better than Q&As"; "I always learn better like that"; "Self-explanation works best for me" (and 2 more).	"Because it explains to you the answer and question"; "It was better for me because I am a question and answer type of person"; "Because I learn better like that" (and 7 more).
Obscure, incorrect or irrelevant	"Self-explanation is a domain general constructive activity" (Author notes: Such explanation was not provided to students therefore is deemed irrelevant to reason of preference) (and 11 more).	"Some people can't remember the material and therefore cannot answer questions (Some answer for all)" (and 2 more).

Item 2: "Which method of learning helped you understand better the importance of utilizing JavaScript for Web development?" Group 1 students preferred SE (58%) over Q&A (42%); group 2 students chose Q&A (52%) over SE (48%). Sample responses for SE preference included: "If I explain it to myself in my own words, I will learn faster"; "If I read the method, I think I can get it myself instead of Q&As"; and "I understand better with my own explanation." Sample reasons for Q&A preference included: "Q&As because it had the answer there for you already"; and "Because when it asked me questions, it reminded me of what the topic was about and what to do."

Item 3: "After which exercise did you think that you could write your own JavaScript code?" Group 1 students preferred SE (54%) over Q&A (46%) and group 2 students also selected SE (57%) over Q&A (43%). SE preference sample reasons included: "Doing it yourself is better than just reading"; and "If I read it to myself & then re-read it & translate it in a way that I will understand & then think about it, I will get it." Sample responses for Q&A preference were: "It's way much easier for me to do because it's done for you already"; and "Q&As helped me write my own JavaScript code because it gave me review to what was coming towards me and gave me the understanding of what it was possibly going to ask me."

Item 4: "Which method of learning helped you visualize better what a given piece of JavaScript code will do in your Web page?" Group 1 students preferred SE (57%) over Q&A (43%); group 2 students also chose SE (55%) over Q&A (45%). Sample responses for SE preference included: "I would've read it myself and try to get it the JavaScript code"; and "Because I feel like it explained it good, to the point where I really understood it." A sample response for Q&A preference was: "Gives me the correct code."

Item 5: "Which method of learning helped you understand better the importance of the correctness of writing the JavaScript code?" Group 1 students selected SE (57%) over Q&A (43%); group 2 students also preferred SE (57%) over Q&A (43%). Sample reasons for SE

preference were: "Because it was laid out clear on what you have to do"; "Because self-explanation helps me understand it a little bit more"; and "I understand this better with explanation." Sample responses for Q&A preference were: "I would be able to understand it better"; "Easier to understand"; and "Helps me remember more, explains it better."

Item 6: "Which method of learning helped you learn JavaScript better?" Group 1students preferred SE (64%) over Q&A (36%); group 2 students also chose SE (52%) over Q&A (47%). See sample responses in Table 3.

Table 3: The elicited themes and sample reasons of students' preference for Item 6.

Elicited Theme	Sample Student Reasons for Preference	
	SE	**Q&A**
It shows me what to do exactly	(None)	"…Q&As made me reassured that I knew how to write JavaScript code…tested my immediate wit"; "…you can get exact information…"; "…it gave me a question and I wouldn't have to look for the answer"; "Because it tells me the questions I should be looking for and the answers I should say" (and 40 more).
It helps me think	"I think to myself"; "It got me to think harder" (and 3 more).	"I think to myself."
It provides more information	"It explains more specifically" (and 1 more).	"Gives more info"; "…because it not only helped me review but gave me useful information, that could enable me get a full understanding"; "More detail was explained"; "Because there were more details."
Doing nothing/no typing	(None)	"I only need to read…to understand the concepts."
It is easier to understand	"…easier to understand"; "I can tell from my own wording that I understand more"; "Made me comprehend the material better"; "It's a lot easier to understand …"; "Self-explanation is more helpful to understand" (and 2 more).	"I say both but Q&As helps me understand it"; "It explains better"; "I only need to read the Q&As to understand the concepts" (and 4 more).
I learn better with examples	"Self-explanation clearly gave me examples"; "It helped me learn better by giving examples..."	(None)
Taking the initiative to learn	"I think both helped, but self-explanation helped more by practice" (and 1 more).	(None)

&express knowledge		
Helps remember better	"I remember better by explaining to myself."	(None)
I get to learn and practice on my own / challenge myself	"…because if put in your own words it's easier for you"; "I can tell from my own wording that I understand more"; "I can explain to myself what's going on"; "It gave me the code to study and type on my own" (and 9 more).	(None)
"…less stressful"	"…all I can say it was less stressful."	(None)
The prompted answers enlighten me	"Because it explains it like an adult/professional would"; "Because after you type, it tells you and explains it to you."	(None)
"Just because"	"…teaching me the best way to use JavaScript"; "Because it just helps you understand a lot more than Q&As" (and 4 more).	"Because questions and answers help me better."
Obscure, incorrect or irrelevant	"Am not sure which one may help me learn the JavaScript" (and 12 more)	"It helped me to interact." (Author notes: There is no interaction with Q&As.)

Due to the similarity of the themes elicited from student responses throughout all questionnaire items, they were combined to count frequencies and chi-square tests were performed to determine the differences between SE and Q&A preferences (see Table 4).

Table 4: The elicited themes and frequencies of students' preference.

Themes	SE	Q&A	χ^2
It shows me what to do exactly	0	140	140.00^{***}
It helps me think	26	8	9.53^{**}
It provides more information	11	10	0.05^{ns}
I don't have to do anything/Easier than typing	0	5	5.00^{*}
It is easier to understand	43	45	0.05^{ns}
I learn better with examples	10	4	2.57^{ns}

It affords (allows/forces) me to take the initiative to learn and express my knowledge	24	0	24.00^{***}
It helps me remember better	10	4	2.57^{ns}
I get to learn and practice on my own/challenge myself	66	0	66.00^{***}
It's new/interesting/less stressful to me	3	0	3.00^{ns}
The prompted answers enlighten me	10	0	10.00^{**}
"Just because"	36	30	0.55^{ns}
Obscure, incorrect or irrelevant	70	15	35.58^{***}

* $p < .05$. ** $p < .01$. *** $p < .001$. *ns* = not significant.

Several themes in students' reasons for preference demonstrated statistically significant differences between SE and Q&A. Those themes that demonstrated higher frequencies in SE included: "It affords (allows/forces) me to take the initiative to learn and express my knowledge"; "I get to learn and practice on my own/challenge myself"; and "The prompted answers enlighten me." The themes with higher frequencies in Q&A included: "It shows me what to do exactly"; and "I don't have to do anything / easier than typing." The following categories did not demonstrate statistical significance: "It provides more information"; "It is easier to understand"; "I learn better with examples"; "It helps me remember better"; "It's new/interesting/less stressful to me"; and "Just because."

Discussion

Both self-explanation and reading questions and answers strategies have shown positive effects on learning in previous studies (Durkin, 2011; Raphael & Au, 2005), however this study is the first to compare their effects on learning computer programming. To strengthen the understanding, students' preferences and reasons were examined. Furthermore, the current study, along with the study by Kwon and Jonassen (2011), filled the research gap after nearly two decades by examining the effectiveness of the self-explanation strategy in learning computer programming.

Differential Effects of Two Learning Strategies on Learning Computer Programming

Students' end-of-lesson test performance did not differ. However, the questionnaire data revealed that students from both groups had more favorable impressions toward self-explanation over the reading questions and answers method. The reasons expressed by students have informed why self-explanation was perceived as better. The major elicited themes and their response frequencies are discussed.

Elicited Themes

The elicited themes reflected students' attitude toward learning. Excluding the reasons that were "just because" or "obscure, incorrect or irrelevant," and only considering the reasons with more than zero count, the reasons among students' preference for self-explanation were more evenly distributed than those for the preference for reading questions and answers. Of nine

themes with 203 counts of reasons for the self-explanation preference, the largest count was 66 for one reason ("I get to learn and practice on my own/challenge myself"). As for the reading questions and answers strategy, of the seven themes elicited with 216 counts, there were 140 counts toward one reason ("It shows me what to do exactly").

Students preferring the reading questions and answers method appeared to like to be shown what to do, which is aligned with one of the benefits of the question-answer relationship strategy as guiding students in the right direction of learning (Benito et al., 1993; McIntosh & Draper, 1995, 1996; Raphael, 1982). Nevertheless, their remarks demonstrated passivity in their learning approach. On the other hand, the two themes for the self-explanation preference that demonstrated statistically significant differences and accounted for over 40% of the counts were: "I get to learn and practice on my own/challenge myself"; and "It affords (allows/forces) me to take the initiative to learn and express my knowledge." They seemed to indicate that students liked the challenges brought forth by self-explanation, appreciated the opportunity to take charge of their own learning, wanted to be in control of the learning process, and were happy to give their input during learning. These themes showed that students enjoyed active participation in learning.

One theme revealed that self-explanation had appealed to some students because it was new, interesting, or less stressful. According to students' verbal and written comments, they had never heard of this learning strategy before the study. It is possible that there was a certain novelty effect. The conjecture for the "less stressful" comment was that the appearance of the reading questions and answers caused higher anxiety in the individuals. Not surprisingly, no students considered it a new experience to read questions and answers, attesting to their previous exposure to reading.

The two themes for self-explanation, "The prompted answers enlighten me"; and "It helps me think" appeared to support the premise that students would rather think about how to answer the questions on their own before verifying with the prompted answers, while still drawing upon the knowledge provided. Students seemed to enjoy knowing that they had understood it correctly by reading the prompted answers after some delay, instead of being fed with immediate answers. On the other hand, some themes with preference for reading questions and answers also demonstrated higher frequencies with statistical significance such as students expressed their pleasure of "not having to do anything" or "easier than typing" because typing was only required by the self-explanation method, indicating their reliance on being guided with their learning.

Some reasons were given for both preferences. For example, one student who cited the reason, "It is easier to understand" described himself as a "Q&A type of person," while another student citing the same reason but with the preference of self-explanation explained, "I understand better with my own explanation." The reasons: "It provides more information"; "I learn better with examples"; and "It helps me remember better" were also expressed for both strategies. Students seemed to share these same opinions toward their respective preferred learning methods. It appeared that students considered their preferred method as the one that provided them with more information because that method had a better appeal to their learner characteristics than the other method did.

This alludes to the conjecture that both methods could appeal to certain learner characteristics and favorably help learners process the information. An understanding of the learner characteristics of a target audience is essential for instructional design. Tailoring the

instructional design to accommodate learner characteristics can help maximize student learning, especially for those who struggle. Teachers and instructional designers should strive to search for and use well-evidenced, effective learning and instructional strategies in developing instructional materials.

There were extraordinarily high numbers of the reasons of "just because" and obscure, incorrect or irrelevant answers, probably caused by the low academic standing of the participants. Students' poor reading comprehension could have hindered appropriate understanding for the strategies and their ability to reason (Schumm, Vaughn, Klingner, & Haager, 1992).

Proposed Suppositions for No Group Difference in Test Performance

Familiar versus new strategies. The reading questions and answers strategy had a wide and consistent application with success in various subject matter (McIntosh & Draper, 1995, 1996; Raphael & Au, 2005). The participating students had experience with reading and were more ready to take advantage of it, as compared to the unfamiliar concept and procedure of self-explanation.

Difficult learning material. Computer programming as a subject appears to have radical educational novelty (Dijkstra, 1989), imposing high levels of intrinsic cognitive load on novice learners (Garner, 2002). Additionally, the questions in the current study were open-ended, not multiple choice items, or those that require one correct answer (Pappa & Tsaparlis, 2011). For instance, the question that asked how to tell if there was embedded JavaScript code in a Web file was a "think and search" question requiring learners to understand the text and formulate an answer in their own words. Thus, the difficult learning materials and questions could have reduced the discriminating ability of the tests.

Short experimental period. Several 50-minute class periods spanning five days might be challenging for students to master a new learning strategy. More studies of a longer experimental duration are needed.

Limitations and Future Research

To answer the research questions, students had to experience both learning strategies. The design switched the subjects between the strategies due to the limitation of the subject pool and experimental period. We can refine this design to be more balanced by adding a fourth stage of learning, switching to the other strategy one last time. We can also add clarification on the difference between treatments versus no treatment by adding a control group that experiences neither strategy.

The nonsignificant test performance might have been partly due to variation in students' general academic differences. The current findings warrant the need for continued research, especially with difficult subject matter or underperforming participants. To accommodate learner characteristics, the multimedia pre-training principle that helps prime learners before a formal study and the signaling principle that assists in orienting the learners throughout the study can be utilized and will help maximize the understanding of learning strategy effects.

Conclusions and Implications

Although students' test performance did not differ between the two strategies, students preferred self-explanation, as it is interesting, challenging, and affords active participation in learning. It was also evident that learner characteristics played an important role in students' preferences. Future design and development of instructions therefore should utilize research findings on effective learning strategies in general as well as adapt to local needs like learner characteristics. More studies on the strategy of self-explanation with learning computer programming in appropriate lengths of experiments are warranted to help ascertain its potential effect.

The interactive online tutorial developed for the current study can be used for online or classroom teaching. When utilized in the classroom, students can learn at their own pace and teachers can provide personalized assistance. Students can further utilize the tutorial after school for extended practice. The tutorial provides performance-related feedback, along with the multimedia learning instruction guidelines such as the spatial and temporal contiguity principles (Mayer, 2008, 2009, 2011), and can keep learners interested and result in efficient instruction (Lee, 2008).

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Posters That Teach – Blended Learning and Total Engagement

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Abstract

Electronically mediated technologies are prohibited from use in a major assessment component of a blended learning subject. This subject employs a multidisciplinary problem-based approach to explore international issues and perspectives using a rich blend of face-to-face, electronically mediated, individual and team-based activities. The assessment is a role-play which occurs during the second half of a year-long pathway to university program. Belief in the importance of helping students integrate knowledge with an understanding of learning strategies informs the design of this particular assessment task. To complete the task, small teams develop and display a hand-drawn poster summarising their understanding of a real life 'wicked problem' explored in depth during the semester. Composing and preparing their poster ensures that students create visual evidence of their learning about the context of a complex contemporary international issue, which varies from year to year. It also introduces students to higher order thinking and develops critical and creative thinking skills.

This paper aims to introduce and describe the learning principles informing the design of the assessment strategy. The task compels students to question information, seeking deeper engagement with data and generating first-hand engagement with the issue. The learning design also facilitates students' crucial skills of knowledge generation and learning management, and helps them apply this knowledge to other aspects of their future learning. This task bridges the gap between the technical and non-technical skills essential for success in the 21st century.

Keywords: role-play; visual literacy; blended learning; wicked problem.

Introduction

What Are These Posters That Teach?

They are hand-drawn by teams of 4 to 5 students, who work collaboratively to investigate and solve wicked problems in International Issues and Perspectives**,** an interdisciplinary, problem-based subject at UNSW Foundation Studies, which is a university pathway program. The posters represent one element of a more complex learning assessment, which takes the form of an extended role-play. Teams have one week to prepare their poster. The most prominent feature of these posters is that they are hand-drawn, and no electronically mediated technology is allowed for the production of the posters. This is especially challenging as all the activities that contribute to the development of the learners' knowledge leading up to and following this task are underpinned by a blended learning approach (Torrisi & Drew, 2013).

This paper builds on a previous analysis of the same activity presented at the Asian Conference on Technology in the Classroom 2017, Kobe, Japan by the same authors (papers.iafor.org/papers/actc2017/ACTC2017_34873.pdf). We have reviewed our ideas taking into account a broader range of literature as well as our own discussions and reflections following the conference. This paper aims to argue that the role-play contextualization of the poster stimulates active learning by framing collaboration, divergent thinking and convergence of meanings. At the same time, the collaborative hand drawing of the poster in the absence of electronically mediated technology has a deeper impact on the quality and complexity of student engagement, knowledge construction and originality of expression.

Why a *Role-Play* Instructional Design? A Literature Review

According to Kariel (1977), experiential learning can generate tensions which can only be resolved by "becoming alive to new ways of seeing the world" (p. 61).

Over the years, the terms role-plays, simulations and games have been used interchangeably in the education literature to refer to "active learning exercises that seek to deepen students' conceptual understanding of a particular phenomenon, set of instructions, or sociopolitical process by using student interaction to bring abstract concepts to life" (Krain & Shadle, 2006, p. 4). According to Sutcliffe (2002), these exercises provide learners with an imaginary or real world within which to act out a given situation. Sutcliffe (2002) goes on to explain that "remote theoretical concepts can be given life by placing them in a situation with which students are familiar" (p. 3).

Active learning is an approach that shifts pedagogy from a teacher-centred instruction to a student-centred (even teacherless) learning paradigm whose aim is to create experiential learning environments that bring learners to discover, construct knowledge and problem solve for themselves (Barr & Tag, 1995). Gardner (1991) has called this 'education for understanding' because it facilitates "a sufficient grasp of concepts, principles, or skills so that one can bring them to bear on new problems and situations, deciding in which ways one's present competencies can suffice and in which ways one may require new skills or knowledge" (p.18). Fox and Ronkowski (1997) show that active learning enhances learner involvement with and comprehension of abstract concepts while simultaneously facilitating skill development. Furthermore, Jensen (1998) suggests that an active learning approach makes learning more engaging and memorable while Krain and Nurse (2004) show that active learning can make issues more real, more 'human' to the learners.

Given the variety of uses of the terms role-plays, simulations and games in education literature, some scholars attempt to draw distinctions between them. According to Krain and Shadle (2006), simulations place learners "within a reasonable representation of a real environment within which political or social interactions occur" (p. 52). They involve mainly structured interactions revolving around negotiations, policy-making or decision-making processes as can be seen in the negotiations of treaties or debates on various issues from the perspective of certain individuals, organisations or countries (Boyer, 2000; Krain & Shadle, 2006). As such, "simulations have the power to recreate complex, dynamic political processes in the classroom, allowing students to examine the motivations, behavioural constraints, resources and interactions among institutional actors" (Smith & Boyer, 1996, p. 690).

As early as 1959, Bloomfield & Padelford commented that simulations could "produce tangible results over and above what [could] be taught and learnt about politics by more usual methods of instruction" (p. 1112). This has been confirmed by more recent research, which shows that learners remember 10% of what they read, 20% of what they hear, 30% of what they see, 50% of what they see *and* hear, 70% of what they say, and 90% of what they do *and* say together (Stice, as cited in Smith & Boyer, 1996).

Conversely, games engender a sense of competition and have clearly defined rules, endpoints and ultimately, winners and losers (van Ments, 1989). For example, in a business context, learners may engage in a competition buying and selling shares on the stock market with the aim of achieving the highest profit in a given context and time frame (Sutcliffe, 2002). Games do not require the players to take on the persona of a real-world actor (Krain & Shadle, 2006). Christopher and Smith (1988) distinguish between closed and open games. Unlike closed games, which are puzzles with pre-determined answers, open games are fluid and changeable by nature; players with conflicting interests navigate complex and nuanced relationships to reach collaborative solutions to real-life problems. These features make open games very similar to role-plays.

Role-plays place learners in a structured environment and ask them to take on a role. Unlike simulations, which can be more prescribed and have clearly defined preferences and goals, role-plays, in large part, allow learners to create their own interpretation of their roles because they are less goal-oriented (Krain & Shadle, 2006). In fact, interactions within the role-plays are more interpersonal than goal- oriented (Shaw, 2010). The main aim of a role-play is to dramatize the phenomena of interest, the relationships between players and the challenges confronting them (Sutcliffe, 2002). According to Andrianoff and Levine (2002), this dramatization "provides the essence of learning" (p. 121) because it allows learners to personalize their learning and engage in role-playing. In this way, learners "inhabit the issue (making it more "real" and immediate) and think beyond their own perspectives" (Scott, 2001, p. 347). This point of view is further strengthened by Heathcote's and Bolton's (1995) 'mantle of the expert' approach.

Acting in the role of representatives of real-life organisations, the learners are entrusted with a 'mantle of the expert' which authorises them to investigate and address the issues ***as if*** they were the experts (Heathcote & Bolton, 1995). This 'mantle' of expertise changes thinking and learning ***about*** the issues, to that of thinking ***from within*** the issues. Acting within this 'mantle', learners investigate and respond to the issues from the perspective of contributors to, victims of or activists against the issues rather than neutral passive observers. In this way, learners experience an active, urgent and purposeful view of learning, in which knowledge is to be acted upon, not merely taken in (Heathcote & Bolton, 1995). In addition to empowering the learners

to drive their own learning, the 'mantle of the expert' gives legitimacy to trial and error, and learning from errors. This stimulates critical review and self- and peer-correction as the learners engage with the task and co-construct their knowledge.

This is especially so in our role-play, as different stakeholder teams liaise with each other in search for relevant collaborations and partnerships that can help them solve the issues. The gradual realization that there are a variety of stakeholders with opposing or even conflicting interests reveals the tension and reinforces the life-like 'wickedness' of the issues. Therefore, role-plays can be particularly effective in bridging the gap between academic knowledge and everyday life (Maddrell, as cited in Krain & Shadle, 2006). This is confirmed by Kuzma and Haney (2001), who suggest that "one way to ground abstract concepts is to provide references so that students can 'see' what the instructors are trying to explain" (p. 34).

In this context, the role of the teacher/instructor is to facilitate a learning environment that develops in the learners qualities of leadership, competency and responsibility for their own learning (Aitken, 2013). Cognitive conflict or puzzlement becomes the stimulus for learning and knowledge evolves through social negotiation and individual understanding (Kirkley & Kirkley, 2005).

The Role-Play Overview

"When an individual plays a part, he implicitly requests his observers to take seriously the impression that is fostered before them" (Goffman, as cited in Freie, 1997, p. 732).

The role-play assessment is an active learning instructional design based on a framework first developed at UNSW Foundation Studies by Elizabeth Rosser over ten years ago. Known as *The Big Paper b-Sim,* the original design was modelled on the highly successful *Mekong e-Sim* created by R. McLauchlan, D. Kirkpatrick, H. Maier and P. Hirsch (Baron & Maier, 2004). In its current format, the role-play maintains the core structure and methodologies from these exemplars with changes to allow for upgrades in the technological tools used.

The role-play fosters an environment of open inquiry, debate and reflection within an atmosphere of urgency that reflects contemporary international events (van Ments, 1989). Participants attempt to solve contemporary international issues, known as 'wicked problems'. These are ill-defined social problems that are by their nature confronting, and as such have no known definitive or objective solutions (Rittel & Webber, 1973; Khaira & Yambo, 2005). Learners take on the role of real-life stakeholders, develop empathy and experience real-life complex issues from multiple perspectives. To reinforce authenticity, the wicked problems are introduced via scenarios based on current investigative documentaries capable to reveal the complexity of the issues and provide visual evidence of their severity. Some of the scenarios have covered topics such as fuel for the future, fracking, water security, plastic pollution or gender inequality.

More concretely, the role-play is staged over a period of six weeks. The activities of each week build on the achievements of the previous week(s) as can be seen in Figure 1, below. The first stage (weeks 1–2) includes the briefing, when the lecturer introduces the topic, and learners form teams (of 4–5 students) and select their stakeholder from a given pool. A typical role-play is likely to consist of approximately 20 stakeholders. This stage stretches over to the second week, when teams interpret and research their stakeholder role using both face-to-face and web-based strategies.

In the second stage (weeks 3–4), a scenario is released to provide a clearer topic focus. Teams investigate the issues arising out of this scenario from their stakeholder perspectives using a variety of pre-taught analytical tools (later described in more details in the context of visual literacy), and develop their stakeholder profile on UNSW Wikispaces. This profile is then reviewed, refined and represented visually by hand in the mind map poster. The poster is an assessable task worth 10%.

The third stage (week 5) includes a public forum that reunites all the stakeholder teams in a three-hour emergency summit, where teams use their expertise to negotiate solutions to a serious, unexpected and high-risk issue development that requires immediate action. Each team prepares an assessable action plan poster worth 10%.

The fourth and final stage (week 6) is debriefing. This involves "talking about the experiences, analyzing them, evaluating them, and integrating them into one's cognitive and conscious data base" (Lederman 1984, p. 417). To consolidate this, learners prepare individual Debriefing Reports in which they record their reflections on their learning experience throughout the role-play. This is the final assessable component of the role-play, also worth 10%.

The role-play integrates all four stages of Kolb's (1984) experiential learning model to accommodate a variety of learning preferences. Kolb's model consists of four stages: abstract conceptualization, concrete experience, reflexive observation, and active experimentation (Kolb 1976, 1984, 1988). Players learn abstract concepts from lectures, scenarios, readings, videos and discussions (abstract conceptualization). Second, learners research their roles and develop goals to achieve (concrete experience). Third, learners develop strategies to achieve their goals and experiment with their strategies – this includes the preparation of the mind map poster in stage two, and action plan in stage three (active experimentation and concrete experience). Finally, they reflect on their actions, choices, and the learning outcomes (reflexive observation).

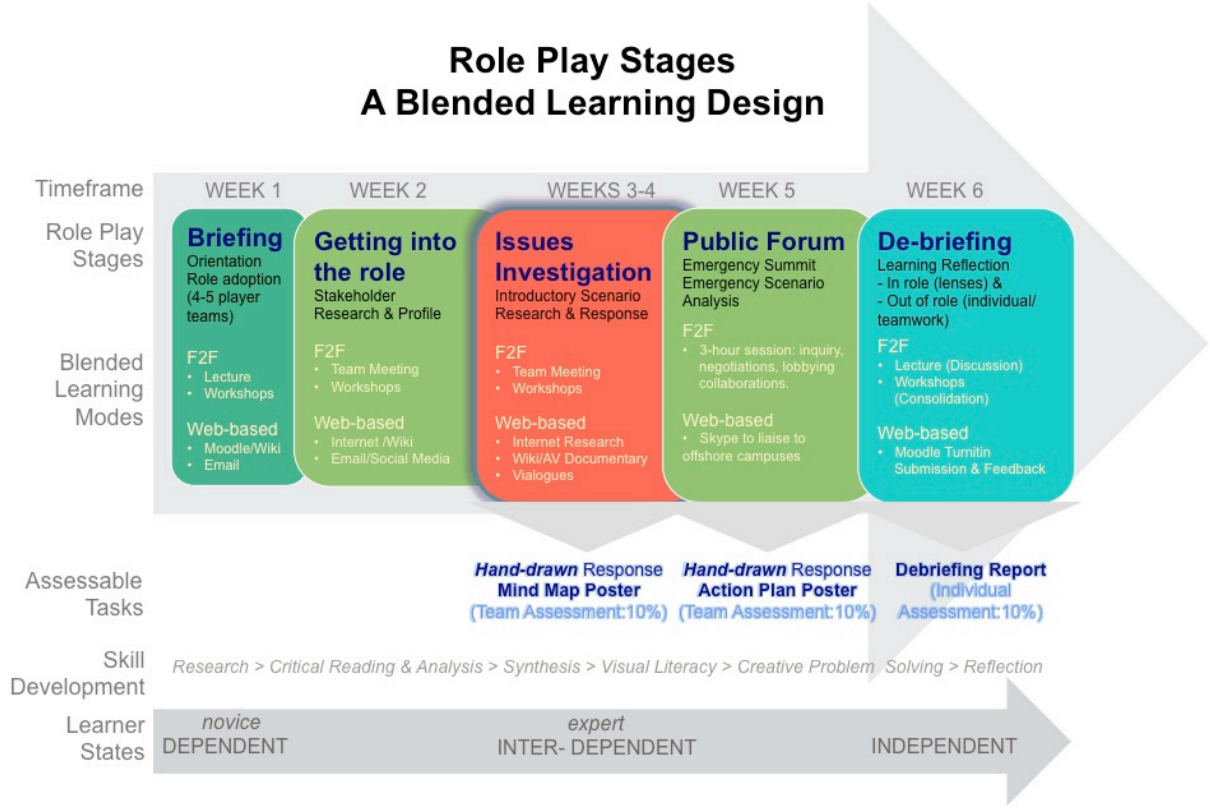

Figure 1: Role play stages – A blended learning design.

The transformative nature of the role-play encourages learners to progressively gain expertise in their stakeholder role and insight into the complexity of related issues. The real-life approach to the role-play also has potential to create a deliberate sense of ambiguity, which is integral to the 'wickedness' of the problem they are addressing (Rittel & Webber, 1973). Hence, players find themselves constantly thoughtful and questioning as they are prompted to react to the unfolding situation. Thus, the emphasis of learner performance and assessment is on behaviour/performance rather than outcome. The authentic possibility of multiple decisions and outcomes ensures a safe environment for bold critical thinking, direct emotional engagement, originality and creative problem solving.

Preliminary activities involving team and stakeholder selection as well as the introduction of the 'wicked problem' are aimed at revealing the heterogeneity of group members. Productive differences of opinions are valued as fuel for creative team-based learning, critical thinking and original expression. Progression from one stage to the next is driven by the release of new tasks, questions or news flashes (trigger events) intended to stimulate more focused lines of inquiry. Nevertheless, different stakeholder teams pursue their own directions and interests within the bounds of the wicked problem and their stakeholder role. Learners are, therefore, more likely to be process-minded than goal-oriented. In this context, the role of the teacher is to monitor proceedings and intervene as little as possible, preferably not at all while helping teams stay aware of their learning goals, time frames and required outcomes.

Why *Visual* Expression? A Literature Perspective

The Greek poet Simonides observed that "Words are the images of things", and Aristotle claimed that "without image, thinking is impossible" (as cited in Benson, 1997, p. 141).

Researchers who study problem solving are convinced that visualisation, namely imagery or picture-like representations, is a powerful cognitive tool (Finke, 1990; Rieber, 1995). In fact, the meaning of the Greek term 'to prove' (*deiknumi*) is *to make visible or show*; pointing to "the close link between demonstrating understanding and having the capacity to show or draw a proof" (McLoughlin & Krakowski, 2001, p. 1).

Research confirms that there is a strong correlation between visual and verbal information, memory and learning. In 1969, John Debes first used the term, 'visual literacy' in education to describe the capacity of a learner to "discriminate and interpret the visible actions, objects, and/or symbols, natural or man-made, that he encounters in his environment. Through the creative use of these competencies, he is able to communicate with others. Through the appreciative use of these competencies, he is able to comprehend and enjoy the masterworks of visual communication" (as cited in Avgerinou & Ericson, 1997, p. 281). In support of Debes' definition, Brill et al. (2007) propose that visual literacy is "the ability to both accurately interpret and create messages that are transmitted through the sense of sight, with emphasis on using communication systems that do not rely primarily on traditional text based alphabetic or numeric codes" (pp. 49–50).

Horton (1983) sees a correlation between visual literacy and visual thinking, hence he defines visual literacy as "the ability to understand and use images, including the ability to think, learn, and express oneself in terms of images" (p. 99).

While we agree with the above definitions, we tend to associate visual literacy with both visual thinking and creative expression in line with Baca & Braden's (1990) view: "Visual literacy refers to the use of visuals for the purposes of communication, thinking, learning, constructing meaning, creative expression, [and] aesthetic enjoyment" (p. 48). In addition, as reinforced by Felton (2008), we believe that "the capacity to manipulate and make meaning with images is a core component of visual literacy" (p. 61). This is further substantiated by Wileman (1993), who sees visual literacy as "the ability to turn information of all types into pictures, graphics, or forms that help communicate the information" (p. 114). Hence, visual literacy is "an organizing force in promoting understanding, retention, and recall of so many academic concepts with which students must contend" (Robinson, quoted in Stokes, 2002, p. 12); and as such, a core 21st century skill (White, Breslow & Hastings, 2015).

The mind map poster is a hand-drawn visual expression of the learners' insights into and stakeholder response to the role-play 'wicked problem'. As such, the learners manipulate imagery to encode complex messages that demonstrate their ability to construct and express nuanced meanings visually. According to Zeyab (2017), learners "can better visualize their ideas using visual information, thereby offering students a better understanding of the concept and transferring this abstract idea to a more concrete image" (p. 31). In this way, learners use their critical and creative thinking as they conceive, develop and integrate their visuals into the mind map poster.

Interestingly, White, Breslow & Hastings (2015) see visual literacy as global *communication* competency. The mind map poster is prepared in teams; therefore, visual literacy is achieved thought interactive thinking, extensive discussions and negotiations which enable learners to derive meaning through what is being communicated. In this way, the negotiating of visual expression of complex, abstract ideas is motivational, and stimulates genuine interest in and engagement with the topic (Rasul et al., 2011; Yunus et al., 2013). From a cognitive load theory perspective, visual literacy can also enhance learning effectiveness by facilitating faster storage

of knowledge in the long-term memory (Mayer, 2009). According to Sweller & Chandler (1994), the capacity of the working memory to assimilate multiple elements of information simultaneously is limited. Nevertheless, since the working memory processes visual and auditory separately, the capacity of working memory can be extended if information is presented through two channels – one processes auditory and verbal information while the other manages visual information, imagery (Mayer & Moreno, 2003). According to this dual encoding theory, the working memory processes the information from these channels at the same time by integrating words and images to create long-term memory knowledge. Hence, audio-visual information is processed more effectively than either audio or visual alone (Clark & Pavio, 1991). Therefore, a multimedia approach is more likely to foster more meaningful and deeper learning on condition that there is not too much information, or ideas are not too complex, in which case there is the possibility of cognitive overload (Sweller & Chandler, 1994).

The drawing of concrete visual symbols allows learners to interpret and transfer to paper abstract concepts, in other words the formation, inspection, transformation, and maintenance of images in the 'mind's eye', which Mathewson (1999) calls 'visual-spatial thinking'. This crystalizes and consolidates understandings and maximizes the capacity of the working memory to process complex information. In fact, Mathewson (1999) sees this construction of learning as a "self-activating response to challenges, dissonance, or discrepancy rather than a purely passive encoding of experience" (p. 36), where the role of visual-spatial thinking is to "preserve relationships among a complex set of ideas as a single chunk in working memory, increasing the amount of information that can be maintained in consciousness at a given moment" (p. 33). Spatial images are, therefore, very important to the cognitive process because they have the capacity to expedite the movement of information to the long-term memory. Ainsworth et al. (2011) confirms that drawing helps learners remember the information more effectively and can make learning more enjoyable.

Embedded in the International Issues and Perspective course are visual frameworks that promote thinking and learning based on visual discourse analysis. This is defined as "a theory and method of studying the structures and conventions within visual texts, and identifying how certain social activities and social identities get played out in their production" (Albers, 2007, p. 87). Consequently, learners are pre-taught a range of visual/analytical tools capable to serve as organizational frameworks that can communicate the logical structure underpinning their visual message (Tarquin & Walter, 1997; Trowbridge & Wandersee, 1998). The use of such visual organisers can reduce the cognitive demands on learners because they assist them to process information in a non-linear format and, thus, free up working memory space that can be employed for creative thinking and problem solving (Myer & Moreno, 2003). This is especially useful given the fact the participating learners are international students whose first language is not English.

In preparation for the role-play, learners also explore relevant visual literacy techniques as well as corresponding skills of visual exploration, critique and reflection. Some of the techniques include analysis of visuals in terms of colour, size and symbolism of different image elements, positioning on the page, overall context of the image, possible direct and underlying messages, intended audience reaction, impact, etc. In addition, a series of relevant visual organisers/analytical tools are explored for the purposes of both illustrating and deciphering complex visual messages. Some of these are:

- **Critical Lenses** such as socio-economic, financial, cultural, political, environmental, etc. Different stakeholders may highlight different aspects of the issues depending on their unique lenses. For example, in *The Plastic Age?* Role-play, a stakeholder such as the 5 Gyres Institute may be inclined to view the plastic pollution 'wicked problem' through environmental, education, scientific lenses while a plastic manufacturing company (e.g. MBA Polymer) is likely to use economic and financial lenses.
- **Issues**, namely, important problems or challenges that are difficult to address in isolation because of their strong connections with and implications for other problems or challenges. These *must* be consistent with the relevant stakeholder lenses.
- **Scale** of the issues and/or stakeholder impact (individual, group/family, local, regional, national, international, bilateral, multilateral, global).
- **SWOT Analysis** (Stakeholder Strengths, Weaknesses, Opportunities and Threats)
- **Stakeholder Disposition Map** to position the role-play stakeholders with regards to the main issues on a scale ranging from a position of power (in favour and influencing the situation) to one of a victim (against and unable to influence the situation). This also allows the disposition of stakeholders against each other depending on their similar or antagonistic interests.
- **Fishbone Diagram (Ishikawa Diagram)** to identify and illustrate cause and effect relationships.
- **Forces and Impacts** of relevant issues.
- **Known Knowns/Unknowns – Unknown Knowns/Unknowns** to drive in-depth, meaningful research of the issues.

Observation of our learners using this range of visual organisers/analytical tools shows them move through a "continuum of visual thinking" (McLoughlin & Krakowski, 2001, p. 8). At first teams engage in visual thinking by interpreting visually abstract concepts; this is done at the stage when learners research and analyse their stakeholder role. Then, they move on to visual learning by constructing knowledge through interaction with the visuals; this is the stage of producing the mind map poster. Finally, they progress to visual communication where a range of creative imagery and graphic frameworks are brought together to stimulate transaction and dialogue; this is achieved at the stage of the emergency summit, when teams negotiate partnerships with a view to producing action plans capable to solve the problems raised in the emergency scenario.

The Role of Technology

In the International Issues and Perspectives course, technology is not merely a tool for instruction delivery, but it is thoughtfully integrated into the curriculum to optimise learning and empower students to become independent learners (Mills & Tincher, 2003, Garrison & Kanuka, 2004). Thus, we believe we have achieved an effective blend of **instructional modalities** (facilitator-driven, learner-driven, flexible learning) and **delivery media** (multimedia, UNSW Moodle (moodle.telt.unsw.edu.au), lectures, workshops, PowerPoint Presentations, Prezis (prezi.com), Vialogues (vialogues.com), workbooks); **instructional methods** (face-to-face and technology-based), **web-based technologies** (e.g. UNSW Wikispaces (www.unsw.wikispaces.net), Prezis (https://prezi.com), PowToons (www.powtoon.com), Vialogues (vialogues.com), Wordle (www.wordle.net/create), online discussion forums and blogs) and **learning states** (dependent, inter-dependent, independent).

The combination of these depends on learning goals, course content, teaching and learning styles, and learner characteristics (Dziuban, Hartman & Moskal, 2005 in Kosar, 2016). Hence,

the role-play also combines a rich blend of instructional modalities and methods that facilitate the learners' transformation from novices to experts (in terms of content knowledge) and from interdependent to independent learners (in terms of study skills and competencies). Lectures are used to introduce the role-play wicked problem, stages and weekly tasks while workshops are allocated to learner-driven learning. The role-play is hosted on UNSW Wikispaces (Figure 2), where teams develop and publish their stakeholder profile, investigations and response to the documentary scenario. They also use the wiki discussion board to liaise and seek collaborations with other participating stakeholders. An example can be viewed at: http://ufsb2016.unsw.wikispaces.net.

Figure 2: A snapshot of the 2016 Role Play Assessment WIKI: The Plastic Age? (http://ufsb2016.unsw.wikispaces.net).

The documentary scenario, which offers an overview of the wicked problem, is a multimedia program which teams analyse via Vialogues (Figure 3). This online software facilitates private and autonomous team discussions about the video, creating opportunities for both synchronous and asynchronous interactions.

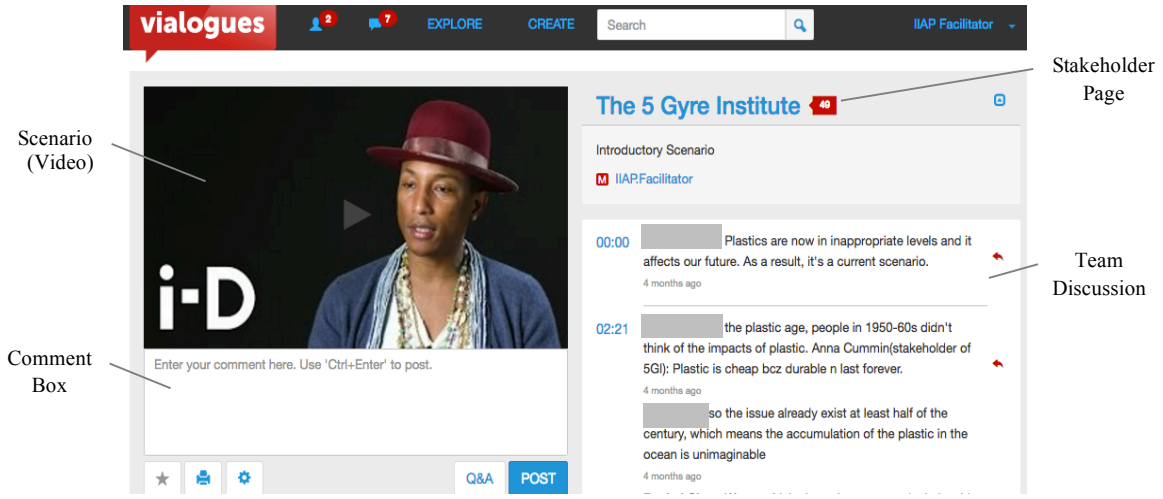

Figure 3: A snapshot of an online discussion about the Introductory Scenario 2016 Role Play Assessment WIKI: The Plastic Age? For privacy reasons, the names of the learners participating in this discussion have been covered.

Why *Hand-Drawn* Posters in a Blended Learning Course?

While the stakeholder analysis and wicked problem investigation in the early stages of the role-play are mediated by information and communications technology, the ensuing stakeholder response to the issues raised in the documentary scenario is presented visually in the form of a hand-drawn mind map poster. In fact, the use of *any* electronically mediated technology is prohibited in the *performance* of this task. This is because we believe that "computers have the potential to support cognition" and "extend intelligence" (McLoughlin & Krakowski, 2001, p. 5) but, at the same time, have the potential to overpower creative expression if the users do not have the optimum skill level to operate them with confidence. Zeyab (2017) agrees that, "sometimes, the best strategy does not include digital tools" (p. 13). We have, therefore, opted for hand-drawn techniques that involve only basic technologies, such as coloured pens, highlighters, markers, watercolours, paper and occasionally, as per learners' original choice, sand to represent sandstorms in the Sahara desert, or makeup powder for various effects. Admittedly, learners are allowed and even encouraged to draw inspiration from online research, which may also include imagery.

The rationale for this is to stimulate in the learners "the active reconstruction of past visual experience with incoming visual messages to obtain meaning" (Sinatra, 1986, p. 5). In other words, we aim to place an emphasis learners' ability to actively develop original visual interpretations of known information and team understandings as opposed to simply copying and pasting existing visuals. In this way, learners are stimulated to analyse, evaluate and manipulate images to develop their own specific language in a sense that the visual messages presented need to be decoded to have meaning (Branton, as cited in Stokes, 2002). Ainsworth et al. (2011) suggests that expressing abstract concepts as hand drawings can be "transformative by generating new inferences" (p. 1). Moreover, Clark and Pavio (1991) observe that generating images produces better recall than traditional semantic exercises, such as repetitions, translations into another language or brainstorming synonyms. This is especially meaningful in our context, where the language of instruction is our students' second language. Visual literacy, thus, compels our students to avoid acceptance of knowledge/authority without questioning it and engage in deeper thinking by effectively recognizing, interpreting, and

employing the distinct syntax and semantics of different visual forms (Felten, 2008). This prompts stakeholder teams to filter semantics and expression and adopt a constructivist approach to their learning, namely "acquire knowledge by building it from innate capabilities interacting with the environment" (Houston, 1995, p. 64). Through iterative appraisal and re-evaluation of their drawings, teams revisit and refine their shared understanding of the issues, as well as potentially transform their own initial perceptions and re-assess their thinking gaining more depth of insight (Gardner, 1994). This leads to a more genuine engagement with the issues and a higher level of creative thinking and originality.

Another reason for limiting learners to the hand drawing of complex abstract ideas as opposed to verbal or written expression is that we understand that not everyone can perceive, filter or express information the same way. The mind map poster accommodates 'multiple intelligences' (Gardner, 1994) and various learning styles, visual, auditory and kinaesthetic (Brown, 2014). According to Gardner (1994), visual-spatial and linguistic intelligences provide the main sources of information storage and problem solving. Furthermore, hand drawing involves three senses, *seeing*: visualising abstract concepts; *hearing*: listening to team members' perspectives; and *touching*: learners draw visual symbols on paper using their hands and coloured pencils. In this manner, the hand drawing of the poster engages various learning styles at the same time, which maximizes interaction and creativity, heightens awareness, provides for surprise and reinforces sentiments (Bredemeir & Greenblat, 1981; Wilson, 2011).

According to Dallow (2008), the visual is "like an interface or cultural zone of social exchange … a social sphere or arena where contemporary views of reality are displayed;" he goes on to add that "a notion of visual literacy could be the capacity to negotiate or 'navigate' this visual cultural zone" (p. 98). Hailey et al. (2015) also agree suggesting that experiences that engage visual literacy are 'essentially social exchanges'. The requirement to hand draw the mind map poster on one piece of paper with a certain set of pens and without any computer technology generates a need for all the members of a stakeholder team to inhabit the same space at the same time. This is conducive to insightful and passionate discussions during which team members listen with the same attention and intensity with which they talk. They reflect on their own and others' thinking, they shift perspectives and develop the ability to hold multiple perspectives simultaneously. They gain confidence dealing with ambiguity and gradually learn to appreciate the impact of providing visual evidence. They overcome challenges through perseverance and realize that there can be more than just one possible answer (Hailey et al., 2015). Such face-to-face conversational interactions provide a means for the teams to converge, influence each other's thinking and construct meaning together through their own interpretations and refinements of ambiguous, abstract and possibly fragmentary information (Roschelle, 1992).

By prohibiting technology, we ensure that teams engage in genuine 'collaboration' as defined by Lai et al. (2001), namely, "participants work together on the same task, rather than in parallel on separate portions of the task" (p. 6). Research shows that social interaction stimulates the elaboration of conceptual knowledge, which enhances comprehension of abstract concepts (Roschelle & Teasley, 1995; Lai, 2000). By collaboratively representing their own stakeholder position on paper in a visual form, teams gain deeper insights into their own stakeholder role and develop expertise in solving the role-play wicked problem. As such, the preparation of the mind map poster is like a rite of passage, or in the words of Bredemeir and Greenblat (1981), more like an "initiation ceremony experience" (p. 309).

We have been questioned about the decision to refrain from using design software such a

Photoshop or InDesign. The pros and cons of using such technology have been extensively discussed among our colleagues, nevertheless, the consensus has been that such software is technically complex and requires detailed understanding to be used flexibly and effectively; and neither learners nor facilitators can be assumed to master such technology. Hence, limited software-handling skills are likely to act as a barrier not only to expression but also to critical and creative thinking. At the same time, there is the possibility for one or two team members, who may be more confident using computer-mediated technology to take over the creative process and dominate the teamwork. This would only stimulate 'cooperative learning', "typically accomplished through the division of labor, with each person responsible for some portion of the problem solving" (Lai, 2001, p. 6). Admittedly, this would limit learning for all team members involved.

A Mind Map Poster Example

The poster in Figure 4 was submitted by the stakeholder group representing 5 Gyres Institute (www.5gyres.org) in response to plastic pollution in *The Plastic Age?* Role Play in September 2016. It represents visually the team's analysis and response to ocean plasticization through their stakeholder lenses (environmental, scientific) and in consideration of other stakeholders in play.

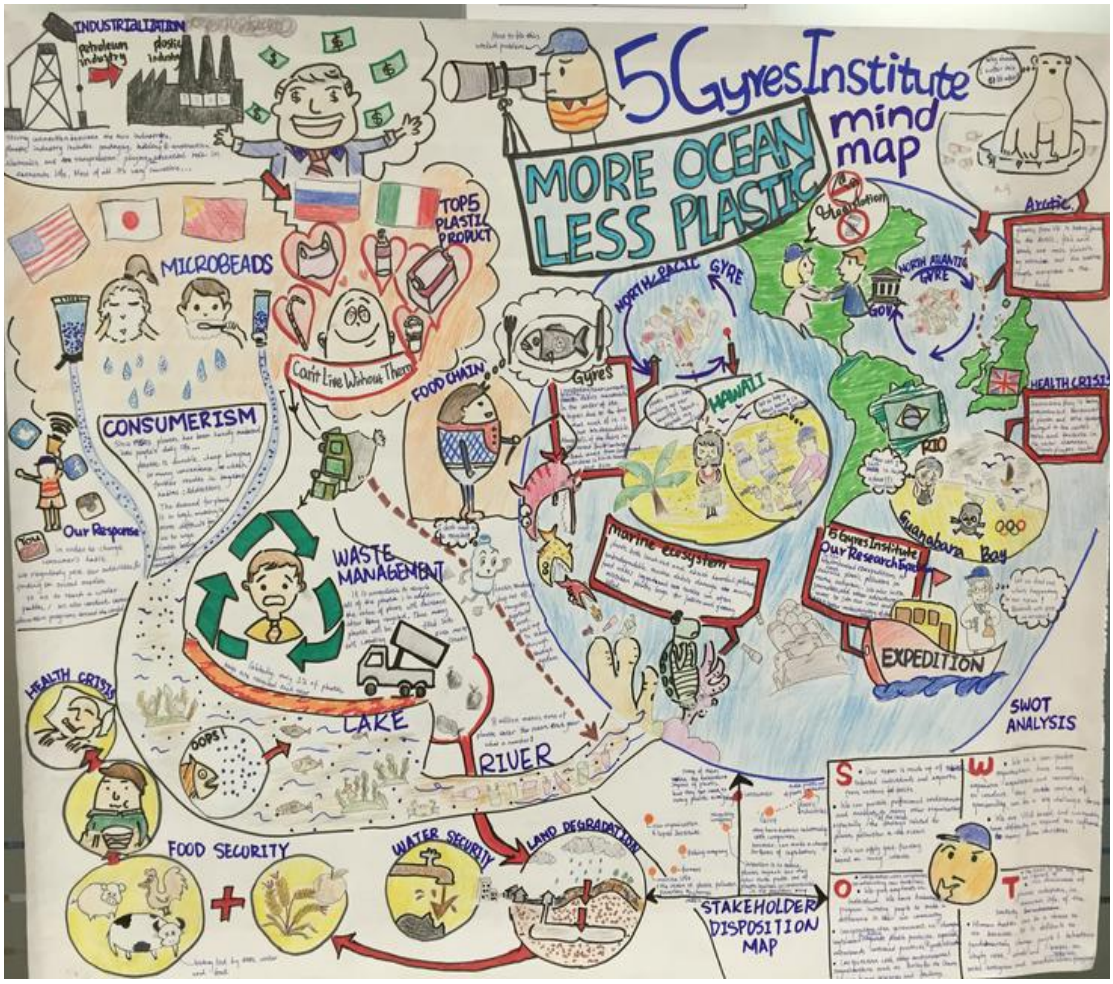

Figure 4: Mind Map Poster illustrating the response of the 5 Gyres Institute Stakeholder to the plastic pollution 'wicked problem' raised in The Plastic Age? Role Play in September 2016. Student permission has been given for using these materials.

After the completion of the mind map poster, stakeholder teams are given the option to write a brief summary of the illustrated message. This allows them to critically reflect on their work and their mastery of visual literacy and derive further confidence in their own learning.

In the words of the *5 Gyres Institute* Stakeholder Team:

> The Mind Map Poster aims to illustrate, from the top left corner: plastic is massively produced (**industrialisation**) and consumed globally (**consumerism**) however, there is a failure to manage it thoroughly during recycling. Plastic waste, which is not biodegradable, is dumped into landfills that pollute the soil. This leads to **land degradation** that contaminates drinking water systems and food production (**water and food security**). In addition, toxic microbeads directly flow into lakes and rivers through the drainage systems. Fish accidentally eat micro-plastics and, thus, toxins penetrate the **food chain** all the way up to humans (**health crisis**). Plastic waste that does not get recycled ends up in the oceans and tends to accumulate in the centre of **ocean gyres** or float to seashores of many islands (**global environmental system**). The toxic plastic damages the **marine ecosystem** casing the **Arctic ecosystem** to become the victim of plastic pollution due to the chain of effects. **Responses** from our organization include: promoting activism through social media, conducting research expedition, corporation with government in legislation and beach clean-up action. (Student permission has been given for using these materials.)

Conclusion

The mind map poster requires, on the one hand effective understanding, evaluation and creation of visual symbols to encode complex messages; and, on the other hand, the ability to decode nuanced visual messages. In this way, the poster teaches a variety of skills ranging from visual literacy to critical and creative thinking, team collaboration, and not least, communication skills. The decoding of visual messages can be very effective to also enhance verbal learning since, according to Sinatra (1986), visual symbols are nonverbal representations that precede verbal symbols. This allows learners to interpret and transform their own and others' thinking.

Therefore, the preparation of the mind map poster is a turning point in the role-play learning process for most learners especially because of the restriction on the use of electronically mediated technology. This is the stage when team members are compelled to physically come together to discuss, question, analyse, synthesize information and distil their understanding. It is during these interactions that learning is crystallised. The fact that learners are compelled to express their learning in a visual form away from the filter and support of computer software genuinely pushes them out of their comfort zone in a way that stimulates their critical and creative thinking. The role-play procedural framework ensures versatile support through the provision of guiding content references as well as a variety of analytical tools and complex visual literacy skills, as well as empowering the learners to construct their own learning journey. While electronically mediated technologies are prohibited for production of mind map poster, these are extensively employed as a scaffold for the preparation of this task. Hence, the success of this learning experience is thoroughly dependent on the fine-tuned blend of the electronically mediated technology with stripped-down original expression.

Limitations

Some of the limitations of this educational approach are related to the learners' abilities to express their ideas visually in the absence of advanced technological support. Those who are not confident with their drawing skills may find the task extremely demanding especially at the early stages of preparing the poster due to insufficient familiarity with the assessment criteria. This can create a sense of frustration in some teams and even demotivate some learners at the start of the task. Some learners need more time to adapt than others but ultimately all participate actively and appreciate the challenge as an enriching learning experience. Not only learners but also educators need to adjust to this teaching/learning approach (Dougherty, 2013). They need to allocate more time to clarifying the learning goals and, most importantly, reassuring learners that the mastery of drawing skills and sketching is not key to the success of the mind map poster but the relevance and complexity of the visual message conveyed.

To overcome these challenges, educators introduce the learning goals at the beginning stages of the task and explain each component providing some examples of previous posters especially the ones that are more aesthetically pleasing and demonstrate above-average drawing skills but do not entirely meet the assessment criteria in terms of the insight and complexity of the message delivered. This is especially important at the stage when team members produce their mind map posters. This not only alleviates learners' frustration learners but also assists in directing their attention to the learning goals and reduces any chance of diverging from the focus of the task.

Learner Testimonials

The following testimonials extracted from the 2016 *The Plastic Age?* Role-play participants' debriefing reports reinforce from the learners' perspective some of the learning design achievements illustrated above. Student permission has been given for using these materials.

> The Role Play has been the most exciting and unique assessment that somehow doesn't feel like an assessment. It engaged a large group of students sharing information and communicating with each other on the Internet and face to face - just like in the real world. I have never experienced this before. (A role-play participant representing the 5 Gyres Institute – www.5gyres.org)

> One of the most notable experiences I've had during the Role Play was designing the mind map poster. Trying to visually represent concepts made me look at them in a different way. Without words, every other element such as shape, colour and size couldn't be overlooked. I had to think of ways to use them to get the maximum effect. I had to think about what MBA Polymer would put on the paper, what they would want the eyes of the viewer to focus on and what impression they wanted to give about the issue and their company's role. It was challenging to try and both give an honest picture of the issue and keep in mind what parts of that image MBA Polymer liked people to see. It was significant for me because it made me think a lot about the balance between the honest truth and the truth someone with bias wants to show others. It taught me to recognize bias. (A role-play participant representing MBA Polymer – www.mbapolymers.com)

> The most frustrating stage for us has been creating the Mind Map Poster. We abandoned many drafts before finalizing the most satisfying one. It almost seemed

> impossible to achieve a quality mind map poster at first. Accepting the challenge, we reviewed the video of introductory scenario as well as the comments our team made in Vialogues several times and summarized the forces and impacts of plastic pollution in order to capture the main information for our mind map. This proved to be very effective later. In addition, we've learnt that combining the components of issues with visual literacy involved decision on images, positions, sizes and colours to illustrate an integrated and logical mind map. We were very surprised at our creativity when we finished the task. Moreover, we found that the mind map poster was such a direct, powerful and interesting tool to reveal the complexity of the wicked problem. (The 5 Gyres Institute Team – the authors of the Poster analysed in this paper)

Acknowledgement

According to the Research Ethics and Compliance Support at the University of New South Wales (UNSW), our paper refers to our students' work to exemplify our pedagogical practice and illustrate the educational principles underpinning our teaching strategies; as such, it does not need to get ethics clearance. The privacy of our students is respected and the information provided in our study is anonymous.

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Social Network Misuse in the Classroom and Its Impact on Male Student Motivation in UAE Tertiary Education

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Abstract

This paper presents data obtained from focus groups conducted to investigate male students' experiences in higher education in the United Arab Emirates. Among the issues discussed by students was the impact of social networks addiction on student motivation and this paper focuses on that issue. Thirteen focus groups were conducted with 83 English as a Foreign Language male students at four government campuses including United Arab Emirates University at Al Ain Campus, Higher College of Technology at Ras Al-Khaima Campus, and two campuses (Abu Dhabi and Dubai) of Zayed University. Students access social network sites for both educational and non-educational aspects. Students spoke about their experiences and how social network addiction influenced their academic motivation to study. The resulting themes from the focus groups show that social network addiction has had an impact on student class performance and in some cases led to class failure. Recommendation for better class management and intervention programs are suggested to policy makers and instructors to foster a better student learning experience.

Keywords: Mobile Learning; social networks; focus groups; motivation; self-efficacy.

Introduction

The United Arab Emirates (UAE) is the Middle East hub for quality higher education. There are 103,431 students enrolled in 75 higher education, public and international private universities and colleges (College Accreditation Association [CAA] 2011 Annual Report, 2011). In a region known for high unemployment because of the "low productivity of education" (Isfahani, 2010, p. 2), the UAE has taken the lead in educational policy change. In its 2021 vision initiative, the UAE government promises first rate education built around innovation, research, science and technology, with a special concentration on students' achievement and attainment (UAE 2021 Vision, 2011). Although the education curriculum is undergoing a major revision to enter the digital economy era following the country's 2021 vision initiative, public education at the primary and secondary level still follows a traditional face-to-face, teacher-centric education approach (Abu Dhabi Education Council [ADEC], 2009). However, higher-education universities and colleges have been progressively adopting a student-centric approach to learning (Hamdan Bin Mohamed e University [HBMeU], 2011). Building on the high investment in internet availability and infrastructure, the country leads the region in information and communication technology (ICT) connectivity (Robson, 2008). Higher education institutions have taken advantage of this connectivity continuum to offer students "functional, meaningful mobile learning in and outside of the classrooms" (Hargis, Cavanaugh, Kamali, & Soto, 2014, p. 46).

Tablets like the iPad are considered mobile learning tools and have been adopted as a technology that supports learning in educational institutes (Courts & Tucker, 2012). As a result, in 2012, the UAE vice president inaugurated the use of 14,800 iPads in the three UAE federal universities (Wekalat Anbaa eMarat [WAM], 2012) as a mobile learning device to pave the way for active learning and student-centric education (Hargis et al., 2014). The initiative, from planning to deployment, was executed within 8 months. Students in college English as a Foreign Language (EFL) programs started using unrestricted-access iPads for their learning of English, Math, Arabic and Information Technology (IT) classes as a replacement for textbooks in the second semester of 2012 (WAM, 2012). The aim was that iPads would motivate and engage students to acquire digital-economy skills of analytical thinking, adaptability and information technology.

Methodology

This study was constructed following a qualitative descriptive method design to acquire first-hand knowledge and gain a better understanding of what social issues affect student motivation in UAE tertiary education. It was essential that the research design followed a baseline design process. The flow of design took into account Onwuegbuzie and Collins' (2007) guidelines for a sound research design technique, where research goal, objectives, purpose and research questions guided the selection of the research design. In other words, the methodology and method chosen, analysis technique and discussion presentations were carefully constructed to answer the research question. Focus groups "produce data that are seldom produced through individual interviewing and observation and that result in especially powerful interpretive insights" (Kamberelies & Dimitriadis, 2008, p. 397). Therefore, in this study, focus groups were used instead of observation or individual interviews because the technique was better suited to answer the research question (Connaway & Powell, 2010; Liamputtong, 2013).

The focus group protocol was carefully designed to extract the maximum information from students. The research opted for a technique that is a blend between specific and general inquiry

about the topic at hand. The generality here was intentionally being controlled by the topic introduced by the researcher, to let students freely determine, by themselves, the factors that they deemed important to their motivation. Data was collected using focus group sessions as per the following considerations of location, sample, language, and analysis method.

Location

The study included the three UAE public (government) higher education institutes of the UAE University, Zayed University (ZU) and Higher Colleges of Technology (HCT). The research was conducted within large UAE public universities that adopt blended learning within their curriculum. The participants were divided into three groups based on their English level standings: lower, medium, and higher levels of English. Also, to cover the three universities and the diversity of the locations in the UAE, four locations or campuses were chosen to represent the different geographical regions in the UAE. The socioeconomics in Fujairah, Ajman, Um Al Qaiwain (UAQ) and Ras Al Khaima (RAK) are similar and students from these regions have been shown to have similar behavior patterns and attitudes to school (Ridge, Farah, & Shami, 2013). Dubai and Abu Dhabi (AD) have different socioeconomics, because more of the country's wealth is concentrated within these two cities. The focus group session breakdown and designation is listed in Table 1 below.

Table 1: Focus group designation.

College	Campus Code	Student English Level	Focus Group (FG) session
HCT	Campus 1	Low	FG3
		Medium	FG1
		High	FG2
UAEU	Campus 2	Low	FG5
		Medium	FG4
		High	FG6
ZU AD	Campus 3	Low	FG9
		Medium	FG7
		High	FG8
ZU Dubai	Campus 4	Low	FG11
		Medium	FG12
		High	FG10
		High	FG13

Source: Developed for this research.

Sample

Three to six focus groups were deemed suitable, as a minimum, with each having 6–10 participants (Krueger, 1994; Onwuegbuzie & Collins, 2007). The goal was to select group size so that the outcome information reached the saturation point where no new information could be obtained, while keeping the groups small enough for deep understanding (Johnson & Christensen, 2012). Initially the researcher planned to conduct 9 focus groups, 3 for each

campus. However, after ZU administration suggested an extra campus and groups, the researcher added 4 more groups and the final count of the focus groups conducted for the research was thirteen with a total of 83 male students.

Language

Since all students are Arabs, all questions were translated to Arabic language and then the answers were translated back to English through an authorized local legal service translator. This ensured that participants were able to express their opinion without the difficulty of looking for the right expression in a second language that they might not know very well.

Data Analysis

Analysis began with coding the factors for each of the thirteen focus groups on its own using the raw transcribed data of each recording. Then, using a long table technique, similar factors and opinions were gathered and tabulated for clarity and coherence. This helped with reducing redundancy during analysis. The long table approach allows data analysis to be "systematic. It breaks the job down into doable chunks. It helps make analysis a visual process" (Krueger & Casey, 2000, p. 137). The full study investigated motivation in the context of a broader set of issues but this paper reports specifically on data related to the iPads.

Results

The results have been divided into two sections: social network (SN) use section, and an SN impact section.

Social Network Use

Most students are members of varieties of SNs. When asked which SNs they frequently access, students acknowledged that the main SN sites accessed in both academic and social settings were: Instagram, BlackBerry Messenger (BBM), Facebook, Twitter, YouTube, Tumblr, WeChat, Keek, Skype, and social games like Subway Surf. Of all SNs, Instagram was the most frequently accessed. When asked what the purpose of accessing SNs in the classroom, students focused on explaining their habits about accessing SN sites during classes. Across the groups, most students discussed the social and academic perspectives of their experiences with SNs. Students used SNs in the classroom for learning, social interactions, entertainment, and academic cheating.

Learning

As mentioned in Table 2, most students agreed that SNs are accessed in class for educational, chatting and cheating purposes.

Table 2: SN use in the classroom: Learning.

SN use : Learning	FG	Student Quotes
	9	*"Sometimes we look up a word on the net, to know the meaning"*
	1	*"others try to find a translation to a word, so it has a positive negative impact in class"*
	3	*"There are programs that facilitate us writing and sending to our teacher"*

Source: Developed for this research.

Social

Across the focus groups, students gave examples of what social activities they engage in on SNs. Some students use SNs to communicate with their families and others use it to chat with both male and female friends as listed in Table 3.

Table 3: SN use in the classroom: Social.

SN use : Social	FG	Student Quotes
	5	*" WhatsApp , I use it always to chat with my family"*
	8	*"Mostly chat with girls"*

Source: Developed for this research.

Entertainment

Many students confessed that they access SN for leisure activities such as games, movies and picture browsing. Students acknowledge that such activities form a distraction to their focus in the classroom. Table 4 lists some student quotes on the leisure use of SNs in the classroom.

Table 4: SN use in the classroom: Entertainment.

SN use : Entertainment	FG	Student Quotes
	5	*"Teacher sometimes explains, and students are busy with SNs on their iPads, Instagram, and twitter. Some students, in the same class, they send each other pictures on Instagram while teacher is explaining the lesson"*
	2	*"When the teacher is busy writing on the board, most of the students open Instagram, twitter, and the like."*
	7	*"**What about SN in class?"** "mostly games; some check Instagram"*
	1	*"some students play while teacher explain,"*

Source: Developed for this research.

Academic Cheating

Some students talked about the use of SN in academic misconduct during exams. Students acknowledged that SN cheating is a trend at their colleges and is on the rise. Table 5 lists some intriguing details of students' quotes on the issue of SN cheating in the classroom.

Table 5: SN use in the classroom: Academic cheating.

	FG	Student Quotes
SN use :Academic Cheating	4	*"Using Instagram, some students would take pictures and post it to help others…", "**to help others understand or cheat**?", "both ways,"*
	6	*"There was an exam using iPad, so all students were social-networking the solution. All got full marks. It was social networking cheating."*
	6	*"Students cheat using all sorts of social networks. I don't deny it**,** I cheat. I even taught others how to cheat using iPhone. Instead of studying vocabulary of 10 pages or 360 words, I take a picture of the pages on the iPhone, in the exam; I keep a phone on the table so the teacher thinks I don't use a phone. But the other phone which has the picture is in my lap, I open it and cheat. And solve. The teacher did not see me. I got full marks" **"Is this a trend?",** "Yes; it is a social trend that will not stop."*

Source: Developed for this research.

Reasons for Improper SN Use

Most students think that SNs are accessed in class for various reasons such as boredom, defying sleep, annoying the teacher or addiction. Some bored students quotes include a student saying "We use it a lot because we get bored in class"(FG8), while another claimed that "Sometimes, frankly, I get bored in class, I watch English movies on You Tube during class" (FG11). Yet another student offered this explanation "I don't use in class, but if the teacher does not teach, I pull my phone and start BBM chatting" (FG2).

Social Network Impact

The views of students on SN impact include both positive and negative reviews. Both are discussed hereafter.

Positive SN Impact

On a positive note, many students expressed their opinion that the positive impact of social networks included learning new words, accessing news and entertainment such as jokes and funny videos. Further, positive outcomes included gaining academic knowledge and communicating with family members. In FG 9, many students think social networks have positive effect on learning correct spelling of words in English and minimum negative impact because their phones are taken away when they enter the classroom. For example, one student

noted that using SN in the class is "positive in the sense you can learn from it, check spellings and stuff" (FG9).

Negative SN Impact

On the other hand, there were both social and academic implications of using social networks, according to students. Negative SN impact includes SN addiction, social isolation; lower motivation, improper time organization, lower motivation to learn, and weak academic outcomes.

Social Network Addiction

In some cases, students explained they are hooked on SNs to the point of addiction. Most students think that this form of addiction is on the rise and forms a trend as they encounter it every day in the classroom and beyond. Some even use it while driving, as one student confessed: "For me it [SN] is negative…all the times, even when I am driving sometimes, I play with my Blackberry" (FG2). In one instance, a student in FG 5 shared his social-network addiction experience in which he reached a point where his focus and attention outside and inside the classroom was solely on social networks. At the end, he deleted all the social network sites. Table 6 lists some of the students' quotes on SN addiction.

Table 6: SN addiction quotes.

FG	Student Quotes on SN Addiction
1	*"Chatting about news, some people like to read on twitter, we made Instagram (account), we cannot. 24 hours we have to look, check, or on twitter, what is new news, or talking to another person"*
8	*"Even in class, they open SNs and chat. Tumblr, twitter"*
5	*"Sometimes I stay late, chatting and Youtubing from video to video and time is gone, all night. From football to cars".*
8	▪ *"I have friends online, we chat, then I waste my time"*
3	▪ *"And negative…you care about it more than studying"*

Source: Developed for this research.

Some students keep checking their SN for updates all the time; others chat or watch videos all night. In some cases, students acknowledged that they cared about SN more than they cared about studying. However, in Campus 4, most students acknowledged that SNs are not accessed that much in the classroom. The reason behind that is mainly the teacher strictness.

Social Isolation

Some students, as a result of addiction to SN, become isolated from their society. When talking about SN addiction, a student described the symptoms of this isolation on his friend: "They stay home, isolated, just at home. Or when they go out with us, they are mentally not with us, only their body" (FG8).

Lower Motivation

Students with SN indulgence issues reportedly had lower motivation to learn. Table 7 lists some students' quotes on SN impact on their motivation.

Table 7: SN motivation issues.

	FG	Student Quotes
SN Motivation issues	1	*"From my point of view I see that social networks have a negative impact on students; student's motivation to learn. Especially if he was studying, he has an exam, If he was addicted on social networks, anything like WhatsApp or similar, every little while he will go and check it,"*
	13	*"I waste a lot of time, I am distracted, I enter another world. I think it is demotivating, I do not know what the teacher said in the class."*

Source: Developed for this research.

Improper Time Organization

Many students noted that because of their constant engagement on SN, they were left with little time to study. As a result, assignments were either late or not done at all, and students were unprepared for their quizzes and exams. Sample of students quotes on time organization issues are listed in Table 8.

Table 8: SN time organization issues.

	FG	Student Quotes
SN Time Organization Issues	**13**	*"I watch you Tube... it distract me a little"*
	5	*"Yes, my sleeping and studying time. It affects time organization"*
	9	*"we all feel that sometimes we get into it so much that it leaves little time to do assignment or study"*
	8	*"this (social network activity) takes me away from studying"*
	10	*"I, sometimes, forget about time when I am on social networks"*

Source: Developed for this research.

Weak Academic Outcome

In some instances, student academic outcomes were negatively impacted. Some students noted that their grades were low, and sometimes they failed classes because of SN addiction. Ultimately, there were cases that students, as a result of the poor academic outcome, dropped

out of college. Some samples of students' quotes on SN impact on their academic outcomes are listed in Table 9.

Table 9: SN academic outcome issues.

	FG	Student Quotes
SN Academic Outcome issues	1	*"**And what is the impact on your study?**" "I get low grades in the exams, it all depends on one's desire, some use it for chatting, and others to learn"*
	1	*"some students they get distracted, they focus on Instagram and then they fail IELTS and then they say : why I failed ?", you did not focus"*
	1	*"there were 2 students in my class that failed and left college, I see them in the classroom, they did not care, and they failed, and left, they failed for two years, because of their addiction on social networks and not caring"*

Source: Developed for this research.

Discussion

In Table 10 below, SN impact on students is shown. There are both positive and negative outcomes of using social networks as listed in the table.

Table 10: SN use & impact @ UAE colleges.

SN Use & Impact	**Campus**			
	1	**2**	**3**	**4**
use				
Chatting with teacher	✔			
Spelling/ Translation	✔		✔	
Writing apps	✔			
Academic Cheating		✔		
SN Chat in class	✔	✔	✔	✔
Playing SN games in class	✔		✔	✔
Check SN sites in class	✔		✔	✔
Watching YouTube all night		✔		
Watching YouTube in class				✔
Send pictures to peers in class		✔	✔	
Impact				
SN addiction	✔	✔	✔	✔
Care SN more than studying	✔		✔	
Low motivation to learn	✔			✔
Loss of focus in the class	✔	✔	✔	✔
Time organization issues		✔	✔	✔
Social Isolation			✔	
Incomplete assignment	✔		✔	

Low Exam grades	✔		✔	
Low IELTS Score	✔			
Drop out of college	✔			

Source: Developed by the researcher.

Academic use of social networks includes chatting with teachers, spelling checks, word translation and cheating. This has positive and negative impact on students' learning. Many students mentioned that they use social networks for non-academic purposes in class for two main reasons: social network addiction and feeling bored in the classroom. Students' social use of social networks includes browsing Instagram, Tumblr and twitter, chatting and sending pictures to friends and girlfriends using WhatsApp and BBM, watching movies on YouTube, and playing games like Subway Surf. Most students agree that negative use of social networks outweighs its positive use. Students mentioned that the impact of social network use includes loss of focus in class, time organization issues, social isolation in social gatherings, low motivation to learn, social network addiction and less care for studying. Most students thought social networks addiction is a trend at college and is on the rise.

Social network activities distracted students' study schedule and sleep habits which in turn affected their attendance and grades. It also had an impact on their social status as they became more and more socially isolated even when they were with their friends. Academically, negative outcomes of social network access by students were incomplete assignments, low grades, and sometimes failing their classes. As a result some students dropped out of college.

Research on social media utilization by students in and out of the classroom supports the finding of this study (Bain, 2015; Kuss, Griffiths, & Binder, 2013; Stollak, Vandenberg, Burklund, & Weiss, 2011; Tindell & Bohlander, 2012; Wiest & Eltantawy, 2012; Yu, Hsu, Yu, & Hsu, 2012). Wiest and Eltantawy (2012) conducted a survey of 200 students of a UAE private college asking them to rate their use of social networks one year post-Arab spring. The survey revealed that as many as 81% of students have Facebook profiles, and 63% send daily messages through social networks during and after classes (Wiest & Eltantawy, 2012). When asked about the purpose of accessing social networks, only 4.7% of students accessed social networks for educational purposes while the majority used them for news updates, political and health information, and entertainment purposes (Wiest & Eltantawy, 2012). Using data from their online survey of 269 male and female students, Tindell and Bohlander (2012) found that engaging in social network actions had a negative impact on students. As many as 35% of students admitted to texting during classes and suffered from loss of attention and poor grades. In their study on social media access in the classroom, Stollak et al. (2011) administered an online survey on a sample of 430 students at a liberal arts college in the US asking them to rate their usage of social media. Mostly, students used social networks to build social contacts and find jobs. Of the accessed social networks, students spent most time on Facebook which had a negative impact on their grades. In their quantitative study of 577 students, both males and females, at five universities in Taiwan, Yu et al. (2012) focused on the relation between time spent on the social network platform of Facebook and increased internet addiction amongst students.

The study concluded that the more time students spent on Facebook, the more addicted they were as it became a daily habit to access Facebook for both emotional support and amusement. Therefore, students addicted to Facebook became more socially withdrawn than those who were not. On the other hand, a survey-based research conducted by Helou and Rahim (2014) on 30 undergraduate and graduate Malaysian students indicated that although students

acknowledged their addiction to social networks, spending more than 50% of their time on social networks to make friends and chat, their grades and academic outcomes were not affected (Helou & Rahim, 2014). This difference between Yu et al. (2012) and Helou and Rahim (2014) could be attributed to the sample size difference. The latter study used a very small sample of students and different age groups of student with graduate students being more mature in their social networks interaction, while the former study used a large sample size from many universities of similar age students. Although they differ on the impact of social networks, both studies agree that students are addicted to social networks; a result that confirms the finding of the current study. Kuss et al. (2013) conducted a study on use of Twitter and online gaming and internet addiction. The study found out that participants' use of Twitter gives them instantaneous satisfaction while online gaming makes them encounter the internet more often and become addicts. The findings of the study support the notion that internet addiction has become a mental health issue amongst students and that increased usage of social networks may lead to situations where "adolescents who are less conscientious would chosoe using the Internet over other, less pleasurable activities, such as doing their homework, and may therefore be at increased risk of using the Internet excessively" (Kuss et al., 2013, p. 1992).

In this study, it emerged that improper time management and consequent attendance issues are related to student use of social networks outside the classroom for long hours into the night. This association is confirmed by Wolniczak et al. (2013) who studied the relationship between social networks use and sleep disorder. The study used the Pittsburgh sleep quality index to assess sleep quality of college students who use Facebook. The findings of the study revealed that "there is an association between Facebook dependence and poor quality of sleep" (Wolniczak et al., 2013, p. 4) and that over 55% of students suffered sleep disorders because of their addiction to Facebook, which had a negative impact on their academic standing (Wolniczak et al., 2013). Cheating using social networks is a representation of how "e-cheating has also advanced to creative and new levels" (Bain, 2015, p. 3) where, for example, students access the internet to find and copy answers for their tests. The range and complexity of technology-assisted cheating behaviors constantly increases as technology improves and social networks become more pervasive.

Recommendations

There are many recommendation for better SN utilization in college classrooms. Two such recommendations are countering SN cheating and positive use of SN as educational tools. Both are discussed hereafter.

Countering Cheating Using Social Networks and Smart Devices

One way to counter cheating through social networks is to use a three-point remedy summarized by Bain (2015) as awareness, prohibition, and reporting. The approach begins by establishing and implementing an academic integrity policy and ends with awareness campaigns as regards the definition of cheating and sanctions applied to cheaters. This program could be extended to instructors to keep them up to date with the latest technology-based cheating methods used by students. A second step is to block students' ability to access social networks using college-provided iPads or their own smart devices during examinations. This step requires the involvement of the college information technology department to help implement such measures. Reporting is the last step of the remedy to help prevent academic cheating using social networks. Although punishment for academic cheating is commonly implemented, it is the reporting that is loosely applied, where some cheating actions go

unnoticed or some faculty hesitate to report the case and this gives students a message that "cheating is not taken seriously" (Bain, 2015).

Social Networks as Educational Tools

Davis III, Deil-Amen, Rios-Aguilar, and Gonzalez Canche (2012) argue that theories such as student persistence (Astin, 1984; Braxton, Hirschy, & McClendon, 2011; Donovan, 1984; Tinto, 1987), attrition (Bean, 1982; Bean & Metzner, 1985; Braxton et al., 2011; Tinto, 1982, 1987, 1988), engagement (Lamborn, Newmann, & Wehlage, 1992; Skinner & Belmont, 1993) and social and academic integration (Merton, 1968; Shilling, 2012; Terenzini & Pascarella, 1977) are focused on positive achievement and are associated with "engagement, involvement, and connection and belonging with the academic and social realms of the campus" (Davis III et al., 2012, p. 20). These theories can be used as research frameworks to "explore how SMT (social media activity or social networks) may or may not function to support such student engagement and involvement" (Davis III et al., 2012, p. 20) at college.

Furthermore, a national survey of 224 colleges in the US on the current and potential use of social media in academic learning revealed that embedding social media in the learning activities was widely used in college. The survey, described usage of social networks in these colleges as an environment to link class Blackboard spaces to Facebook, post lectures, class discussions, group-assignments, study groups and student recruitment information in academic programs (Davis III et al., 2012). Further, it was seen as a tool of increased communication, better learning communities and as a boost to student engagement and academic outcomes. Junco, Heiberger, and Loken (2011) conducted a semester-long student-engagement experiment on 125 students divided into two groups on the impact of using Twitter in the curriculum. Twitter, a form of social network, was embedded in an experimental group as a platform for academic discussions between students and instructors, and monitoring their engagement and grades in comparison with the control group where Twitter was not utilized. The result showed that use of Twitter increased students' engagement and grades in comparison to those who did not use it. This study provides evidence that social networks such as "Twitter can be used as an educational tool to help engage students and to mobilize faculty into a more active and participatory role" (Junco et al., 2011, p. 119).

Conclusion

Social networks are interwoven in the daily lives of today's student generations. As the study at hand showed, there were positive and negative uses of SN in UAE college classrooms and these uses have implications on student learning experiences in college and their motivation to pursue their academic career or not. Therefore, students' opinions should be taken into account when addressing the shortfalls and issues in using SN in the classrooms. UAE Colleges should adopt SN as an ducational tool to help counter the negative effects of improper use of SN. Future studies should focus on the extent of the SN addiction phenomena in UAE colleges. Also, since this study focused only on male students, future research should include female students in their sampling for data collection. A gender comparison of SN addiction in college might shed some facts on how female students compare to their male counterparts regarding SN adiction.

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Acronyms

AD: Abu Dhabi

ADEC: Abu Dhabi Education Council

BBM: Black Berry Messaging

CAA: College Acreditation Association

EFL: English as a Foreign Language

FG: Focus Groups

HBMeU: Hamdan Bin Mohamed e University

HCT: Higher Colleges of Technology

ICT: Information & Communication Technology

IELTS: International English Language Testing System

IT: Information Technology

RAK: Ras Al Khaima

SN: Social Networks

UAE: United Arab Emirates

UAEU: UAE University

UAQ: Um Al Qaiwain

WAM: Wekalat Anbaa Emarat

ZU AD: Zayed University Abu Dhabi

ZU: Zayed University

Academic Engagement and Technology: Revisiting the Technological, Pedagogical and Content Knowledge Framework (TPACK) in Higher Education (HE): The Academics' Perspectives

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Abstract

Research into the use of innovative information and communications technology (ICT) for academic purposes is growing quickly. Much of the current research explores the opportunities presented by ICT and social media as innovative tools for teaching and enhancing student learning (O'Brien & Glowatz, 2013; Duncan & Barczyk, 2013). This paper suggests that the role of the academic in navigating the use of ICT in their teaching in Higher Education (HE) has been overlooked in discussions. Koehler and Mishra (2009) propose the technological, pedagogic and content knowledge (TPACK) framework to explore the relationship of technology in teaching. O'Brien and Glowatz (2013) investigate the suitability of the TPACK framework in the context of academic engagement in order to investigate its relevance for academics teaching in HE. This paper suggests elements of the teaching dynamic are overlooked and evaluates the use of the TPACK framework in the exploration of technology in higher education by academics. Specifically, the authors address the key question 'How do academics currently make use of technology to teach at higher education?'.

Keywords: TPACK; eLearning; Irish Higher Education; academic engagement.

Introduction

There is an increase in the available academic literature on the use of innovative Information and Communication Technology (ICT), such as Facebook, Xing, Twitter or YouTube in Higher Education (HE). The social network Facebook has over 1.72 billion monthly active users (Statistics Brain, 2017) and was initially created for university students. Though the use of a technology for academic purposes can be viewed by some academics cautiously, other academics perceive that it may allow for the investigation and cooperation of answers and opportunities and solutions to problems during the course of the modules' online strategy (Duncan and Baryzck, 2013). This paper reviews how technology use is perceived by academics and reviews the TPACK framework because of their perceptions. The Technology, Pedagogy and Content Knowledge (TPACK) framework is an heuristic for exploring the elements required for effective teaching with technology. However, the data presented also demonstrate some limitations in the current TPACK framework.

Literature Review

The TPACK Framework

The TPACK framework was introduced as a framework for teachers and researchers to conceptualize the knowledge base to teach effectively with technology (Schulman, 1987). In the research to date, different terms have been used to refer to the instructor; some use the term lecturer and others refer to the teacher. Many of the articles from the United States tend to refer to the 'teacher' (Schulman, 1986; 1987). Incresingly educators are asked to consider how technological pedagogical content knowledge (TPACK) can be applied through design thinking processes (Koh, et al, 2015). Currently, there are few available surveys for understanding teachers' perceptions of implementing constructivist instruction with technology. This is termed as their constructivist-oriented technological pedagogical content knowledge. Therefore, teachers' perceived knowledge gaps in terms of constructivist-oriented technology integration are not well understood (Koh, et al, 2014a). For this paper, which looks at TPACK in the context of the Irish HE sector, the term 'lecturer' or 'educator' is more commonplace. The term 'lecturer' will be used ubiquitously through this paper to capture the terms ~~of~~ teacher, academic, educator and instructor.

Koehler and Mishra (2009) outline that traditional teaching technologies, e.g., a tool as simple as a pencil, tend to have characteristics such as specificity, stability, and transparency of function. By contrast, digital technologies tend to be usable in many different ways and are unstable and opaque, i.e., the mechanics of the technology are not visible to users. Koehler, et al (2017) have used the TPACK framework to review educational technology, including most recently digital teaching portfolios. Thus, because of the characteristics of digital technologies, they present challenges from a teaching perspective. For example, in the case of Facebook, some of the challenges might include the perception of Facebook as a social tool, the reluctance of institutions to use it for academic purposes or the digital privacy issues of using a social tool for academic purposes.

The TPACK framework outlines a complex interaction between three areas of knowledge: content, pedagogy and technology which produces the category of flexible knowledge required to integrate technology into teaching. Only the interplay between these three domains can generate the type of flexible knowledge which is needed to successfully incorporate technology into teaching. Contextual factors are acknowledged to influence the practice of teachers.

TPACK does acknowledge this dynamic. However, the influence of the contextual variables on on a teacher's conceptions of TPACK remains unexplored and this gap is acknowledged by others explored the heuristic (Koh, et al, 2014b). Case studies and explorations of TPACK tend to characterise its seven constructs. The manner in which lecturers' TPACK conceptions are affected by by the contextual factors, suh as their beliefs about ICT or access to ICT are generally very briefly referred to and rarely analysed by studies (Koh et al., 2014b).

Koehler and Mishra (2009) acknowledge that teaching is a complex phenomenon and often a lecturer has to practice their craft in a very dynamic environment which requires them to constantly develop their own understanding. A newer technology may be obscure and unstable itself. It may present new challenges to those who attempt to use technology more in their teaching. An example in the context of this study could be the use of the social networking site (SNS) Facebook and the areas of ethics and privacy, which it requires. In addition to the complexities of the technology, context and social factors may also affect the use of technology, e.g., the educational institutions themselves may not be supportive of an individual's efforts to use technology. Thus, the task of integrating technology into teaching can be both complex and difficult. Mishra and Koehler (2009) highlight while that there is no one best way to incorporate the use of technology into the learning environment; three central components are central to its success; content, pedagogy and technology. They suggest that the interaction between these three areas account for the diversity experienced in the quality and scope of technology integrated into teaching. Building on Shulman's work (1986; 1987) the TPACK framework may capture how a lecturer's knowledge of educational technology and how the domains of content and pedagogy knowledge interact with technology knowledge. As important as these three components are, so too, are the relationships between these three bodies of knowledge which are PCK (pedagogical content knowledge), TCK (technological content knowledge) and TPK (technology pedagogical knowledge) building the core components of the overall TPACK framework (Figure 1).

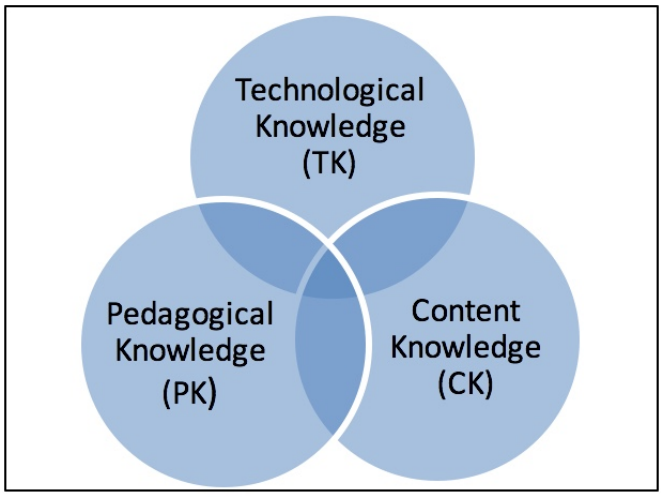

Figure 1: The TPACK Framework and its knowledge components.

TPACK Framework Components

There are seven constituents components of the TPACK Framework and each will be briefly alluded to now. Content knowledge (CK) relates to the lecturer knowledge regarding the material to be taught or learned. A lecturer needs to have in-depth content knowledge of the

concepts, theories, evidence, practices and approaches, which might develop a student's content knowledge of the material. Pedagogical Knowledge (PK) provides insight into the lecturer's knowledge about the methods or practices of teaching and learning, including educational values, rationales and intents. It also includes awareness of how students learn, are assessed, how content knowledge is best communicated. According to Koehler and Mishra (2009) Technology Knowledge (TK) is the most dynamic element of the framework as the definition of a particular technological tool can be outdated by the time it is researched or discussed. TK is never an 'end state' (Koehler & Mishra, 2009, p. 74) regarding how to master a technology but instead it is all the time advancing as the individual interacts with technology.

Pedagogical Content Knowledge (PCK) refers to lecturer's unique knowledge of the subject matter, which they interpret and present to students using their insight into the student's needs, the curriculum, assessment required. It requires the ability to demonstrate the relationships between the different discipline ideas, pedagogic strategies, students'prior knowledge. Technological Content Knowledge (TCK) demonstrates how technology and content knowledge have a close relationship as technology changes are often associated with new understandings of the world. Koehler and Mishra (2009) give the example of how a digital computer advanced understanding of mathematics and physics and led to a fundamental change in the nature of this field.

An appreciation of the impact of technology on practices and knowledge of a particular subject area is fundamental to advancing appropriate technological tools for educational reasons. Lecturers require some appreciation of the specific technological tools which are available and best suited to address the subject-matter learning in their field and how this technology might change the content of their discipline or vice versa. Another example of relevance to this study might be the use of Facebook to demonstrate how social networking might operate in the business environment for marketing purposes. Technological Pedagogical Knowledge demonstrates how an understanding of learning and teaching can alter when a specific technology is utilized in a certain fashion, including knowledge of how the quality of the teaching object or environment relates to the module and the ability to develop suit pedagogical strategies and designs to develop student learning.

Finally, Technology, Pedagogy and Content Knowledge (TPACK) is an emergent form of knowledge, which pervades beyond all three key constituents (Koehler & Mishra, 2009). TPAC knowledge emerges from the dynamic between pedagogy, technology and content knowledge and yet, it is an unique type of knowledge, which is the basis of effective teaching with technology. Such teaching demands an appreciation of the representation of concepts using technology. It requires pedagogic tools which utilise technology to teach content; and knowledge which present concepts to students as tangible. Teaching with technology requires the knowledge of how technologies develops new ways of understanding. Koehler and Mishra (2009) acknowledge that there is no single correct amalgamation of how these elements should be utilised. The lecturer is best placed to respond to the demands of the three elements in accordance with the learning environment and students. Thus, they require the skills to adapt and respond to the fields of technology, content and pedagogy (T, C and P) and the areas of interplay between them (PCK, TPK, TCK and TPACK).

Implications of TPACK

The TPACK framework is one which lends itself to the investigation of the knowledge basis of a lecturer in utilising a SNS for teaching purposes. It acknowledges a number of the key

variables and allows for the flexible combination of them depending on the dynamic of the learning environment. An inherent strength of the framework is its ability to review technology not simply as an add-on but to focus on the connections between the three domains of content, technology and pedagogy in the learning environment (2009). While the framework helps conceptually with the knowledge base required by lecturers, it does appear to misrepresent the human interaction required in this knowledge transfer. There might be three elements to this misrepresentation; first the lecturer's accumulated knowledge of their practice of teaching which they bring to the learning experience: second the centrality of the learner and understanding in the experience of being taught with technology: third the lecturer's proficiency with the technology is central to the use of using technology to enhance the quality of the education experience. Each of these elements is briefly discussed from a theoretical perspective before the results of this study are reviewed.

First, in a review of the TPACK framework, Voogt, Fisser, Pareja Roblin, Tondeur, and van Braak (2013) completed a systematic literature review of 55 peer-reviewed journal articles and one book chapter which were published between 2005 and 2011 to explore the theoretical and practical uses of TPACK. They note the value of the TPACK framework is that technology is acknowledged to support students in learning the conceptual and procedural aspects of a particular subject domain. Voogt et al. (2013) suggests that it is important to understand how technological reasoning affects the lecturer's decisions when using technology. Equally, they suggest that lecturers need to be shown what benefit technology is for their subject for improving the teaching and learning environment.

Second, the current framework does not sufficiently account for the lecturer knowledge of student's cultural backgrounds, their knowledge of student profiles and demographics of different student cohorts, insight into the students' familiarity with the technology to be utilised, or the cultural variances, which may exist within a cohort in utilising technology in the teaching environment. Such a dimension extends beyond the idea of pedagogic knowledge or its related areas of pedagogic content knowledge or pedagogic technological knowledge. This critique, perhaps, is indicative of a deeper concern regarding the centrality of the student to the learning process as outlined in the current TPACK framework. The model currently focuses on knowledge and the transfer of knowledge, rather than the learning experience of the student. The research below demonstrates the importance of understanding student profiles, as well as the lecturer's own craft knowledge and technological knowledge, to successfully use technology in the learning experience.

This need for craft knowledge, technological knowledge and technological proficiency raises the third issue with the current TPACK framework. The authors wish to explore the importance of a lecturer's proficiency with technological knowledge as perceived by the students. Some suggest students' expectations of their lecturers and the use of technology in their teaching have changed. Central to this improved and more engaging experience is an expectation for lecturers to have a high level of technological knowledge.

Lecturers and Technology Use

There has been considerable growth in the adoption of ICT within HE. Using ICT can be costly in terms of the financial investment made by institutions for infrastructure, equipment and technical support staff, and in relation to the personal investment made by staff and students in using the technology for teaching and learning. In western universities, institutional learning environments are almost ubiquitous and their use by teachers and students can no longer be

considered a novelty or the domain of enthusiasts alone (Kirkwood & Price, 2013). Indeed some have reported the use of some technology can be a distraction for students (Tossell, et al, 2014; Gikas and Grant, 2013). Higher education institutions are aware of the possible digital disconnect between enthusiastic rhetoric and the actual reality of educational technology in a higher education institution.

Conole (2014) acknowledges that in recent decades educational technology was promoted to have the power to transform higher education. Some suggest the evidence of this transformation is limited (Kirkwood and Price, 2013). While there is much research into how lecturers might use the technology, their conceptions of approaches is rather absent. Englund, Olofsson, and Price (2016) illustrate a number of interesting findings in their longitudinal study which demonstrated that novice lecturers changed their conceptions of and approaches to lecturing with technology which related to more student–centered approaches. However, their research found that more established colleagues did not change their approach to teaching with technology. This paper hopes to review their approaches to teaching and learning, as per Kember's (1997) definition; those strategies which lecturers adopt for their teaching practice. The ICT tools used at University College Dublin (UCD) College of Business and their perception of them by academic staff is now explored.

Methodology

As is usual in the business and management disciplines, a survey methodology was selected for this research project. It allowed potentially large-scale data to be collected (Byrman and Bell, 2015). The survey was distributed online to allow for data collection in Ireland, Singapore, Hong Kong and Sri Lanka, including two campuses in Dublin. These are the five campuses of the College of Business. Using the online survey instrument Qualtrics (www.qualtrics.com), the authors designed an online questionnaire as the primary data collection tool for this study. One survey was distributed to academic staff members associated with the UCD College of Business in April 2015. In each case, academics were sent an online survey and had a two-week period to respond anonymously. UCD Code of Research Ethics was adhered to in the execution of the data collection and analysis. 58 lecturers responded out of a sample of 300 resulting in a response rate of just above 19%. Approximately 50 of the 300 adjunct staff are from Hong Kong, Singapore and Sri Lanka. Eight (8) lecturers were from the overseas campuses. To allow for some anonymity, the researchers did not discern between the five campuses but only provided two options: Dublin and overseas. While the sample is small and the results are inconclusive, it does provide important insights into the perception and usage of technology by academics for teaching purposes.

The survey comprised eighteen (18) questions, which were a mix of open-ended, closed-ended and a rating scale (modified Likert scale). A copy of the survey is included in Appendix A. The statistical data was analysed using the tools of the Qualtrics survey software allowing the data to be analysed and cross tabulated where appropriate. Descriptive statistics were used to summarise the survey's quantitative data. Content analysis, using themes arising from the literature, were used for coding the open-ended questions. Seven key themes were identified. They were student expectations, student experience, and impact of technology, perception of knowledge base, student engagement and challenges. Phase two of the project has commenced to allow for some qualitative, semi-structured interviews with participants. The data based on only the survey instrument is admittedly a limitation of the study.

Research Site

UCD College of Business – being the top business school in Ireland – was selected as the research site. Its faculty has the most significant publication record in the country. It is the only Irish business school with triple accreditation – i.e. EQUIS, AMBA and AACSB and is the only Irish business school ranked in the various Financial Times rankings. It spans five campuses in Europe (UCD Main Campus Belfield Dublin and the Michael Smurfit Graduate School of Business Blackrock, Dublin) and Asia (Singapore, Hong Kong and Sri Lanka). It has approximately 100 full-time faculty dedicated to the business discipline, as well as approximately 300 part-time, adjunct faculty. There is a dedicated Business eLearning team which provides four skilled staff members to support the use of technology in teaching and learning (T&L) related initiatives at the College.

Research Results

The findings from the survey analysis are presented here. In order to gain an insight into the profile of the respondents to the survey, participants were asked how long they had been teaching or supporting teaching in the HE sector (Figure 2).

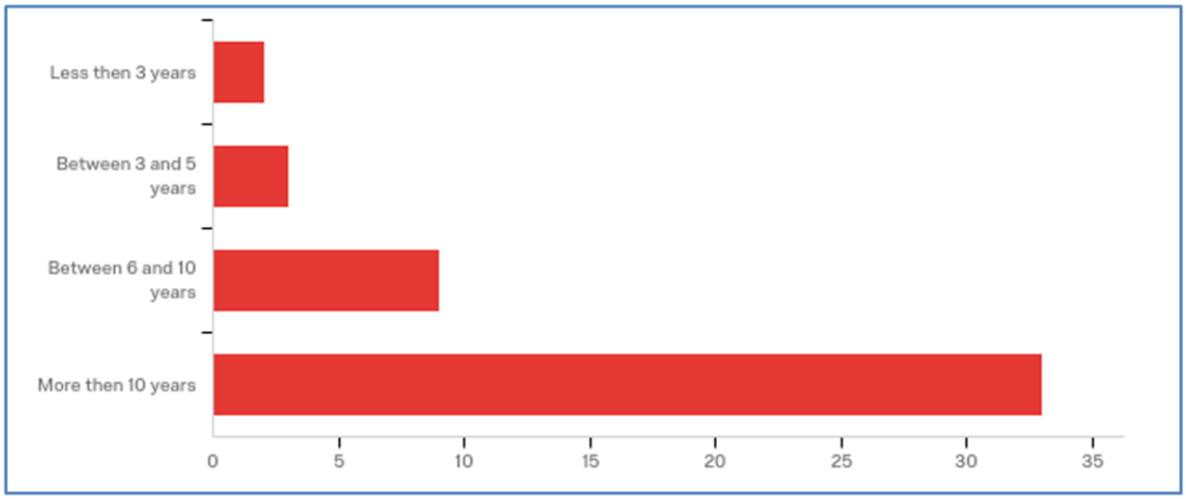

Figure 2: Duration of service of respondents at the time of study.

The profile of candidates was also reviewed in terms of the teaching position. There was representation across all of the five campuses at the College of Business with most respondents being that of College Lecturer (24 respondents), as per Figure 3.

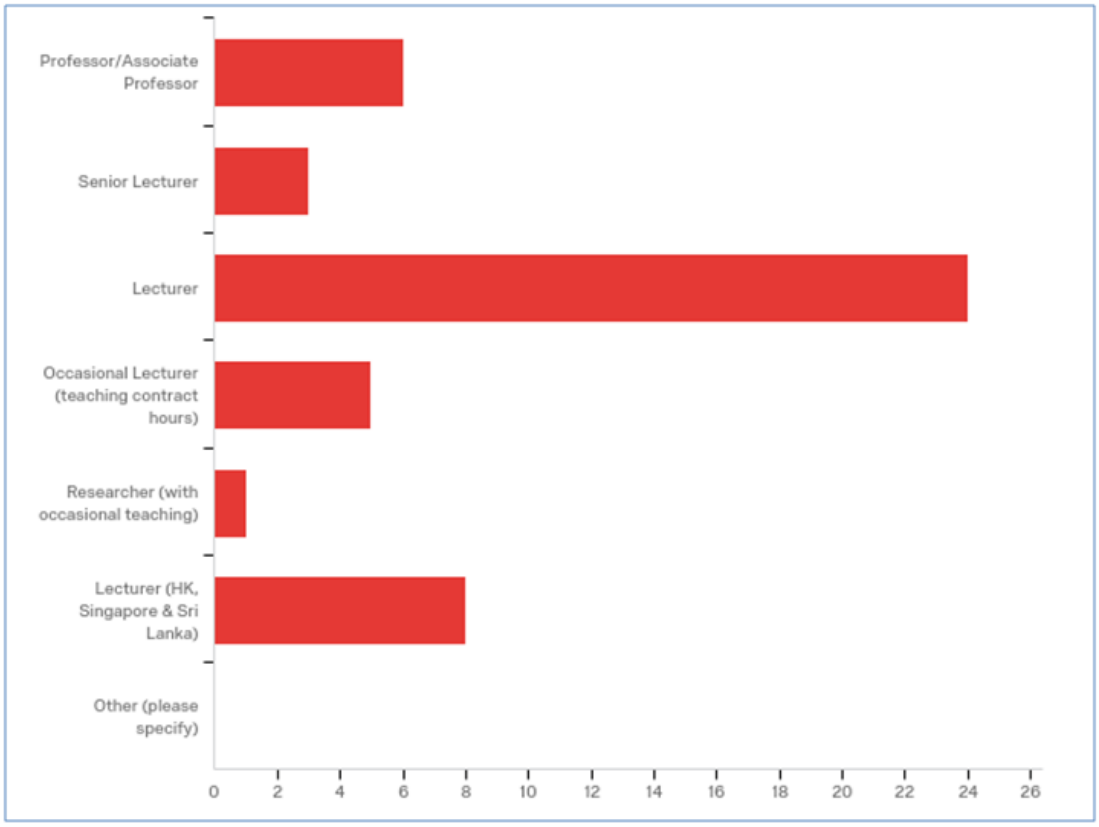

Figure 3: Position in the School of Business.

Staff were asked to respond to the extent of technology usage for teaching related purposes, as reported in Figure 4 below. Email and the Internet were reported by many as daily uses. While the Google suite and Blackboard (UCD's selected virtual learning environment rated highly also, there was a relative narrow number of other applications drawn upon from a listing which included Facebook, Twitter, polling software just to name a few). Interestingly, the 'Moodle' virtual learning environment appeared to have a high level of engagement given it is not the official university designated and supported supported Virtual Learning Environment.

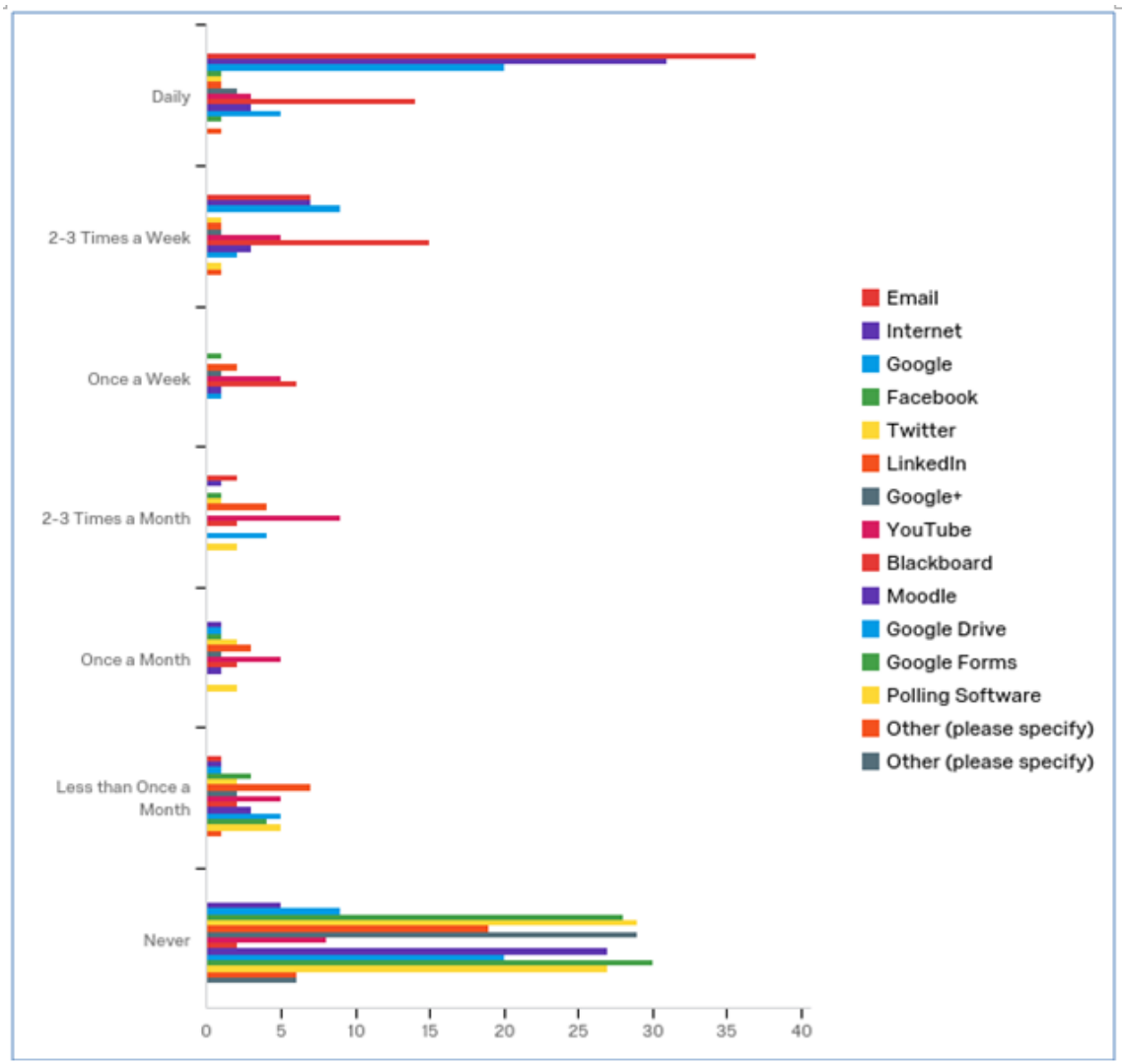

Figure 4: Technology usage for student engagement and teaching purposes.

Figure 5 reviews the reasons why the particular technology was selected by teaching staff. The ability of the lecturer to manage their student engagements appeared to be the most common driving influence 69.57% of lecturing staff were also being led by the intention of improved student interaction and the opportunity to assist students with understanding the module material. The opportunity to expose students to new technology and skills was not something which was highly rated. Equally, lecturers did not appear to respond to students' expectations to make use of social media in their teaching.

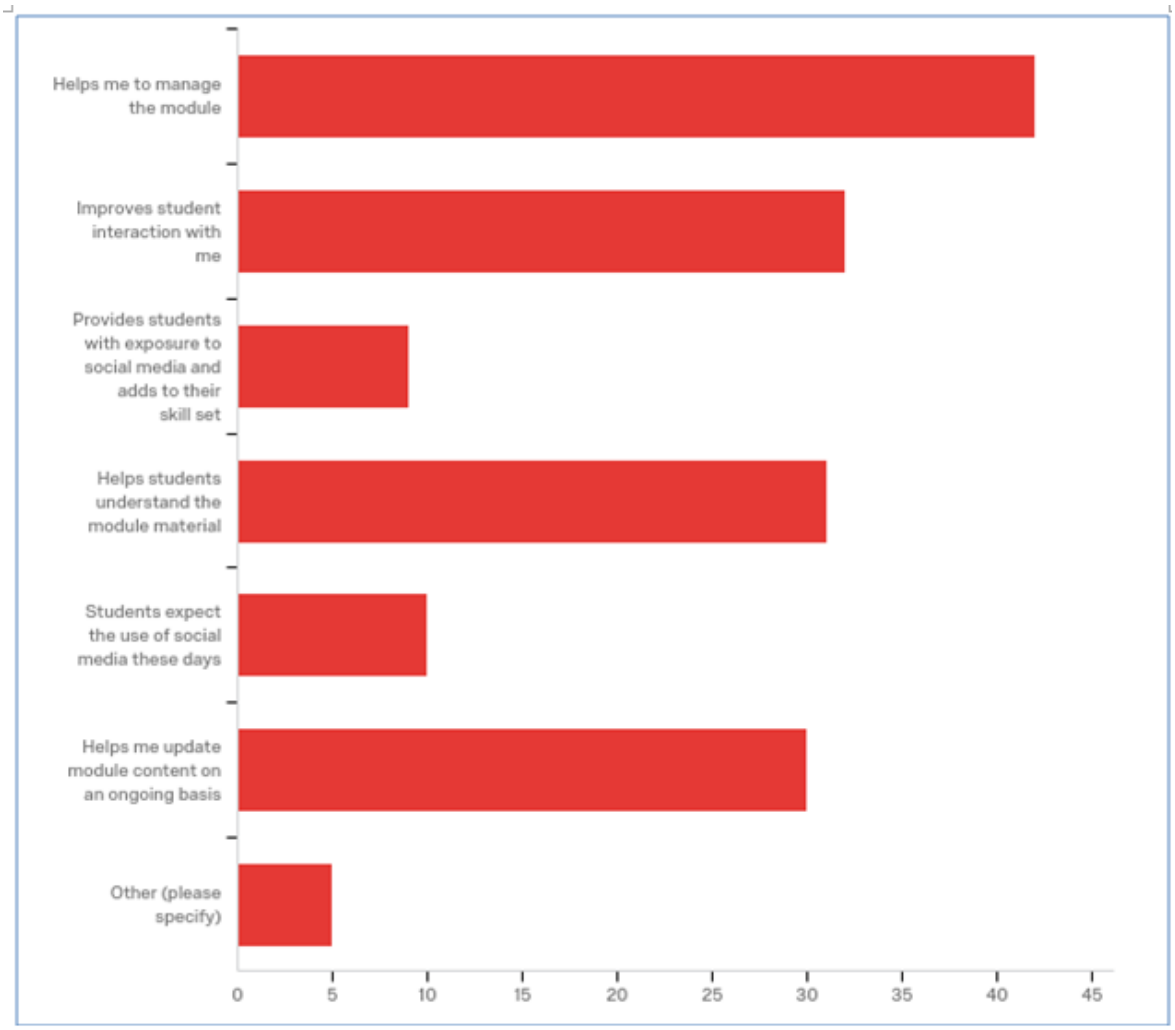

Figure 5: Reasons for selecting particular technologies for teaching purposes (multiple answers possible).

Respondents were asked to outline the features of the technology they using. The responses suggest that engagements are largely around document sharing, rather than more active, higher order learning opportunities to utilise technology. Figure 6 demonstrates some less frequent engagement with wikis, online quizzes and collaboration.

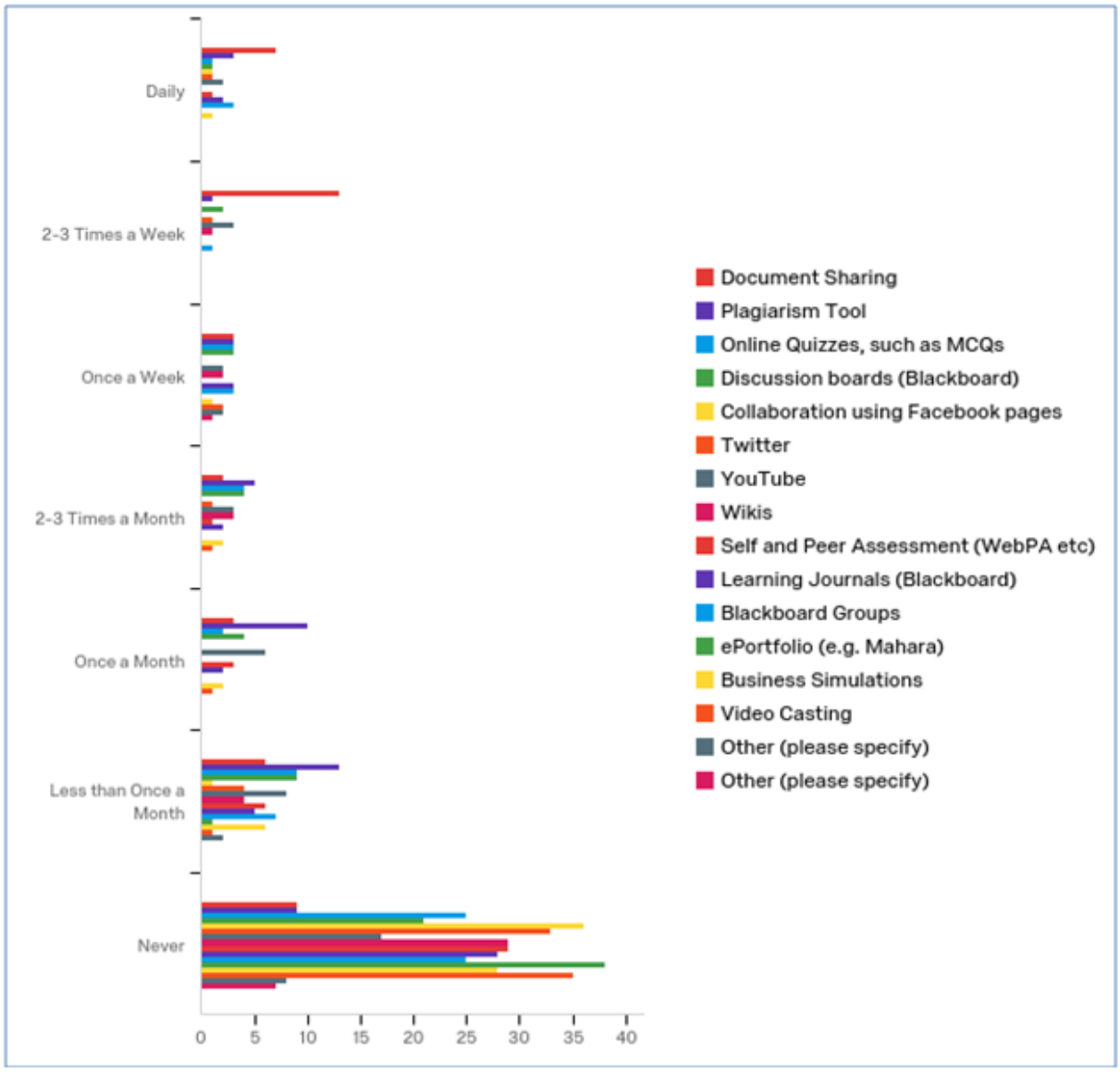

Figure 6: eLearning currently utilized?

Figure 7 provides an insight into how lecturers perceive their own use of technology. In particular, this table indicates that lecturers in this study do not firmly believe in the use of technology to enhance the learning experience. 29% were neutral in the opportunity for students to learn more from the content because of blended learning. Only 15% demonstrate that they perceive technology as something, which reduces their workload.

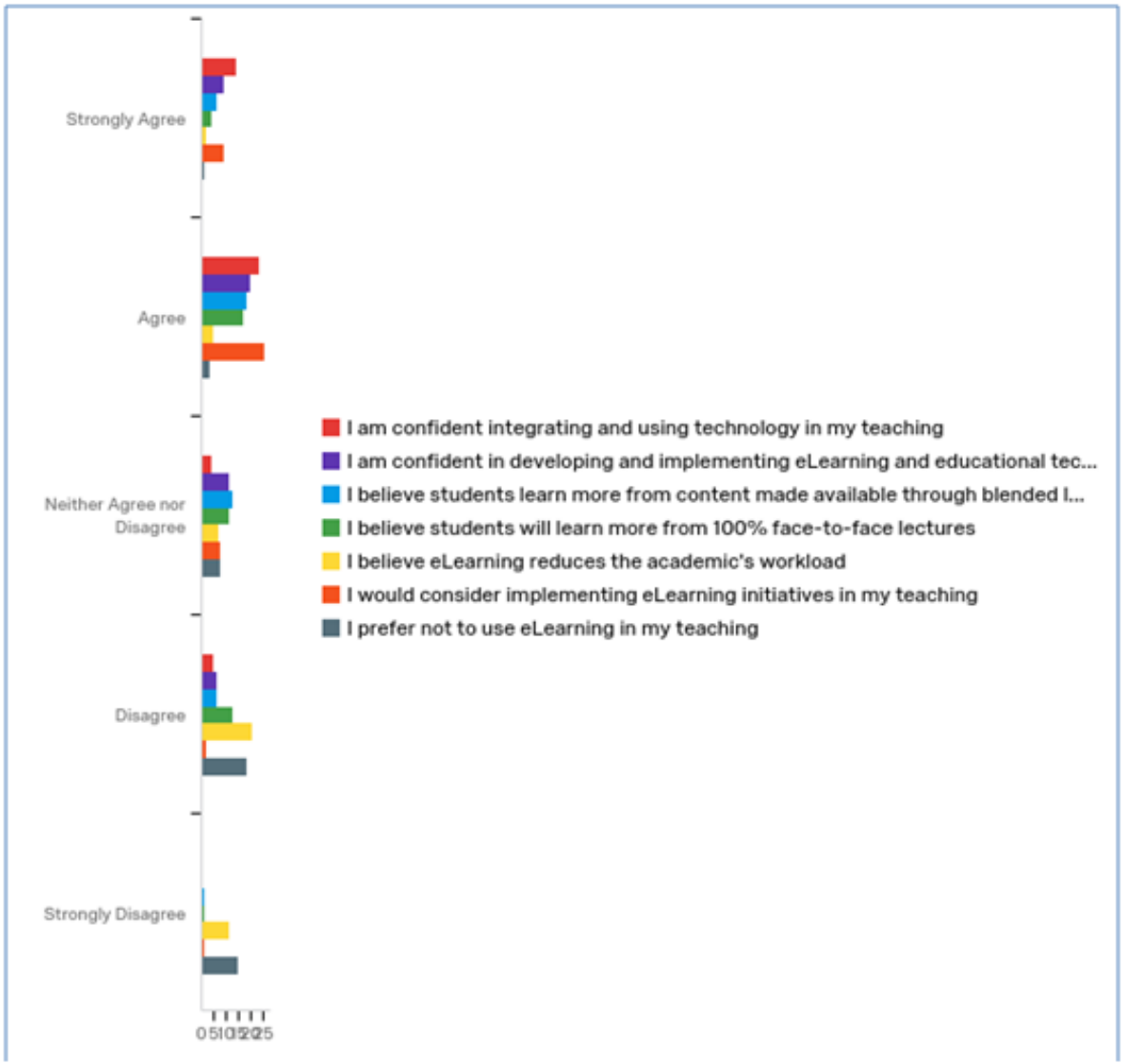

Figure 7: Indicate your opinion on the following statements regarding eLearning and the use of educational technologies in the higher education sector.

The next section of the questionnaire investigates the technology confidence level among lecturers and perceived EdTech implementation challenges and opportunities. The results shown in Table 1 suggest that the surveyed lecturers are indeed confident in integrating and using technology as part of their curriculum design and teaching; however, Figure 8 suggests that lack of time, resources, suitable infrastructure and suitable training and support are the main reasons for not implementing innovative EdTech.

Table 1: Academics' confidence level in integrating EdTech.

#	Question	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total Responses
1	I am confident integrating and using technology in my teaching	14	24	4	5	0	47
2	I am confident in developing and implementing eLearning and educational technologies in my teaching	9	20	11	6	0	46
6	I would consider implementing eLearning initiatives in my teaching	9	26	8	2	1	46
3	I believe students learn more from content made available through blended learning (combination of face-to-face and eLearning)	6	19	13	6	1	45
4	I believe students will learn more from 100% face-to-face lectures	4	17	11	13	1	46
5	I believe eLearning reduces the academic's workload	2	5	7	21	11	46
7	I prefer not to use eLearning in my teaching	1	3	8	19	15	46

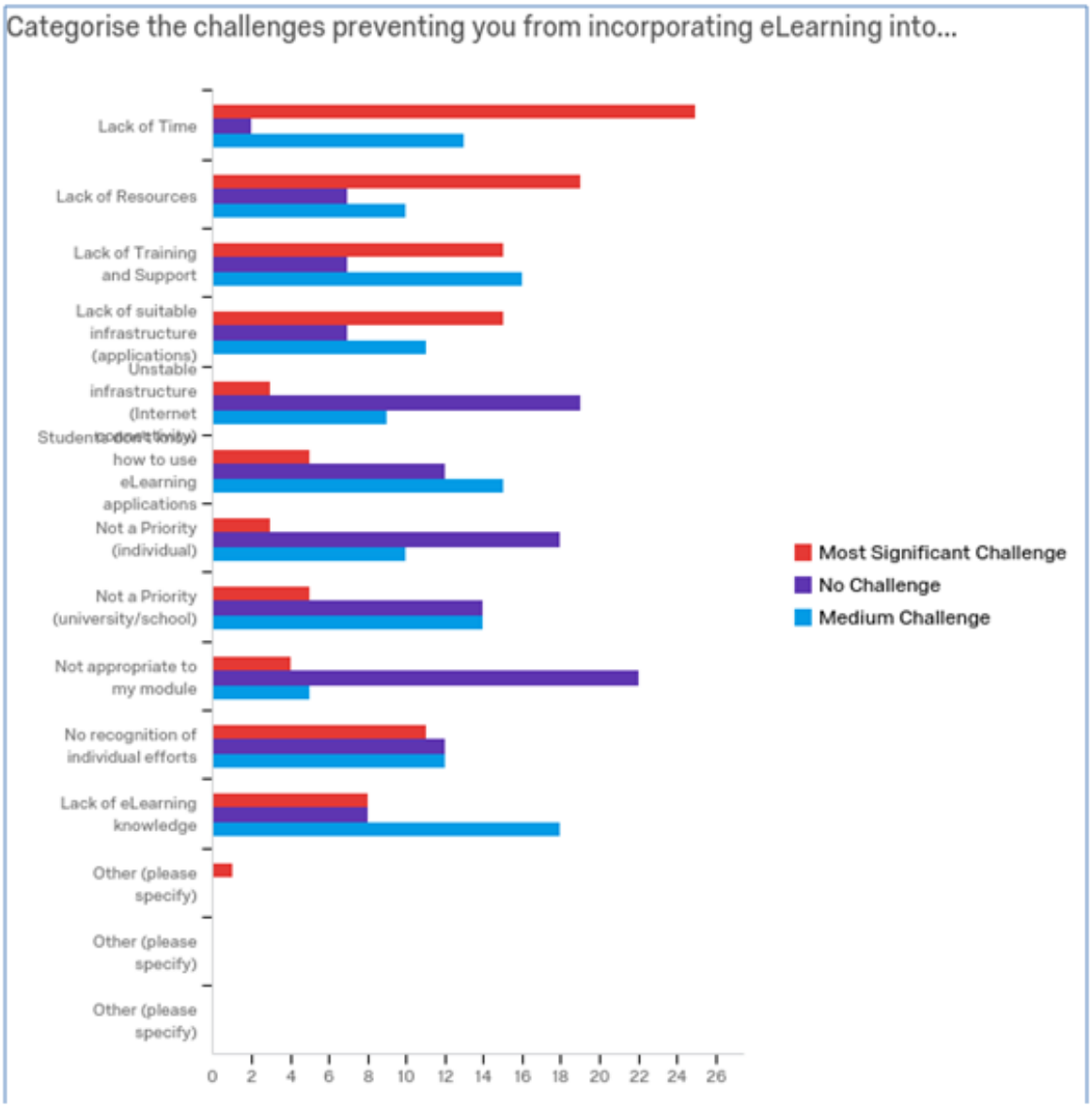

Figure 8: Challenges preventing lecturers from incorporating eLearning into curriculum design.

On the other hand, survey respondents indicated that incorporating EdTech in their teaching would potentially result in enhanced student learning, student engagement and more efficient module content delivery (Table 2).

Table 2: EdTech opportunities.

#	Answer	answer0 ▲	answer1	answer2
2	Enhanced student learning	25	3	11
3	More efficient delivery of module content	19	5	16
4	Enhances student engagement	19	6	14
1	Better lecturer/student collaboration	10	5	20

Finally, academics were asked to indicate their interest in EdTech related areas as outlined in Table 3 below.

Table 3: EdTech interests.

#	Question	Great interest ▲	Some interest	Little or no interest	Total Responses
2	Designing blended learning	22	20	5	47
1	Learning how to implement eLearning strategies	18	25	3	46
7	Customising Blackboard features	17	18	11	46
3	Designing mobile learning	10	15	20	45
6	Designing social learning (YouTube)	7	20	19	46
4	Designing social learning (Facebook)	4	9	33	46
5	Designing social learning (Twitter)	3	11	31	45

The following quote provided an interesting insight into one participant's understanding of role of the lecturer. There is a sense that while they are experts in their discipline, technology creates an additional concern and a set of expertise, which is additional to their role:

> Currently available eLearning tools are of little interest to students. We either have to use the media of 'their' world (FB and the likes) or we may not bother at all. I don't want to use FB out of principles and that's where I hit a wall. Also, online content should be professionally developed. In top schools blogs etc. are written by PR experts. Why should this be on the lecturers to develop such content? Why can't we have a team of web experts who translate my teaching materials into the new media and technologies? I really can't be an expert in everything.

Some of the key findings presented by the survey outlined above include the apparently limited use of technology tools in teaching, the scope of these tools appears to be relatively narrow and there is some evidence of a rather benign belief about the possibilities of technology to improve the student experience of learning.

Discussion

The TPACK framework does indeed provide invaluable insights into the many complexities of the knowledge bases lecturers utilise to successfully design and deliver a module to improve student engagement and maximise student-learning experience in the HE sector. The data presented in the research suggests that academic staff at UCD's College of Business embrace a relatively small number of technological tools for teaching purposes. The utilization of traditional educational technology (EdTech) tools such as email and the college's virtual learning environment, namely Blackboard, were most commonly reported. More innovative tools such as social media or polling software, however, were often overlooked (Table 3 above). Only 10% of staff completing the survey believed that students' have expectations regarding usage of social media tools today. As discussed earlier, this perception is at odds with the research, which demonstrates that the current generation think and learn differently compared to previous generates (Lai & Hong, 2015).

Technological knowledge is a key facet of the TPACK framework and is acknowledged as central to the effective use of technology in the classroom (Koehler & Mishra (2009). The literature acknowledges that technological knowledge is premised on how an individual continues to respond and evolve with the technological tools available in the learning experience. Respondents suggested that there were mixed levels of self-reported proficiency regarding electronic learning (eLearning) tools (Table 6). The mixed proficiency reported is compounded with the suggestion of perceived lack of training and support. It is acknowledged that this is only the experience of those surveyed and indeed the level of technological knowledge may be higher than reported. The concern based on the findings here is that the level of technological knowledge is maintained and sufficiently high to meet the needs for quality provision.

To summarise, the authors identified several key observations:

1) The survey suggests that lecturers embrace a relatively narrow range of technology tools for teaching purposes.
2) Most lecturers responding does not appear to be concerned with student expectations to make more use of technology in their teaching.
3) Survey results suggest limited interest among lecturers to integrate emerging technologies and EdTech initiatives, such as mobile or social learning into their teaching. However, this raises concern as both mobile and social technologies are already playing substantial part in how students today and cohorts of tomorrow study and learn.
4) Technological knowledge is apparently limited based on the participants' respective responses. The response rate is low, so admittedly there might be greater levels of engagement with technology, which are not captured by this survey.
5) TPACK suggests teaching today requires technological knowledge for teaching to be effective today. The lack of technology engagement is then possibly inhibiting opportunities for teaching.
6) This raises a concern that if technological knowledge is not sufficiently high that this may become a bigger issue as the digital divide increases with young incoming students with technology skills very different to that of staff.

Conclusion and Further Research

The research reorted here set out to investigate 'Does the TPACK framework provide an insight into the knowledge base required to effectively deliver a module using technology?' The TPACK framework provides a useful heuristic to explore the classroom environment. Koehler and Mishra's (2009) model outlines some of the technological considerations which affect both students and academic staff. Their model represents three equally valued spheres of Technological Knowledge, Pedagogical Knowledge and Content Knowledge. However, it may overstate the role of technology in the learning environment in higher education. The learning environment is a dynamic and complex phenomenon. The suggestion of this paper is that perhaps the three elements are not as equal in their contribution to the classroom environment, as per the model offered by Mishra and Koehler. Technological Knowledge seems underexploited in this case, but students do still report a generally favorable experience on College evaluations. It is not clear that Technology Knowledge necessarily impacts the quality of teaching however. There is still the scope to demonstrate that craft knowledge of a discipline is not reliant on technology knowledge. However, with the digital divide outlined above, it does appear that perhaps an opportunity is being missed by not utilising eLearning technology further to enhance the student's overall learning experience. The concept of craft knowledge comes to the fore again and warrants further investigation. It is worth investigating that if technological knowledge is not fully utilised, but a lecturer demonstrates superior content knowledge do students still perceive their learning is attained? Is it the craft knowledge, which ultimately counts for students? Does craft knowledge possibly compensate for a lower level of Technological Knowledge? This remains to be seen, as does the possibility that there is a threshold of technology engagement expected by students in higher education today.

For educators, the use of the TPACK framework can help the individual their understanding and awareness of the contextual influences of the TPACK framework. As Koh et al. (2014b) suggests an awareness of the TPACK framework creates an opportunity to convert this awarness into teaching opportunities as they enact the framework. Educators need to be able to draw the conclusion between the discourses which focused on the Culutral/Institituional concerns which may emanate around logistics and then those which are derived from pedagogy. This paper suggests that educators need to be empowered to engage in these discourses about their design considerations.

In summary, while the use of a technology, for academic purposes can be viewed by some lecturers cautiously, other lecturers perceive that it may allow for the investigation and cooperation of answers, opportunities and solutions to problems during the course of the modules online (Duncan & Baryzck, 2013). Evidence based on the survey findings suggest some staff are still cautious regarding the use and potential use of technology. It raises questions for the opportunity for optimising the craft knowledge of lecturers if they are cautious in using technology to teach the Millennial Generation in the years ahead.

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Appendix A (Survey Design and Questions)

1 Introduction

This research project is being conducted by Orna O'Brien (Centre for Distance Learning, UCD School of Business, orna.obrien@ucd.ie) and Matt Glowatz (MIS, UCD School of Business, matt.glowatz@ucd.ie).

What is this research about?

The primary aim of this study is to examine the School of Business' academic staff's understanding, perception and opinions on aspects of the use of educational technologies for electronic learning (eLearning) at the School. The objectives of this study are as follows:
To explore what academic staff define as eLearning
To examine how academic staff use eLearning to enhance their teaching
To identify examples of good practice in terms of implementing eLearning

Why are we conducting this research?

The higher education sector is faced with students that were brought up in a world of digital and social media with the role of the university going from one of a broadcaster to a collaborative facilitator. Academics are at the forefront of electronic learning as they are the experts in providing content to the learning (student). Consequently, the academics' perceptions, attitudes and behaviours related to eLearning may be the single greatest determinant of success (Wickersham & Emelhany, 2010). To date, the majority of research around technology and learning has focused on the students' experience, as opposed to that of the academics (Mishra & Koehler, 2009).

In conclusion, this project is building upon existing research into the use of innovative eLearning technologies in higher education with particular focus on the academic's perspectives.

How will your privacy be protected?

If you take part in the study, the research team will treat your contributions with the utmost confidentiality and in reporting the findings of this study, we will exclude any identifying information.

What are the benefits of taking part in this research project?

The findings of this project will make a valuable contribution to our understanding of academics' perceptions relating to eLearning and the use of educational technologies. The findings from this study will be presented at school level and at national and international conferences. The findings will also be submitted for publication in peer-reviewed journals. However, no individual participant will be identified in any publication or presentation.

What are the risks of taking part in this research project?

There are no known risks associated with participation.

Contact details for further information

If you have any further questions about the research or would like information on the findings, you can contact Orna O'Brien (orna.obrien@ucd.ie) or Matt Glowatz (matt.glowatz@ucd.ie).

Thank you for taking part in this project.

Q2 How many years have you been teaching, or supporting teaching, in the higher education sector?

- ❍ Less than 3 years
- ❍ Between 3 and 5 years
- ❍ Between 6 and 10 years
- ❍ More than 10 years

Q3 How many years have you been teaching, or supporting teaching, in UCD's School of Business?

- ❍ Less than 3 years
- ❍ Between 3 and 5 years
- ❍ Between 6 and 10 years
- ❍ More than 10 years

Q4 Which of the following describes your position in the School of Business?

- ❍ Professor/Associate Professor
- ❍ Senior Lecturer
- ❍ Lecturer
- ❍ Occasional Lecturer (teaching contract hours)
- ❍ Researcher (with occasional teaching)
- ❍ Lecturer (HK, Singapore & Sri Lanka)
- ❍ Other (please specify) _____

Q5 Which of these devices do you use for general purposes?

	Daily	2-3 Times a Week	Once a Week	2-3 Times a Month	Once a Month	Less than Once a Month	Never
Desktop Computer	❍	❍	❍	❍	❍	❍	❍
Laptop	❍	❍	❍	❍	❍	❍	❍
Tablet, such as iPad	❍	❍	❍	❍	❍	❍	❍
Smartphone	❍	❍	❍	❍	❍	❍	❍
eReader	❍	❍	❍	❍	❍	❍	❍
Other (please specify)	❍	❍	❍	❍	❍	❍	❍

Q6 Which of these devices do you use for teaching-related purposes?

	Daily	2-3 Times a Week	Once a Week	2-3 Times a Month	Once a Month	Less than Once a Month	Never
Desktop Computer	❍	❍	❍	❍	❍	❍	❍
Laptop	❍	❍	❍	❍	❍	❍	❍
Tablet, such as iPad	❍	❍	❍	❍	❍	❍	❍
Smartphone	❍	❍	❍	❍	❍	❍	❍
eReader	❍	❍	❍	❍	❍	❍	❍
Other (please specify)	❍	❍	❍	❍	❍	❍	❍

Q7 Which of the following do you use (general usage)?

	Daily	2-3 Times a Week	Once a Week	2-3 Times a Month	Once a Month	Less than Once a Month	Never
Email	❍	❍	❍	❍	❍	❍	❍
Internet	❍	❍	❍	❍	❍	❍	❍
Google	❍	❍	❍	❍	❍	❍	❍
Facebook	❍	❍	❍	❍	❍	❍	❍
Twitter	❍	❍	❍	❍	❍	❍	❍
LinkedIn	❍	❍	❍	❍	❍	❍	❍
Google+	❍	❍	❍	❍	❍	❍	❍
YouTube	❍	❍	❍	❍	❍	❍	❍
Video Conferencing (Skype etc)	❍	❍	❍	❍	❍	❍	❍
Other (please specify)	❍	❍	❍	❍	❍	❍	❍
Other (please specify)	❍	❍	❍	❍	❍	❍	❍

Q8 Which of the following do you use for student interaction and teaching-related purposes?

	Daily	2-3 Times a Week	Once a Week	2-3 Times a Month	Once a Month	Less than Once a Month	Never
Email	❍	❍	❍	❍	❍	❍	❍
Internet	❍	❍	❍	❍	❍	❍	❍
Google	❍	❍	❍	❍	❍	❍	❍
Facebook	❍	❍	❍	❍	❍	❍	❍
Twitter	❍	❍	❍	❍	❍	❍	❍
LinkedIn	❍	❍	❍	❍	❍	❍	❍
Google+	❍	❍	❍	❍	❍	❍	❍
YouTube	❍	❍	❍	❍	❍	❍	❍
Blackboard	❍	❍	❍	❍	❍	❍	❍
Moodle	❍	❍	❍	❍	❍	❍	❍
Google Drive	❍	❍	❍	❍	❍	❍	❍
Google Forms	❍	❍	❍	❍	❍	❍	❍
Polling Software	❍	❍	❍	❍	❍	❍	❍
Other (please specify)	❍	❍	❍	❍	❍	❍	❍
Other (please specify)	❍	❍	❍	❍	❍	❍	❍

Q9 Please select the reasons why you have been utilising educational technologies for teaching purposes (multiple answers possible)

- ❑ Helps me to manage the module
- ❑ Improves student interaction with me
- ❑ Provides students with exposure to social media and adds to their skill set
- ❑ Helps students understand the module material
- ❑ Students expect the use of social media these days
- ❑ Helps me update module content on an ongoing basis
- ❑ Other (please specify) _____

Q10 Indicate which of the following eLearning / learning features (if any) you are currently utilising.

	Daily	2-3 Times a Week	Once a Week	2-3 Times a Month	Once a Month	Less than Once a Month	Never
Document Sharing	❍	❍	❍	❍	❍	❍	❍
Plagiarism Tool	❍	❍	❍	❍	❍	❍	❍
Online Quizzes, such as MCQs	❍	❍	❍	❍	❍	❍	❍
Discussion boards (Blackboard)	❍	❍	❍	❍	❍	❍	❍
Collaboration using Facebook pages	❍	❍	❍	❍	❍	❍	❍
Twitter	❍	❍	❍	❍	❍	❍	❍
YouTube	❍	❍	❍	❍	❍	❍	❍
Wikis	❍	❍	❍	❍	❍	❍	❍
Self and Peer Assessment (WebPA etc)	❍	❍	❍	❍	❍	❍	❍
Learning Journals (Blackboard)	❍	❍	❍	❍	❍	❍	❍
Blackboard Groups	❍	❍	❍	❍	❍	❍	❍
ePortfolio (e.g. Mahara)	❍	❍	❍	❍	❍	❍	❍
Business Simulations	❍	❍	❍	❍	❍	❍	❍
Video Casting	❍	❍	❍	❍	❍	❍	❍
Other (please specify)	❍	❍	❍	❍	❍	❍	❍
Other (please specify)	❍	❍	❍	❍	❍	❍	❍

Q11 Which of the following tools are you currently using to develop teaching and learning resources?

	Daily	2-3 Times a Week	Once a Week	2-3 Times a Month	Once a Month	Less than Once a Month	Never
Word	❍	❍	❍	❍	❍	❍	❍
PowerPoint	❍	❍	❍	❍	❍	❍	❍
Keynote	❍	❍	❍	❍	❍	❍	❍
Prezi	❍	❍	❍	❍	❍	❍	❍
YouTube	❍	❍	❍	❍	❍	❍	❍
Facebook	❍	❍	❍	❍	❍	❍	❍
Twitter	❍	❍	❍	❍	❍	❍	❍
Lecture capturing tools (Blackboard Collaborate)	❍	❍	❍	❍	❍	❍	❍
Podcasting	❍	❍	❍	❍	❍	❍	❍
Personal / subject area web sites	❍	❍	❍	❍	❍	❍	❍
Other (please specify)	❍	❍	❍	❍	❍	❍	❍
Other (please specify)	❍	❍	❍	❍	❍	❍	❍

Q12 Which leads your development of module material where you make use of technology in your teaching?

❍ The module concepts / curriculum which are mapped out in advance
❍ The technology and what resources might be available to students using that technology
❍ A combination of the curriculum and the technology available

Q13 Which of the following statements best describes your expected use of Blackboard by your students?

❍ Participation is optional for students
❍ Participation is required for students
❍ I don't use Blackboard for my teaching

Q14 Indicate your opinion on the following statements regarding eLearning and the use of educational technologies in the higher education sector.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
I am confident integrating and using technology in my teaching	❍	❍	❍	❍	❍
I am confident in developing and implementing eLearning and educational technologies in my teaching	❍	❍	❍	❍	❍
I believe students learn more from content made available through blended learning (combination of face-to-face and eLearning)	❍	❍	❍	❍	❍
I believe students will learn more from 100% face-to-face lectures	❍	❍	❍	❍	❍
I believe eLearning reduces the academic's workload	❍	❍	❍	❍	❍
I would consider implementing eLearning initiatives in my teaching	❍	❍	❍	❍	❍
I prefer not to use eLearning in my teaching	❍	❍	❍	❍	❍

Q15 Categorise the challenges preventing you from incorporating eLearning into your curriculum design. (Please drag 'items' into the relevant box).

Most Significant Challenge	No Challenge	Medium Challenge
_____ Lack of Time	_____ Lack of Time	_____ Lack of Time
_____ Lack of Resources	_____ Lack of Resources	_____ Lack of Resources
_____ Lack of Training and Support	_____ Lack of Training and Support	_____ Lack of Training and Support
_____ Lack of suitable infrastructure (applications)	_____ Lack of suitable infrastructure (applications)	_____ Lack of suitable infrastructure (applications)
_____ Unstable infrastructure (Internet connectivity)	_____ Unstable infrastructure (Internet connectivity)	_____ Unstable infrastructure (Internet connectivity)
_____ Students don't know how to use eLearning applications	_____ Students don't know how to use eLearning applications	_____ Students don't know how to use eLearning applications
_____ Not a Priority (individual)	_____ Not a Priority (individual)	_____ Not a Priority (individual)
_____ Not a Priority (university/school)	_____ Not a Priority (university/school)	_____ Not a Priority (university/school)
_____ Not appropriate to my module	_____ Not appropriate to my module	_____ Not appropriate to my module

_____ No recognition of individual efforts	_____ No recognition of individual efforts	_____ No recognition of individual efforts
_____ Lack of eLearning knowledge	_____ Lack of eLearning knowledge	_____ Lack of eLearning knowledge
_____ Other (please specify)	_____ Other (please specify)	_____ Other (please specify)
_____ Other (please specify)	_____ Other (please specify)	_____ Other (please specify)
_____ Other (please specify)	_____ Other (please specify)	_____ Other (please specify)

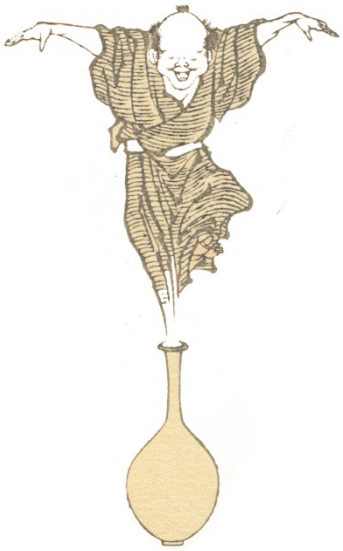
Q16 Categorise the opportunities presented to those utilising eLearning in their teaching. (Please drag 'items' into the relevant box).

Most Significant Opportunity	No Opportunity	Moderate Opportunity
_____ Better lecturer/student collaboration	_____ Better lecturer/student collaboration	_____ Better lecturer/student collaboration
_____ Enhanced student learning	_____ Enhanced student learning	_____ Enhanced student learning
_____ More efficient delivery of module content	_____ More efficient delivery of module content	_____ More efficient delivery of module content
_____ Enhances student engagement	_____ Enhances student engagement	_____ Enhances student engagement
_____ Other (please specify)	_____ Other (please specify)	_____ Other (please specify)
_____ Other (please specify)	_____ Other (please specify)	_____ Other (please specify)
_____ Other (please specify)	_____ Other (please specify)	_____ Other (please specify)

Q17 How interested are you in the following topics?

	Great interest	Some interest	Little or no interest
Learning how to implement eLearning strategies	❍	❍	❍
Designing blended learning	❍	❍	❍
Designing mobile learning	❍	❍	❍
Designing social learning (Facebook)	❍	❍	❍
Designing social learning (Twitter)	❍	❍	❍
Designing social learning (YouTube)	❍	❍	❍
Customizing Blackboard features	❍	❍	❍
Other (please specify)	❍	❍	❍
Other (please specify)	❍	❍	❍

Q18 Please outline any other comments you would like to make in relation to your perceptions of eLearning.



Future Primary Teachers' Beliefs, Understandings and Intentions to Teach STEM

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Abstract

The development of integrated skills and knowledge in science, technology, engineering, and mathematics (STEM) are necessary in order to deal with challenging complex situations and should be developed from primary school. It is expected that early experiences can influence and foster a deep and ongoing interest in STEM. In order to provide these early experiences in their future classrooms, preservice teachers need subject matter knowledge, pedagogical content knowledge and expertise to innovate and deal with STEM in their own future classrooms This research focused on the beliefs and understandings preservice primary teachers (n=119) have about teaching and to what extent they are prepared to teach STEM subjects in primary schools. A questionnaire based on the position paper on STEM issued by the Australian Office of the Chief Scientist (Prinsley & Johnston, 2015) and guided by the theory of reasoned action was used as the basis of this study. The data was analysed qualitatively and quantitatively. The results suggest the preservice teachers in this study believed there should be STEM in the curriculum, but they were not confident in their ability to teach STEM without more professional preparation and development.

Keywords: STEM education; preservice teacher education; primary school; STEM.

Introduction

There is a shift in education to prepare students from primary level on, to deal with challenging complex situations through creative solutions, effective communication and problem solving abilities. Skills in science, technology, engineering, and mathematics (STEM) must be developed from primary schools (National Research Council [NRC], 2015) because early interest and types of experiences can influence and foster interest in STEM. Falk, Dierking, Staus, Wyld, Bailey, & Punnel (2016) pointed out important principles for improving STEM learning and generating interest among primary and secondary school children. Major aspects of these principles include involving everyday experiences, involving practitioners and learners in the research process, using emerging technology to continue to shape content and practices, and considering broader sociocultural and political contexts.

Future teachers play a vital role in implementing STEM in classrooms with creative and innovative practices. Recently the idea of an educational infrastructure has been reframed by STEM educators using the concept of an ecosystem of social networks, peers, educators, friends and families incorporating in school and out of school contexts of learning (NRC, 2015). All these are relevant to existing and future practices for STEM teaching and learning in classrooms. Integrated approaches to teaching and learning and teacher preparation are key to producing a generation who is interested and skilled in STEM. It is important to attract high achievers and boost the rigour of STEM within both primary school teaching and pre-service teacher preparation (Prinsley & Johnston, 2015). Preservice teachers need subject matter knowledge, pedagogical content knowledge (PCK) and expertise to innovate and deal with STEM in their own future classrooms (Abell, 2007 & 2008). Preservice teacher education provides an opportunity to develop PCK and to use creative and innovative practices. It is through professional learning that knowledge and competency through incorporating STEM are developed (Berry, Loughran, & VanDriel, 2008; Lee, Brown, Luft, & Roehrig, 2007).

At present there is a deficit of integrated STEM frameworks internationally (Zeidler, 2016). Accordingly, there is an urgent need to educate preservice teachers about science related challenges (Tobin, 2016). Because STEM has significance in everyday practices (Civil, 2016), future STEM education and research must be positioned within life-wide, life-deep and life-long approaches (Rahm, 2016). Future teacher preparation and the capacity to deal with STEM are necessary for changing classrooms with an integrated STEM approach.

Future Primary Teachers' Beliefs, Understandings and Intentions

Future teachers particularly at the primary level require confidence, competence and skills in integrating STEM into their daily classroom practices. STEM education policies need to be implemented that have clear purposes and understandings around developing instructional material and 21st century teaching practices. Beliefs regarding STEM influence attitudes associated with science and technology. Beliefs also influence how people interact as a part of the natural environment (Schultz, 2001). The interpretation of scientific and technological issues associated with STEM not only requires background science knowledge but also positively held beliefs about STEM (Thomm & Bromme, 2011).

Interdisciplinary approaches (Johnson & Adams, 2011) to democratic civic informed decision making aligns with the Next Generation Science Standards (Next Generation Science Standards [NGSS] Lead States, 2013) and National Research Councils (NRC, 2013) focus on integrating divergent thinking and leads to democratic civic practices for informed decision

making scenarios in classrooms. Such approaches involve different ways of thinking, solving problems and communicating. Students learn to use a range of technologies to plan, analyze, evaluate and present their work. They learn valuable reasoning and thinking skills that are essential for functioning both within and outside the school environment using creativity, design principles and processes (Victorian Curriculum Assessment Authority, 2017). Technology such as the Internet requires students to take the initiative in designing active learning that emphasizes the interaction rather than just the content (Anderson, 2004).

It is important that future primary teachers have the competency and confidence to teach STEM education that is connected to the daily lives of their learners. Perkins (2014) uses the concept of 'life-worthy learning' to discuss an approach to educating young people for a changing world. This involves teaching students to deal responsibly with issues associated with change. Education should address understanding as well as societal implications of democratic informed decisions and actions (Schreiner, Henriksen & Hansen, 2005). Levinson, Kent, Pratt, Kapadia, & Yogui, (2012) argue that if students are provided with authentic scenarios in which decision making involves considerations of different viewpoints, they will be more responsible and look for evidence in democratic decision making. In reality students should be capable of using their knowledge, not just in a scientific context but also for societal and environmental needs (Fernandez-Mazanal, Rodriguez-Barreiro, & Carrasqer, 2007).

Issues in STEM education are very complex and solutions require political, economic, cultural, social and individual decisions and actions. School science programs that allow participation in society provide potential for lifelong participation in learning of STEM related societal issues. In this process teachers and students are required to extend their knowledge of science procedures and make connections to democratic civic decision making (Fensham, 2015 & 2016). The knowledge gained from practical life oriented and life related situations, and connected to daily life may provide students with better confidence and competence to function effectively as informed citizens (Ryder, 2001). An ideal education program targeting STEM issues encourages students to actively participate in societal issues investigating democratic civic decision-making by selecting suitable contexts that are related to the daily lives of students (Liu, Lin & Tsai, 2010; Dede, 2009 & 2013). This provides a basis for uninterrupted lifelong learning related to what is important in day to day life and the ability to cope with changes in their daily lives (Roth & Lee, 2004).

Methodology

Background

This study focused on gaining evidence about the beliefs, understandings and intentions of future primary teachers in STEM education. These beliefs, understandings and intentions are interlinked in terms of background knowledge and teacher capacity to integrate STEM in their future teaching practices. Positive beliefs and understandings can provide confidence, competence and skills to deal with STEM and to design and teach STEM programs in schools. This study looked into details of how the belief system positioned and lead to preservice teachers' understandings. The aspects of beliefs, understandings and intentions that were investigated are included in Figure 1.

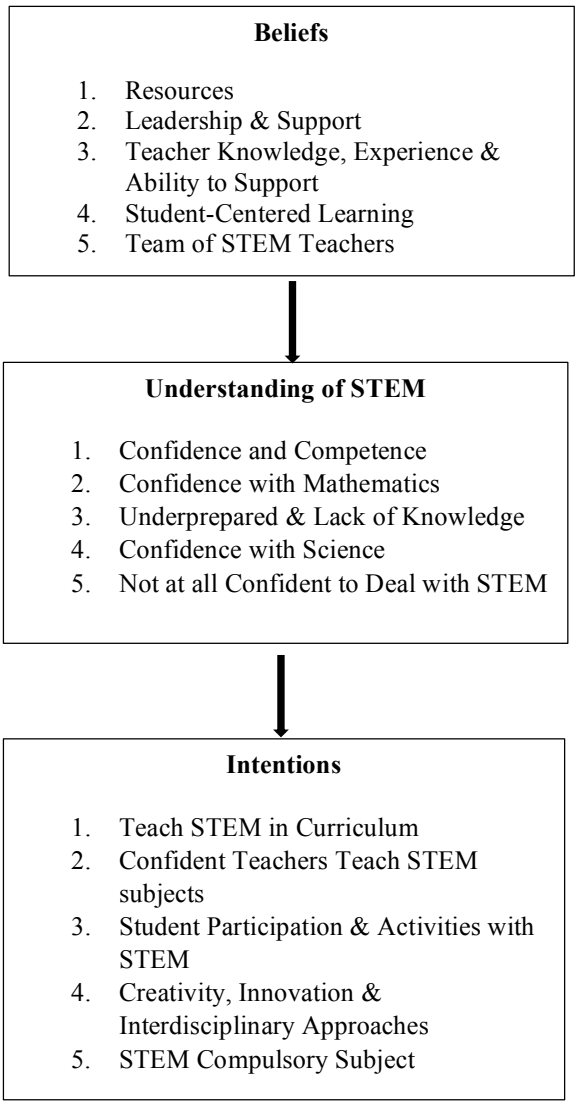

Figure 1: Aspects of beliefs, understandings and intentions of future primary teachers regarding STEM.

Purpose and Research Questions

The purpose of this research was to investigate future primary school teachers' beliefs, understandings, and intentions regarding STEM, their confidence to teach, and their intention toward STEM. This is viewed from the perspective of their background and capacity to deal with STEM in their teaching career. The research questions guiding this study were:

1. What beliefs and understandings do preservice primary teachers have about teaching STEM subjects in primary schools?
2. To what extend are preservice primary teachers prepared and intend to teach STEM subjects in primary schools?

Methods

Instruments

In this study, the research instruments were designed to elicit the responses of preservice teachers based on a questionnaire using the theory of reasoned action (Ajzen & Fishbein, 1980). The design of the instruments drew upon previous questionnaires using the theory of reasoned action (Kurup, Hackling & Garnett, 2005), as well as aspects identified for transforming STEM teaching in Australian primary schools (Prinsley & Johnston, 2015). The instrument contained a total of fifteen items and five items each for beliefs, understandings and intentions toward STEM on a five point Likert scale (1 strongly disagree to 5 strongly agree). There were also descriptive questions to investigate teachers' capacity to teach STEM in each of beliefs, understandings and intentions sections. The descriptive answers to the questionnaire were read and reread to code patterns and categories emerged from these codes. Reliability and validity are discussed in the relevant analysis and results sections.

Descriptive statistics, Cronbach's alpha, and composite reliability were conducted. The bootstrapping procedure was used to analyze validity through the average variance extracted (AVE). Partial Least Squares (PLS) estimation does not directly provide significance tests. Significance levels for loadings, weights, and paths were also calculated through bootstrapping. Two thousand bootstrap samples were used to empirically calculate standard errors and evaluate statistical significance.

Participants

This study surveyed 119 preservice teachers from an Australian University. The sample included 26 males (21.8%); 83 females (69.7%) and 10 not wishing to disclose their gender (8.4%). These preservice teachers had primary science, mathematics, and design and technology methods courses in their degree program.

Instruments

To examine the relationship among beliefs, understandings and intentions, Partial Least Squares (PLS) estimation-based Structural Equation Model (SEM) was used. Structural Equation Model is a largely confirmatory, rather than exploratory, technique to determine whether a certain model is valid. This model is not only used to assess the structural model (path relationships among latent variables) but also evaluates the measurement model (loadings of observed items on their latent variables). PLS is a well-established technique for estimating path coefficients in SEM accomplished using Ordinary Least Squares (OLS) techniques that have minimal demands on measurement scales, sample size, and residual distributions (Chinn & Newsted, 1999). Hence, it is more suitable for research with small to medium samples, non-normal distributions. The PLS method has gained interest and use among researchers (Chin, 1988; Compeau & Higgins, 1995).

Results

The aspects of beliefs, understandings, and intentions mentioned in Figure 1 were examined and responses were initially analyzed to look at the frequency of agreement and disagreement. Table 1 and 2 provided details of latent factors and their indicators in terms of beliefs, understandings and intentions toward STEM in their future career. A frequency of items was

analyzed. The responses indicate that all aspects were considered to be high in agreement (agree and strongly agreement) based on their frequency.

Table 1: Latent factors and their indicators.

Latent factors		Indicators
Belief	B1	STEM education begins in primary school
	B2	We cannot be innovative and creative unless we have a quality education system
	B3	STEM education can produce skills needed in the future
	B4	We need high quality teachers at all levels
	B5	Primary schools need specialist science, technology and mathematics teachers
Understanding	U1	Attracting high achievers in STEM to primary school teaching
	U2	Boosting the science, technology and mathematics
	U3	Should have a specialist STEM teacher
	U4	Should be a national professional development
	U5	Primary school principals should be leaders in STEM
Intention	IT1	Teaching STEM will make teaching and learning more interesting and connected to daily life
	IT2	Mathematics is central and students' success in STEM depends upon understandings and ability to apply mathematics.
	IT3	Every primary teacher should be supported with specialist STEM teacher to build effective STEM education
	IT4	There should be a separate subject in university teacher education program fully focused on STEM
	IT5	Teachers ability, skills and interest in STEM will transform creativity and innovation among children

Table 2: Frequency of questionnaire items.

Item	Strongly disagree	Disagree	Not Sure	Agree	Strongly Agree
Belief					
B1	2 (1.7%)	2 (1.7%)	20 (16.8%)	51 (42.9%)	44 (37.0%)
B2	4 (3.4%)	11 (9.2%)	10 (8.4%)	49 (41.2%)	45 (37.8%)
B3	0	0	8 (6.7%)	47 (39.5%)	64 (53.8%)
B4	0	0	4 (3.4%)	28 (23.5%)	87 (73.1%)
B5	0	10 (8.4%)	30 (25.2%)	49 (41.2%)	30 (25.2%)
Understanding					
U1	0	3 (2.5%)	27 (22.7%)	77 (64.7%)	12 (10.1%)
U2	0	4 (3.4%)	14 (11.8%)	76 (63.9%)	25 (21.0%)
U3	1 (0.8%)	11 (9.2%)	29 (24.4%)	56 (47.1%)	22 (18.5%)
U4	2 (1.7%)	3 (2.5%)	19 (16.0%)	49 (41.2%)	46 (38.7%)
U5	1 (0.8%)	12 (10.1%)	52 (43.7%)	35 (29.4%)	19 (16.0%)
Intention					
IT1	0	6 (5.0%)	13 (10.9%)	65 (54.6%)	35 (29.4%)
IT2	0	9 (7.6%)	34 (28.6%)	53 (44.5%)	23 (19.3%)
IT3	1 (0.8%)	8 (6.7%)	30 (25.2%)	60 (50.4%)	20 (16.8%)
IT4	4 (3.4%)	5 (4.2%)	31 (26.1%)	50 (42.0%)	28 (23.5%)
IT5	1 (0.8%)	4 (3.4%)	15 (12.6%)	66 (55.5%)	32 (26.9%)

We ran a factor analysis with principal axis factoring. In order to determine whether the factor analysis was appropriate for our data set, we checked the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The KMO statistic of 0.728 was above 0.500, suggesting that the data was suitable for factor analysis. Moreover, Bartlett's test resulted in a highly significant chi-square statistic (Chi-Square = 406, p-value < 0.001), indicating adequate correlation among the items.

Preliminary reliability of Cronbach's coefficient was 0.440, 0.551 and 0.622 for belief, understanding, and intention respectively. The Cronbach's alpha coefficient increased to 0.443 or 0.509 if questions B1 or B2 were omitted from Belief. Then the Structural Equation Model (SEM) was used to identify the relationship between beliefs, understandings and intentions to deal with STEM during their future career.

Figures 2 and 3 provided initial SEM model and modified SEM model of the beliefs, understandings and intentions by these preservice teachers towards STEM education. The difference between these two models was B1, B2 or neither. We carried out bootstrapping to check the significance of each indicator (2000 samples, 100 Cases). Based on Figure 2, we found both loadings of B1 and B2 were not significant with t-statistics were 1.04 and 1.43 respectively at 5% level of significance which were consistent with the preliminary reliability result. So the model in Figure 3 was used in this study and the results are explained below.

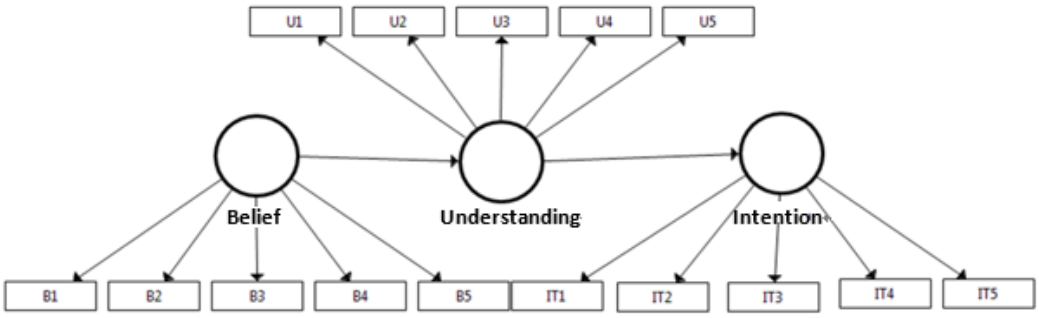

Figure 2: Initial Structural Equation Model of STEM.

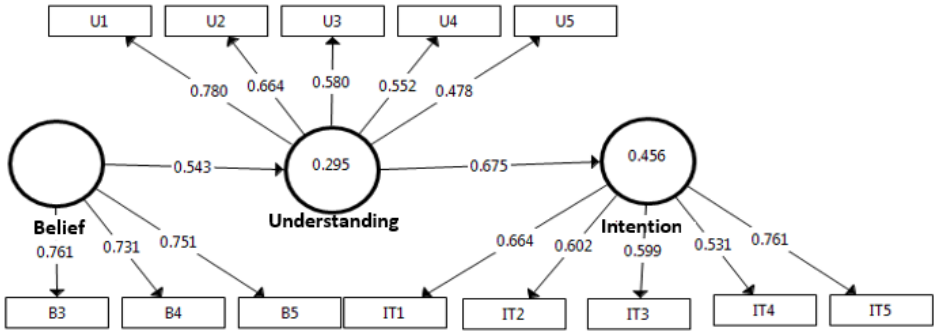

Figure 3: Modified Structural Equation Model of STEM.

Measurement Model (Outer Model)

Reflective constructs in PLS analysis need to be evaluated with respect to their internal consistency reliability, indicator reliability, convergent validity, and discriminant validity (Hair et al. 2011).

Internal Consistency Reliability

The reliability of the reflective measurement model (Figure 3) can be tested by "Cronbach´s alpha" and "composite reliability." Traditionally, "Cronbach's alpha" is used to measure internal consistency reliability but it tends to provide a conservative measurement in PLS-SEM. Prior literature has suggested the use of "Composite Reliability" as a replacement (Bagozzi and Yi, 1988; Hair et al., 2012). Composite reliability (construct reliability) analyses the strength of all indicators' correlations with their construct. Composite reliability (CR) should be 0.7 or higher. If it is an exploratory research, 0.6 or higher is acceptable (Bagozzi and Yi, 1988). Table 3 presented the results summary from the modified model, which showed the CR for all three latent variables were all above 0.7 and Cronbach´s alpha in belief and intention are all above 0.6, understand is very close to 0.6. The internal consistency reliability in this study was established according to the CR value.

Indicator Reliability

As the reliability of indicators varies, the reliability of each indicator should be assessed. Indicator reliability is the proportion of indicator variance that is explained by the latent variable, which is showed in Table 3. Usually 0.7 or higher is preferred. If it is an exploratory

research, 0.4 or higher is acceptable (Hulland, 1999). U3, U4, U5 and IT2-4 are all below 0.4 as showed in table 3, and literature suggest to eliminate indicators only rigorously if their loadings are lower than 0.4 (Hair et al. 20ll). Additionally bootstrapping was carried out to check the significance of each indicator (2000 samples, 100 Cases). As indicated in Table 3, all indicators were significant on at least a 5% level of significance (two-tailed t-test), so even though the indicator reliability was not fully established, we couldn't delete any item for they were all significant.

Convergent Validity

Construct validity, determined through the presence of convergent and discriminant validity, demonstrates how well the measurement items relate to the constructs. Convergent validity is the extent to which the scale correlates positively with other measurements of the same construct. An established rule of thumb is that a latent variable should explain a substantial part of each indicator's variance, usually at least 50% (Bagozzi and Yi, 1988). To check convergent validity, each latent variable's Average Variance Extracted (AVE) is evaluated which represents the amount of variance a construct captures via its items relative to the amount of variation due to measurement error. Again from table 3, we found that only "Beliefs" AVE value is greater than the acceptable threshold of 0.5, but not the other two. Convergent validity is not well established. This indicated that measurement items relating to the "Understanding" and "Intention" might not well be established.

Discriminant Validity

Discriminant validity analyzes whether the construct has more variance with the own indicators than with others. Fornell and Larcker (1981) suggest that the square root of AVE in each latent variable can be used to establish discriminant validity, if this value is larger than other correlation values among the latent variables. To do this, square root of AVE is manually calculated for "Belief" (0.748), "Understanding" (0.620) and "Intention" (0.636). The latent variable "Beliefs' square root of AVE is 0.748. This number is larger than the correlation values between the latent variables understanding and intention, which is 0.543 and 0.411 respectively. The "Belief" and "Understanding" scales measure theoretically different constructs, "Belief" and "Intention" scales measure theoretically different constructs as well. However, Understandings square root of AVE is 0.620, which is smaller than the correlation between "Intentions" 0.675, so discriminant validity was not fulfilled. The "Understanding" and "Intention" scales measure theoretically not the different constructs.

Structural Model (Inner Model)

We next examined the overall explanatory power of the structural model, the amount of variance explained by the independent variables, and the magnitude and strength of its paths, where each of our hypotheses corresponds to a specific structural model path. The R^2 which is used to measure the model's explanatory power, was 0.295 for understand, indicating that 29.5% of the total variance in understand was explained by "Belief". 45.6% of the total variance in intention was explained by "Belief". The explained variation should exceed 10% to qualify for suitable explanatory power. All of the path coefficients were statistically significant ($p<0.001$) based on bootstrapping, "Belief" to "Understand" is 0.543 ($t=7.648$, $p<0.001$), "Understand" to "Intention" is 0.543 ($t=10.637$, $p<0.001$). The total effect of understand to intention is 0.675 ($t=10.638$), "Belief" to "Intention" is 0.367 (indirect effect, $t=10.638$), "Belief" to "Understand" is 0.543 ($t=7.648$).

Table 3: Results summary of the modified model.

Variable	Mean	SD	loading	Indicator Reliability	Composite Reliability	AVE	Cronbach's Alpha	R square	T-Statistics
Belief					0.792	0.559	0.610		
B3	4.470	0.622	0.761	0.579					9.704
B4	4.700	0.53	0.731	0.534					9.122
B5	3.830	0.905	0.751	0.564					10.652
Understanding					0.752	0.384	0.584	0.295	
U1	3.820	0.633	0.780	0.608					12.456
U2	4.030	0.682	0.664	0.441					8.362
U3	3.730	0.899	0.580	0.336					5.788
U4	4.130	0.888	0.552	0.305					4.941
U5	3.500	0.91	0.478	0.229					4.580
Intention					0.770	0.404	0.628	0.456	
IT1	4.080	0.777	0.664	0.440					9.287
IT2	3.760	0.853	0.602	0.362					7.114
IT3	3.760	0.843	0.599	0.358					6.550
IT4	3.760	1.025	0.531	0.282					4.627
IT5	4.020	0.863	0.761	0.579					12.388

Discussion

Only minimal aspects of STEM are presently being taught with in primary schools and this is considered insufficient to produce future citizens capable of dealing with the challenging demands for sustainable living in the 21st century. There is no integrated teaching and learning framework available internationally to deal with STEM (Zeidler, 2106), however, governments internationally have accepted the need to incorporate STEM education for primary schools (Prinsley & Johnston, 2015). Issues in STEM education needs solutions from various angles, but a good starting point would be in pre-service courses at higher education institutes. Primary school teachers need to extend their knowledge of science and technology procedures and link this knowledge to their informed decision making regarding issues of sustainable living for the future (Fensham, 2015 & 2016). The results of this study indicate there is a relationship of beliefs, to understandings, and to intentions regarding STEM, rather than any direct relationships of beliefs to intentions or understandings to intentions among future primary teachers participated in this study.

Based on this study future teachers expressed their preparedness and concerns for taking up STEM in their future teaching. They have university and practicum experience and the reflections are based on their limited experience with STEM education. Participants reported that, there is not much happening at present in their school practicum experience and in their university courses regarding preparations for teaching STEM education and this is explicitly mentioned in their responses. This limits the capacity of these future teachers' to deal with STEM in their own upcoming future classroom practices. However, the following aspects were mentioned by future teachers in this study, which are very important for them in dealing with STEM in their classroom practices:

- Resources and leadership for making things happening in a school environment,
- Teacher knowledge of science, mathematics and technology to demonstrate to students the issues associated with real world,
- Collaboration with teams of teachers using an integrated approach.

The concerns expressed by the future teachers in this study based on their university and practicum experiences include a lack of confidence:

- To teach mathematics and science,
- In terms of understandings associated with the teaching of STEM and ability to incorporate in the curriculum,
- To teach using a creative, innovative and interdisciplinary approaches and student participation in learning activities.

It is suggested that STEM should be a compulsory subject in their teacher education course in terms of building the confidence of new teachers to properly prepare them in teaching STEM in their future careers. All these aspects impacting future teachers' STEM visions should be considered and would encourage these teachers to develop educational vision with respect to STEM education. The key issues emerged based on preservice teachers' lack of preparedness and lack of professional development. These are serious issues in terms of teacher preparation in STEM that need to be considered by higher education institutions. Many of the responses were based on their practicum experience (placement in schools) and many reported not seeing many good STEM practices in operation in schools. In this study, we investigated future teachers' backgrounds and their capacity to deal with STEM in their career and identified their beliefs, understandings and intentions to teach STEM using PLS-SEM model. This study provided empirical evidence that Belief has a positive effect on Understanding, and Understanding has a positive effect on Intention.

Future teachers need commitment, confidence and competence in STEM to deal with the challenging and complex demands of 21st century education. The needs and demands of this century including natural resources, energy needs, food habits and ecosystem will impact such STEM challenges. Basic lifestyle changes are required for individuals to cope with the changing and challenging natural systems. Future programs and curriculum needs to generate interest among students by (Falk et al, 2016) and the ecosystem model of STEM (NRC, 2015) for developing and generating integrated program in schools is required. Another key aspect is professional development of STEM for future teachers, which is well argued by Berry et al. (2008) and Lee et al. (2007) for building capacity among teachers to effectively teach this in classrooms.

Conclusions

Our future teachers need more professional development, exposure to better leadership, specialization of STEM practices and procedures and an innovative and integrated approach useful for primary school education. Future teacher preparation needs to encompass skills associated with STEM education that incorporate integration of science, mathematics, engineering and technology, in competency and in practices. Having developed these skills and competencies, the design and implementation of STEM education within schools should be a priority for 21st century learning. They need to feel confident and be well prepared.

If our society wants skilled citizens who can cope with challenges facing us all this century, then governments and higher education institutions and schools need to make STEM a priority.

Limitations

This study achieved the goals that it aimed to investigate. However, there were limitations in this study. We found that the results of assessing the PLS-SEM model were reliable but the validity was not well established. Future research may seek to improve on these areas by looking for more appropriate items regarding Understanding and Intention.

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Theatrically Digital: Education and Online Identity

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Abstract

The dramaturgical aspects of using social media are applied in this study from a sociological perspective (Goffman, 1959) to describe the process of gaining a sense of self through learning in online-environments. The exploration of data in this qualitative case study sheds light on the theatrical dimension of virtual self-presentation which can encourage individuals to become engaged in interacting online and, in the process of doing so, learn actively though using social media via its unique audio-visual digital content. Social media tools provide a space for information sharing to fill the gaps when students are unwilling to communicate in face-to-face classrooms because of a particular socio-cultural context. The codes and themes from six months' Facebook analysis of adult social media users were analysed based on the self-representation of the digital self with relation to their language and cultural background and its influence on the formation of identity. The 'actual self', as described in interviews, was being manipulated by individuals for different reasons such as its influence on their social/cultural identity and the development of the self-image. Increasingly, educators in all educational domains are using online social media platforms to support engagement in teaching and learning. It is hoped that this research, by offering increased understanding of the importance of online-communities, will have implications for learning from online contexts, particularly in contexts with socio-cultural boundaries.

Keywords: Digital self-presentation; cultural identity; education; dramaturgy; sociology.

Introduction

The increasing attachment of individuals to online social media, particularly Facebook, all over the world has inspired a rich literature forecasting the impact of online interaction on users' social communications (Lerner, 2010). In many societies, Internet users' unwise decisions about what content to share and with whom, can have consequences such as job loss (Wang et al., 2011). Sometimes users will choose not to share content for a variety of reasons, such as to protect their own and others' identity and privacy. This self-censorship is more marked in conservative societies due to more serious results from openness in expression of identity which may be in conflict with societal norms. This paper draws on a larger study of online identity and self-presentation of adult social media users in Iran. The study examines online interviews and Facebook activities to explore how the decision of identity representation can lead to educational improvement.

Iran is a good case study as it has the highest number of Internet users in the Middle East. According to the Internet world statistics in November 2015, 46.8 million Iranians were social media users (http://www.internetworldstats.com/stats5.htm). Facebook as a popular social networking site has been blocked since 2009 in Iran (Austin, 2009) although Iranians have external access to the Internet through VPNs (Virtual Private Networks) (Reardon, 2012). Iranians make use of the Internet as "a means of mobilization, communication, and education" (Lerner, 2010, p. 571).

The victory of the Islamic Revolution in Iran (1979) was the end point for the 2500-year-old monarchy. This was followed by the eight years of war with Iraq (1980-1988). The authorities of the Islamic Republic of Iran had emphasized the Islamic philosophy for the betterment of the nation. The education system after the 1979 revolution in Iran moved towards being religious which was completely different from the previous secular education system that the Islamic republic inherited from the Pahlavy dynasty.

Engagement with Social Media

Our experience of time and location has been changing since the Internet was invented. The Internet enables us to reach beyond the physical aspects of everyday life and be engaged with multiple interactions simultaneously without any geographical boundaries. It is the individuals' social participation that counts as their presence rather than their physical proximity (Meyrowitz, 1986). The unique potential of social media tools such as Facebook creates a situation that links self-presentations of the past to the present ones. The virtual space manipulates the traditional concept of human relations where people can build and edit all the specific communities in which they are interested. The version of self who is interacting in these artificial online communities presents us with its 'avatar' format(s). These 'unreal realities' of the online world influence individuals' presentation of selves and learning about social behaviors in society.

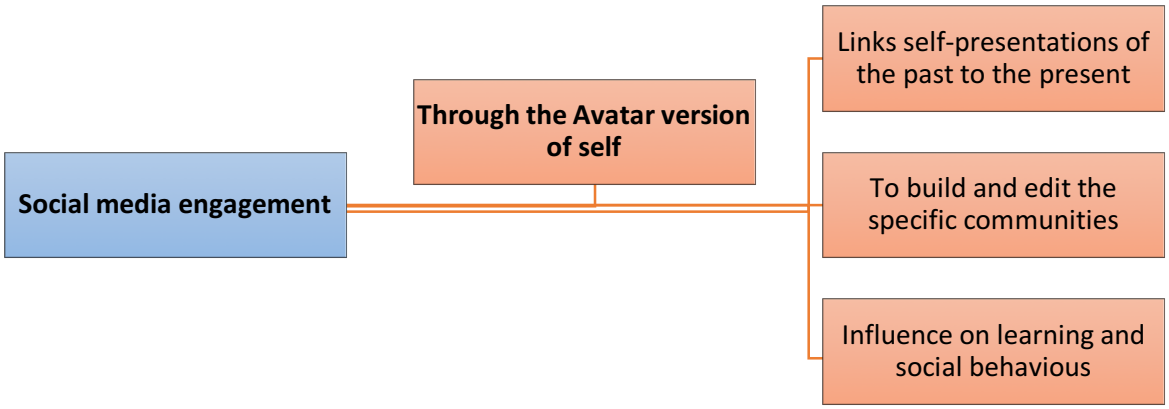

Figure 1: The nature of online life.

Whether we want it or not, our everyday lives are saturated with digital technology which has revolutionized the ways we communicate, learn and gain information. We experience a constant digital connectivity to the outside world and to other individuals that could be significantly different from the real life experience of having connection to whatever is surrounding us. The digital environment provides us with the chance to experience our own representation of identity on a personal and social level. From a dramaturgical perspective, we are performing various roles for known and unknown audiences through different online platforms. We decide to share, post, react, like, dislike, put comments, reply, start/join a conversation, add/remove friends/connections, delete information, revise/edit/create, filter/cut photos, introduce ourselves, and represent ourselves as confident, successful, brilliant, outstanding or contrarily as depressed, deprived and being unsatisfied with clear or vague issues. In an online environment such as Facebook our activities are being published in a context that is accessible by a vast number of people. The process of making decision about this public presentation and learning through online platforms is affected by feedback we receive and the imaginary self we are creating or developing virtually.

The nature of social media is being with many 'others' who can be very close, known or strangers. This version of togetherness is complicated and alien for those who are not comfortable using social media tools. The competent users or those who can at least use it independently and with enough confidence may think about their understanding of interactions and engagement in social media. In social media the reality of users' identities is mixed with ambiguity, insecurity and imaginative interdependence.

Social Media Code of Conduct

There are various announcements from 'friends' that we may encounter every day on Facebook. The range of information can be from their status or profile photos update to breaking news they share with their friends or a wider online population. Erving Goffman (1959) introduced the sociological theory of dramaturgy which describes the process of gaining a sense of self through interacting with others. In these theatrical-like interactions, a role is constructed and being performed to an audience by an individual. The theatrical dimension of a social media tool such as Facebook encourages its users to participate and learn more about their participation. They need to learn about effective and acceptable social norms of online communication, the language of social media and the particular interpretation of the visual aspects of the digital world.

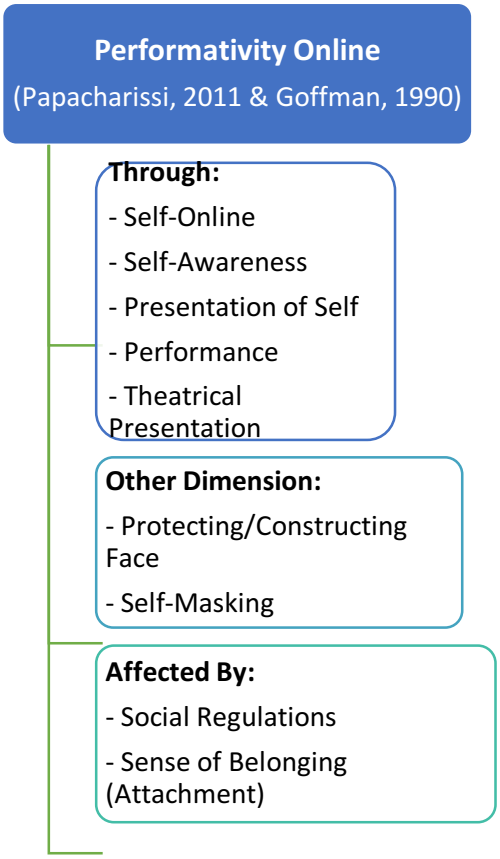

Figure 2: Theoretical framework.

Individuals' behavior on social media is very similar to the interaction of actors while they are playing their roles in theatre. As an example, when the audience laughs, it affects the actors' performance especially considering the reason for this laughter. The laughter might be as a result of missing a line of script or a sympathetic reaction to an unexpected act or word. The latter may result in a pause and accommodating an appropriate response to the audience whereas the former may make the performer nervous and they unconsciously react more quickly (Hare & Blumberg, 1988). Social media users' reactions are affected by how they have been performing on the stage of these various platforms and in front of their contacts as their audiences. Online activities are affected by the audience. Social media users are aware of being observed by other users who are their contacts or the general public. The majority of their online interactions are observed by known or unknown individuals. This constant observation can explain the way in which most online activities and users are acting as performers who play their roles.

Dramaturgy studies ways of finding meaning in the lives of human beings. It concentrates on "connecting action to its sense rather than behavior to its determinants" (Geertz, 1983, p. 34). Two fundamental elements are associated with meaning which are first, the behavioral results or product of human activity and performance and second, the distinguishing attributes of what is being called a social act (Mead, 1934). Human behavior is not only expressive but human beings are also aware of this expressiveness. People may care too much about how they appear to others; sometimes they completely ignore this. The significance and openness of the audience will directly affect an individual's degree of awareness of their expressiveness. The actor's level of awareness of themselves and the acts is built by the degree of their engagement with the audience and their acceptance.

The Facebook Audiences

Facebook exposes us to two different types of audience; our activities are monitored not only by this social media service and the country's authorities but also by the imaginary people with whom we share. In Facebook's virtual world we watch and implicitly judge each other as we share content. The people with whom we share consume the content when they become interested in it and share the post themselves. Our virtual contacts or friends shape the identity that we create by sharing the content (Rayner, 2012).

The act of content sharing on Facebook is similar to the actors playing on stage. The users share a content recognizing that they are being watched by the audiences who are not all known. The act of content sharing on social media might be for the aim of impressing or informing the crowd. Therefore, we can express and introduce ourselves by the shared contents (Rayner, 2012). Orenstein (2010), the award-winning author of New York Times, published her experience on social media in an article, 'I Tweet, Therefore I Am'. She describes how using Twitter redefined her experience of life and self. Twitter provides her with a chance to express herself and to articulate her inner self. Orenstein shaped her subjectivity through using Twitter. We define our identities by sharing content on our profile and share it with our friends. The experience with Twitter made her more aware of herself about who she is or who she believes herself to be. It led to the sense of empowering and anxiety that she was exposed to anonymous audiences who might judge her on the content of what she shared. Thus, use of languages and how it might further enrich this sense of self add another layer of complexity which is linked to the aims of this study.

Language of Social Media

The online environment provides a context in which we express our experiences and also create them through different medium or forms of languages. In social media we communicate through words, visualization and voice in many distinct forms and versions. Various aspects of culture are embedded in the medium in which we choose to communicate (Kramsch, 1998) and express ourselves in front of the online audience. The signs and symbols we implement may vary from time to time and are based on the social identity that is associated with a particular community. Socialization through Facebook provides a context to represent, create, develop, destroy and manipulate a culture via the version of language that is being employed.

The Social Network Sites like Facebook provide a context of languages use. The Facebook users' experiences with different languages would be influential on their identity development. Language learning and use develops a new identity for a person (Benson et al., 2013). This individual is different from the one who has no knowledge of that language. Language identity refers to the aspects of an individual's identity which are connected to their knowledge of that language and how they are using that language. The individuals' identity is under the influence of the specific languages that they are using and the cultures associated with them (Benson et al., 2013). Language is more than just a code. Instead, it is 'the very foundation upon which the concept of "self" is based' (Wolf, 2006, p. 17). Language is also a meaning-making system which constructs the 'meanings that we call "our"selves' (Kramsch, 2009, p. 2). Experiences of language learning and use are intertwined with experiences of life.

Methodology

In this study, internet identities are part of a changing process involving self-presentation and learning. Particular attention is paid to the version of languages on social media and tools that people use to present and represent their identities. Another important aspect of online identity is the way individuals manage their online identities among their multiple communities, friendships and affiliations. The interviews examine the strategies that individuals employ to manage their affiliations as social media user.

Research Approach – A Qualitative Study

This research explores an in-depth insight into the context of languages' use with regard to using Facebook and how this plays a part in the formation of adults' identities. As such, it is positioned within a qualitative, multiple case study approach. Given the aims of this research and in line with Creswell (2005), it follows that 'the participants can best voice their experiences' by 'an open-ended response' (p. 215). Therefore, the researcher asked the participants general, semi-structured questions through online interviews. The interviews have been video-recorded and then, transcribed (or translated if required).

Participants were identified through snowball sampling. There was an attempt to select participants through random sampling via the social networking site, Facebook. The researcher's Facebook friends were invited through an invitation post. The invitation post in this study was open to all her Facebook friends who were mostly between the ages of 26 to 41. They were invited on two occasions and several weeks apart through timeline posts and privately by sending messages. Fifteen individuals of 30 volunteers were considered as key participants who were productive based on both their interviews and Facebook activities.

Data collection was done by conducting two different methods of data collection: the semi-structured, open-ended online interviews (Creswell, 2005) through online video chat tools as well as the examination/analysis of Facebook contents and reported activities of the participants. Part of the data collection process in this study was one-on-one online interviews with the participants who are geographically dispersed and unable to come to a central location for an interview. This process involved gathering data using online chatting tools (Creswell, 2012). The researcher created prior-interview checklists, and write while-interview notes and post-interview reflection reports. These data were kept to inform the data analysis process.

Data Representation

Representation of Self on Facebook – Text, Photos, Jokes – Online Identity – Individual/Group – Shared Patterns/Themes

In this section, the participants' representation of self as well as its underlying meaning has been discussed based on their Facebook profile activities; such as shared posts and upload photos. Rana and Avaa are two female participants who demonstrated a wide range of activities in line with the purpose of this study. The driven themes from Rana's Facebook analysis were more relevant to the aim of this article and have been explained in more details.

Rana

Rana often posts informative posts about the fruit and plants produced on their farm. She shared the best animation of the year (a silent video); a documentary about Iran's beauties and attractions for tourists (English language video with Persian caption); a video with Persian language declamation (a woman's voice) to glorify the traditional Iranian women's day; a video about the negative influence of stereotypes on children's future life (Language: English and Indian with English subtitles and English captions).

Rana posted a photo with a text in Persian about the lack of water in Iran – an issue that needs serious attention. She also shared a post from a page called "In my country people mock whatever they do not understand" which demonstrates a positive point about traffic in Germany. Rana has written a funny text about herself that says 'she is a good person'. Her current profile photo is black and white and has been cut.

Her other profile posts include entertaining videos about animals with English captions; a fun video of children with English/Persian captions and other funny animation videos. She described watching a Hollywood movie. She also shared a video of nostalgia for her generation in Persian language and her Facebook year in review.

She expresses her feelings in an artistic and indirect way saying she has been hurt because of being too attached to others or feels that she lacks close attention from other people. She demonstrates this by posting a photo with Persian caption to those people who have forgotten her. She used an application which shows through her photos how she has changed over the past years.

Underlying meaning:

Rana shared informative posts about their farm, Iran and children through using both English and Persian. She appears to care about her country's problems. Her self-representation has been demonstrated through Facebook's application shared result. She shows signs of conservatism on her profile photos. She is interested in sharing entertaining and reminiscent posts. Rana seems to express her focus on her own emotions, her sense of loneliness and being forgotten.

Avaa

Avaa shared several posts from a Facebook page related to feminism. She shared posts about women's rights in Iran. In one video a child is complaining about sexism in choosing the color of toys for girls and boys. Avaa shared a post to encourage assisting poor immigrant students in Iran. She introduces books and articles in her profile.

Underlying meaning:

Avaa showed interest in women's rights and feminism, helping people in need and the academic area.

Representation of Self in Online Interview – Self Description - Individual/Group – Shared Patterns/Themes

Participants' representation of self and their self-description have been analyzed in this part with regard to the driven data from their online interviews.

Rana

Rana talked about the privilege of access to internet and foreign movies through languages. There is a paradoxical situation for foreign languages at schools. It is not satisfactory but "it is better than nothing". She introduced herself as a nonstop English learner who worked with this language. Persian is her mother tongue and she uses it "all the time in life".

It was not possible for her to use internet without anti-filtering devices. There is censorship in the national TV and satellite channels because of the religion and rules. On Facebook it is possible to be with people you know and you choose. She does not present everything on Facebook. Rana chose to use other social media tools more because they are not filtered and they are easier to use.

Facebook has given a chance to Rana to interact with her international friends. She mentioned that some users use Facebook to show off or spread false information about themselves. She can find her old friends and hang out with them on Facebook even if they are not in the same city. Rana is comfortable with both online and in person communications.

She wanted to take advantage of the educative and informative potential of Facebook but slow pace and interruptions did not let her. It is not possible to watch movies online and there is no real copy of movies. She has learnt through Facebook which information is real and which is not.

Avaa

Avaa believes that these days technology makes the life easier but there is lack of spirituality. She loves her first language, Persian, and wishes it was more important. The avoidance of westernization in the education system prevented them learning anything about the culture of the West. Westernization avoidance led to the emphasis on Arabic language rather than English. Although Avaa declared the importance of English as an international language, she was still more interested in Persian. In order to understand the Middle East happenings better, she put emphasis on learning Arabic as well.

Avaa explained a form of censorship which is sorting the data by internet searching engines. Considering where a person is and when they are searching in google, the driven information would be different. Iranians inside the country are suffering from the internet filtering. They know well how to overcome this censorship through anti-filtering devices. Facebook is a source of news for her but she feels that she should be careful in trusting the information.

Comparison of Facebook Identity/Interview Identity – Similarities and Differences – 'Doing and SAYING' and Links to Identity Literature

Rana

Rana expressed her dedication to her mother tongue, Persian, in her Facebook posts as she was claiming it in her interview. She has been selective to take time with specific friends on her Facebook. Rana tagged their names on her posts and interacted with them more frequently. She shows her conservatism in the photos she chose as her profile's picture.

Rana uses her Facebook page to express her feeling about others as well as about herself and how she is feeling in a particular time. She did not mention this role of Facebook in her interview. She is not communicating directly with anybody in these posts and she is just expressing herself in a virtual way.

Avaa

In her Facebook activities, Avaa showed interest to women's rights and feminism, helping people in need and sharing posts in academic area. She talked about shifting the conservatism of Iranian women through using social media. She believes that women have started to be more themselves and express their identity closer to who they really are. For instance, women started to post their photos without headscarf on Facebook if they would not wear it in reality if they could; such as private occasions or when they travel abroad.

Avaa mentioned that with Facebook she would miss her friends less but her visible activities do not show lots of interactions. It is probable that she has personal interactions with her friends through sending messages. Avaa referred to her own self-presentation on Facebook and claimed that she does not manipulate her online identity. She was unsure about this idea and unpacked her saying by saying that the online self is an incomplete version of herself. She explained that online space provide a chance to become familiar with another version of people which used to be hidden from her. While individuals do not want to reveal some aspects of their identity in their offline life, they may unconsciously express it through their online interactions. For instance, even if they say they are not interested in politics, their political comments on their Friends' post (which could be public) would demonstrate their inclination to these information.

Results and Discussions

First Representation of Self on Facebook: Profile Overview – Photo/Graphic/Text

Facebook users may decide to apply different degrees of privacy to settings for the shared information and visual presentation of their profile overview. The way in which they are presenting themselves to us might be very much different before and after becoming a Facebook friend. In this section, the researcher draw a comparison between the images the participants are presenting of themselves to those who are not our Facebook friends and the images that they present to their current Facebook friends.

Participants – Initial Identity Being Presented

One of the participants, Shervin, said, "On Facebook people mostly want to show that they are cool." He mentioned an underlying reality of many social media users' activities. Most of the time we choose to upload a photo or share a post designed to increase our popularity in an online community and among our Facebook friends and the public in general. Avaa stated, "I just do some other things that I don't publish on my Facebook. I don't change my real photos but it's not the same for the general public."

A variety of issues may influence our choice of identity representation in the online communities that we are part of such as our family background, education, social class and the society that we are living in. Therefore our identity is being determined by both outside and inside factors. A part of our identity formation is under the influence of parents, family and friends and another part is being constructed and formed through our social interactions. These influences may lead to the formation of selves that are not a 'true' representation of our 'real' self. Although people might be hiding their 'real' self, they know there is a 'real' version of identity inside them, the person that they believe themselves to be, that might be waiting for a chance to find its voice and represent itself. Here this issue was expanded through some examples from the participants. In each case their face was covered to protect their identity.

Golab is not sharing much information about herself to the public. Her current profile photo is limited to her face circle and it is not easy to recognize whether her hair is covered or not (Figure 3). She seems to be in a personal dilemma about whether to upload her photos with uncovered head or not. She may see this moderate conservatism as being necessary for saving her family/personal social face or for not losing the (future) job opportunities. The only information she shared to the public is the name of her hometown. Golab shares her education, date of birth and more with the people in her list of friends in whom she has more trust.

Figure 3: Golab.

Rana only shares her job experience and the place she is living in although her friends are given more detailed information such as being married and to whom and her education background. She used filters for some of her profile photos and changed their colors to make them unclear (Figure 4). It is possible that she has been controlling her photo sharing to the public in different stages for personal advantage. Therefore, these edited/filtered photos could be less problematic for particular situations. For instance, if she wants to be employed in a job the employers might look at her online profiles. Her application would not be accepted if she has shared photos and content which do not follow socio-political guidelines.

Figure 4: Rana.

Shared Themes from Online Interviews

The participants answered the online interview questions based on their description of self in relation to Conservatism (online and offline) and Social media (access and use). Participants were asked to describe their challenges in overcoming the boundaries in their online life and its reflection on the formation of their identity was also explored. Socializing through social media and its entertaining nature create a unique educational environment in which the information exchange provides an opportunity to discuss topics that are regarded as taboo. In the following table (Table 1) the most frequent shared themes in online interviews have been categorized into two groups: Conservatism and Social media.

Conservatism	**Social media**

• Socio-political guidelines
  ○ Sexual contents
• Limited Internet access
• Conservatism
  ○ Trusting
  ○ Being fake
  ○ Unreal/real selves
  ○ Saving face
	• Entertaining
	• Informative
	• Educational
	• Connecting people

Table 1: Shared themes.

General Themes of Online Interviews

Online interview data provided me with a number of general themes. The conversations with the participants were mostly about: Censorship and Social media. The following diagram unpacks the aspects of "social media" (Figure 5) based on these themes.

Figure 5: General themes.

Conclusion

This research has discussed that individuals' identities are being socially constructed and socially formed in the context of societies in which they are living. Social media users' representation of self has been changing throughout time. Users have been struggling to keep their online image in accordance with the society's social norms. Therefore, they kept modifying their online behavior assuming that they might be monitored by imaginary users. The researcher acknowledges that her Iranian participants were, to some extent, trying to be the person others wanted to see and this reason led them to learn through this platform consistently. This research contributes to the influence of having an online life on individuals' formation of identity and learning. Participants reported their thoughts about deciding which content to share on Facebook and which to hide and their reasons behind these decisions to represent the idealized self. The 'actual self' was hidden by an individual for different reasons such as its impact on social status, education and careers. There is hope that this research may have value for education contexts, particularly in countries that are experiencing social media or online filtering, by offering increased understanding of the importance of online platforms which provide a space to talk about social topics and to present the virtual ideal selves of those who are hiding behind the virtual gates. The unique role of social media is in supporting education particularly from the sociological perspectives in closed societies. This would address the general public's needs and provides a context for them to become engaged and to communicate with each other. Social media's destructive effects may also be diminished while individuals tend to benefit more from the educational and informative features of online media.

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The Use of Technology for EFL Classes in a Brazilian School: Consolidating Education 3.0

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Abstract

It is undeniable that digital technologies have helped in the creation of a new way of sharing knowledge. This is particularly pertinent in the area of English language education if seen as a way of enhancing connectivity and empowering individuals to promote positive changes in society. Bearing in mind that educational institutions worldwide have gradually incorporated successful innovative practices into their teaching lessons, the present paper aims to address the topic of Education 3.0 and the use of technological tools for EFL classes in a school in the south of Brazil. It reports how technology has been incorporated into the classroom to achieve interdisciplinary practices and discuss whether it has contributed to students' learning and linguistic competence. Regarding applicability, the paper brings some examples of technological tools and current existing projects, using different types of technologies, such as Osmo, smartphones, QR codes, apps and the like. Regarding evaluation of language improvement, it seems that these technological tools have mainly fostered students' listening and speaking abilities, which can be seen through positive students' results obtained through Oxford placement tests. Some considerations about the limitations of this study are also made for further improvements.

Keywords: education 3.0; EFL lessons; interdisciplinary practices; linguistic competence teaching apps; technological tools.

Introduction

Technology has played an essential role in education, allowing substantial interaction among teachers, students and the world off school walls. According to Cox (2015, para.1),

> As we sail through the 21st century, technology in the classroom is becoming more and more noticeable. Tablets are slowly replacing textbooks, and students (and teachers) can use their smartphones to research just about anything they wish. Social media has become commonplace, and the way we use technology has completely changed the way we live our lives.

In the Brazilian educational context, both State and private schools have substantially increased the use of technology in the last decades. According to the 2016 Information and Communication Technology in Education survey, conducted by CETIC (Center for ICTs Studies), published on August 3 this year, 52% of basic education institutions use mobile learning in their classroom contexts. The study shows data about the use of the internet and mobile phones both in State and private schools in urban areas throughout the country from August to December, 2016. Interview data from 1,106 schools (fifth to ninth grades and second year of high school) was collected and counted with the participation of 935 Deans, 922 pedagogical coordinators, 1,854 teachers from different subjects, and 11,069 students. Seventy-seven per cent of the students, who have access to the internet, use it through their mobiles; only 9% use a desktop. Additionally, more teachers have bought smartphones: in 2011, only 15% had them whereas in 2016, this number increased to 91%.

Regarding the use of devices in their classroom practices, 61% of the teachers have incorporated them among their fifth graders whereas 42% among their sophomores. The device is more largely used in private schools (61% of learners who use it) than in State schools (46%).

Additional data collected from the survey refers to students' restriction to internet access: in 2015 and 2016, only 10% of the schools informed that the access was available to all students whereas 21% stated that it is restricted and 61% access is not allowed. Both State and private schools have a similar percentage of desktops (98% e 96%, respectively) and portable computers (86% e 92%); as for internet access, it is available in most private (98%) and State (95%) educational institutions in urban areas. Computer laboratories have been gradually replaced by classrooms, libraries and other educational settings, especially in private schools. In State schools, for instance, only 59% out of 81% with labs use them for teaching activities.

The survey also showed that 77% of the professionals improved their communication with their students and 94% state they have access to an array of high quality teaching resources. As for future improvements, school managers and pedagogical coordinators from State and private schools have different opinions. The first group prioritizes the increase of the number of computers per student whereas the second group wishes to develop innovative and meaningful teaching practices.

Data shown above illustrates that there has been some advancement in the use of technology in education in Brazil, somehow reflecting the progress resultant from worldwide contemporary educational practices and, hence, the acceptance that technology is a facilitator and helps develop students' autonomy, self-learning, creativity and problem-solving behavior if properly applied.

This advancement can be shown through an ePals project implemented by Rio (2012)[1] in a State school in the small city of Charqueadas, near Porto Alegre, the capital city of Rio Grande do Sul. His students (aged between six and eight) shared cultural experiences with students from the Netherlands[2], whose main topics addressed were "the five Brazilian region origins and the most popular regional music, art, food from each Brazilian region" (Rio, Delgado & Pasin, 2015, p. 78). As for the Dutch culture, the main topics were their traditional country music, their basic greetings, the country flag and the clothes they wear.

This collaborative project ended up with a Skype chat, which allowed the kids to get in contact with their peers and consolidate what they had learned up to that point. According to the authors (p.81),

> The motivation students of both nationalities shared during the activities was important to show that they assimilated the importance of praising their cultures. Although they are still kids and have little command of English, they showed maturity when exchanging their feelings towards their countries, which contributed to raise awareness of their own culture and the learning of English *per se*.

With respect to private schools located in Porto Alegre, in the south of Brazil, we can affirm that technology has been more systematically present in the classroom since 2012. Broadly speaking, the use of projectors and interactive boards is mainly restricted to show power point presentations and watch videos, and tablets/smartphones to research a topic on the internet. However, one school in particular (*Colégio Israelita Brasileiro*, henceforth CIB) seems to be standing out in the use of technology to enhance learning, becoming the first school, in this region, to implement the concept of Education 3.0.

The approach CIB has adopted corroborates Lengel's (2012) idea of an education that entails a confluence of neuroscience, cognitive psychology, and education technology, using web-based digital and mobile technology, including apps, hardware and software. In other words, Education 3.0 includes a variety of tools to implement positive changes in schools and raise awareness among teachers that it actively embraces new technologies to see how they can help students learn efficiently (Barrett, 2016).

That being said, the present paper aims to address some theoretical and historical elements on the topic of Education 3.0 and the use of technological tools for EFL classes at CIB. It reports how technology has been incorporated into the classroom to achieve interdisciplinary practices and discuss whether it has contributed to students' learning and linguistic competence. Regarding applicability, the paper brings some examples of technological tools and current existing projects, using different types of technologies, such as *Osmo, smartphones, QR codes, apps* and the like. As for evaluation of language improvement, it seems that these technological tools have mainly fostered students' listening and speaking abilities, which can be seen through positive students' results obtained from the application of Oxford placement tests. Some considerations about the limitations of this study are also made for further improvements.

[1] In Rio, Delgado & Pasin (2015).
[2] For information about the Project with the Dutch school, visit the website www.stlambertus.nl.

Literature Review

The word "technology" was linked, for quite a long time, strictly to the Computer Science domain. However, in the 1960s, the approach named Computer Assisted-Language Learning (CALL) took place in many teaching environments. In fact, it is believed that the first technology created were the stones used to make fire, during the Stone Age (Eisenstein, 2008). During this Age, the humankind used to write in stones. In this sense, it is adequate to affirm that writing is considered a form of technology, once it was developed in order to significantly change the prospects of societies whose knowledge transmission were exclusively oral (Mendes, 2013). It is possible to observe that writing followed, naturally, the expected rhythm of technology: adaptation, improvement and evolution. In order to write, "writing spaces" were necessary, which are described by Bolter (1991, pp. 21–22) as "the physical and visual field defined by a particular technology of writing". In addition, throughout the history of writing, it is possible to notice that these spaces (also considered "technology") evolved. With the evolution of the species, the stones gave space to clay, polished stones, papyrus, paper, computers, etc. (Ryan, 1987). Concerning the evolution of technology in teaching practices, the blackboard is seen as a technological tool, since it supported (and still supports) teaching practices. In the 1960s and 1970s, tape recorders, languages laboratories, videos and televisions took place in classrooms all around the world. In the early 1980s, tools called CALL (Computer-Assisted Language Learning) began to emerge and were defined as "collections of exercises", i.e., tasks that were developed in order to stimulate learners' skills and encourage them to perform different types of duties (Dudeney & Hockly, 2007). Moreover, CALL would give learners automatic feedback, show them their weaknesses and results and point out the areas that would need more attention on their part. These tools would normally come with language learning books and allow students to keep their studies outside the classroom, stimulating an autonomous learning process (Dudeney & Hockly, 2007). The authors affirm that the insertion of technology in the English classroom is an important issue due to the possibilities it brings to education since it can be a source to provide students with authentic tasks and materials.

Desmet and Parente (2013) defend that there is still a huge resistance to technology. They illustrate that this confrontation has happened for many centuries by mentioning the opposition to the introduction of scribbling machines in the woolen industry in the 18th century. It is known that there is still some resistance to computational tools, mainly in the classroom, but it is important to bear in mind that today's educational patterns are dealing with the so-called "Generation Y" and "Generation Z". These generations were born after the massive development and release of a great number of technological resources who are familiar with finding information through multimedia sources and, sometimes, even depending on these assets for several aspects of their lives (Schroer, 2004).

Although young learners are frequently referred to as "digital natives" (Prensky, 2001), research has shown that this is a myth (Hockly, 2016). According to the author, they may be confident with new technologies, but they are not always effective users of new technologies. They use many socially oriented technologies for friendship-driven purposes, but they are less able to search for information online or to evaluate the veracity of that information, which makes them *uncritical*[3] users of technology. She also highlights that a wide range of factors influence students' digital literacies such as parents' educational level and profession, the number of books and the access to ICT resources in the home. In this sense, teachers also play

[3] Italicized by the author.

an important role, since they can use technology, if carefully designed and thoughtfully applied, to accelerate and expand the impact of learning between the 'digital natives'. For Crompton (2013, p. 47), "technologies enable new affordances to the learner such as learning which is personalized, contextualized and unrestricted by temporal and spatial constraints".

In this perspective, a new trend in teaching called the *heutagogical approach to teaching and learning*. The term was defined as the study of *self-determined learning* (Hase & Kenyon, 2000). It applies a holistic approach to developing learner capabilities, with learning as an active and proactive process, and learners serving as "the major agent in their own learning, which occurs as a result of personal experiences" (Hase & Kenyon, 2007, p. 112).

According to Anderson (2010) in the heutagogical approach emphasis is placed on the development of learner capacity and capability with the goal of producing learners who are well-prepared for the complexities of today's workplace. This is due to the fact that learners are becoming more and more autonomous and self-determined. Bhoryrub et al. (2010) claim that the approach has been proposed as a theory for applying to emerging technologies in distance education and for guiding distance education practice and the ways in which distance educators develop and deliver instruction using newer technologies such as social media.

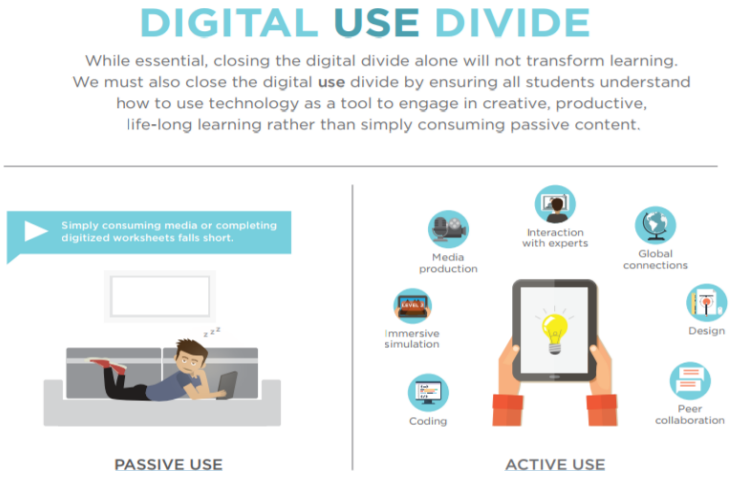
In North America, the office of Educational Technology, from the Department of Education released, this year, an update of the 2016 National Educational Technology Plan (NEPT) due to rapid changes in the educational technology landscape in the country. Among the reasons the Plan was updated included the number of schools that have access to broadband in their classrooms; the advent of new research on the use of technology by early learners; and an increased emphasis on preparing teachers to lead with technology before they arrive in the classroom (U.S. Department of Education, Office of Educational Technology, 2017).

The NETP (2017) focuses on how technology can help learners unlock the power of some of the most potent learning principles discovered to date. Technology, for instance, can help learners think about an idea in more than one way and in more than one context, reflect on what is learned, and adjust understanding accordingly. The Plan suggests five ways technology can improve and enhance learning, both in formal learning and in informal settings.

1. Technology can enable personalized learning experiences that are more engaging and relevant. Educators might design learning experiences that allow students in a class to choose from a menu of learning experiences assessed via a common rubric to demonstrate their learning (p. 12).
2. Technology can help organize learning around real-world challenges and project-based learning. A student might publish her findings online where she receives feedback from researchers and other members of communities of practice around the country and her colleague might draft, produce, and share an announcement via online video streaming sites, asking his audience for constructive feedback (p. 14).
3. Technology can help learning move beyond the classroom and take advantage of learning opportunities available in museums, libraries, and other out-of-school settings. One interesting initiative is the *Global Read Aloud* that allows classrooms from all over the world to come together through literacy. Participating classrooms have six weeks in which teachers read the book aloud to students and then connect their classrooms to participants across the world. This setting helps support learners through the shared experience of reading and builds a perception of learners as existing within a world of readers. The shared experience of connecting globally to read can lead to deeper

understanding of not only the literature but also of their peers with whom students are learning (p. 15).

4. Technology can help learners pursue passions and personal interests. The ability to learn topics of personal interest teaches students to practice exploration and research that can help instill a mindset of lifelong learning (p. 16). A learner, who is studying Brazilian Portuguese for example, might be willing to read classics of contemporary Brazilian literature written by Jorge Amado. Another one would love to read about Greek cuisine and prepare some recipes combining Greek favorites.
5. Technology access when equitable can help close the digital divide and make transformative learning opportunities available to all learners. An adult learner with limited physical access to continuing education can upskill by taking advantage of online programs to earn new certifications and can accomplish these goals regardless of location (p. 17).



Source: 2017 National Education Technology Plan Update

Figure 1: Digital Use Divide.

That being said, we describe in the next section some considerations about the evolution of Education 1.0 towards Education 3.0, highlighting their main characteristics and differences.

Education 1.0, 2.0 and 3.0

It is believed that the era of information technology has represented a watershed in education. Therefore, it is of the utmost importance to understand how the teaching/learning process has changed over the years and how technology has been slowly incorporated into classrooms all over the world. It all started with Education 1.0. According to Lengel (2012), Education 1.0 is a standardized/one-size-fits-all education. It is based on the three Rs – *receiving* by listening to the teacher; *responding* by taking notes, studying text, and doing worksheets; and *regurgitating* by taking the same assessments as all other students in the cohort. Barrett (2016) claims that learners are seen as receptacles of that knowledge and as receptacles, they have no unique characteristics and are all viewed as the same.

At the turn of the 21st century, the web witnessed the birth of the so-called "social web" or "web 2.0". Along with it, tools such as blogs and wikis proliferated in such a rate that millions of blog posts were posted daily. These principles of active production, collaboration, sharing

and publishing were transferred to the educational field, being called "Education 2.0". Gerstein (2014) argues that in Education 2.0, teachers are still the source of knowledge, but more open to adopt the roles of guides and mentors, for instance. Beckingham (2014) states that Education 2.0 takes on the characteristics of a more constructivist teaching orientation where the principles of active, experiential, authentic, relevant, and socially-networked learning experiences are built into the class or course structure. It was with Education 2.0 that teachers started experimenting with technology in their classes.

Similar to Web 2.0, Education 2.0 includes more interaction between the teacher and student, student to student and student to content/expert. Some educators moved into a more connected, creative Education 2.0 through using cooperative learning, global learning projects, shared wikis, blogs and other social networking in the classroom. The renewed interest in heutagogy is partially due to the ubiquitousness of the Web, and the affordances provided by the technology. With its learner-centered design, Web 2.0 offers an environment that supports a heutagogical approach, most importantly by supporting development of learner-generated content and learner self-directedness in information discovery and in defining the learning path, topics to be addressed throughout the paper.

More recently, in 2012, a new trend regarding the integration of technology into teaching emerged, the so-called *Education 3.0*. Education 3.0 is a connectivist, heutagogical approach to teaching and learning. The teachers, learners, networks, connections, media, resources, tools create a unique entity that has the potential to meet individual learners', educators', and even societal needs (Aghaei et al., 2012). Education 3.0, a term originally coined by James G. Lengel (Lengel, 2012), represents the third generation of education that many schools across the United States are currently embracing. It is designed to prepare students for success in whatever future they choose and more specifically, it is designed to help them live and thrive in Society 3.0, which is characterized by advanced technology and communication (Lengel, 2012). Education 3.0 is the combination of a challenging and relevant academic program, using innovative and real-world experiences and technology as a platform. It works best if it is understood, embraced and supported by parents and families at home, as well as the community-at-large.

According to Gerstein (2014), Education 3.0 is a more heutagogical, connectivist approach to teaching and learning. Teachers, learners, networks, connections, media, resources and tools create a unique entity that has the potential to meet individual learners' and educators' needs. It builds on and subsumes Education 2.0. It embraces more directly and comprehensively the idea that learning is personal, social and informal.

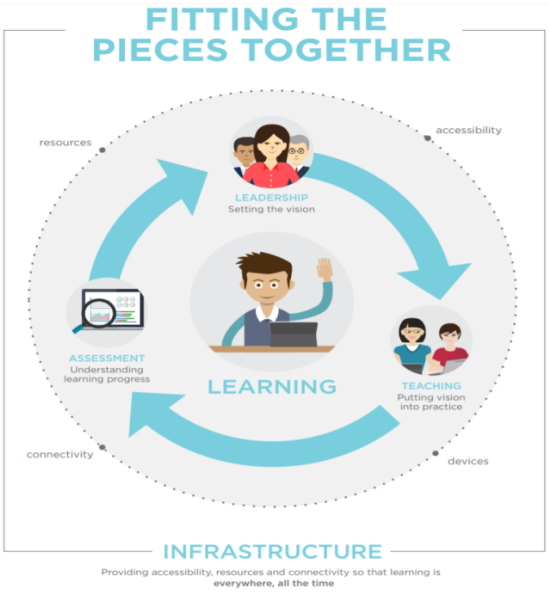
For Beckingham (2014), Education 3.0 is characterized by educational designs and opportunities provided by institutions where the learners themselves play a key role as creators of knowledge artefacts that are shared, and where social networking and social benefits play a strong role in learning. The author explains that Education 3.0 subsumes the four Cs of Education 2.0 (communicating, contributing, collaborating and co-creating) and also includes the additional C's of connecting, collectives and curating (the products of collective learning). In other words, it subsumes the constructivist principles of Education 2.0 and adds in the emerging principles of *connectivism*. Learners are pro-active in authoring their own learning lives and in helping their peers author theirs.

Table 1: The differences between Education 1.0, 2.0 and 3.0.

Characteristics	Education 1.0	Education 2.0	Education 3.0
Primary role of professor	Source of knowledge	Guide and source of knowledge	Orchestrator of collaborative knowledge creation
Content arrangements	Traditional copyright materials	Copyright and free/open educational resources *for* students within discipline, sometimes across institutions	Free/open educational resources created and reused *by* students across multiple institutions, disciplines, nations, supplemented by original materials created *for* them
Learning activities	Traditional, essays, assignments, tests, some groupwork within classroom	Traditional assignment approaches transferred to more open technologies; increasing collaboration in learning activities; still largely confined to institutional and classroom boundaries	Open, flexible learning activities that focus on creating room for student creativity; social networking outside traditional boundaries of discipline, institution, nation
Institutional arrangements	Campus-based with fixed boundaries between institutions; teaching, assessment, and accreditation provided by one institution	Increasing (also international) collaboration between universities; still one-to-one affiliation between students and universities	Loose institutional affiliations and relations; entry of new institutions that provide higher education services; regional and institutional boundaries breakdown
Student behaviour	Largely passive absorptive	Passive to active, emerging sense of ownership of the education process	Active, strong sense of ownership of own education, co-creation of resources and opportunities, active choice
Technology	E-learning enabled through an electronic learning management system and limited to participation within one institution	E-learning collaborations involving other universities, largely within the confines of learning management systems but integrating other applications	E-learning driven from the perspective of personal distributed learning environments; consisting of a portfolio of applications

Source: Keats, D., and Schmidt, J. (2007).

Education 3.0, as we can see, is characterized by rich, cross-institutional and cross-cultural educational opportunities. It encourages educators to see the world from the learner's perspective, where formal educational opportunities are but one element of a much richer life wide set of learning experiences and opportunities that are co-created by the educators, learners, institutions and communities. The figure below represents the important continuous connection between technology, tutors and students. "Fitting Pieces Together" exemplifies the cycle inherent to contemporary educational practices through the promotion of students' self-learning, assessment, criticism and autonomy.



Source: 2017 National Education Technology Plan Update

Figure 2: Fitting the Pieces Together.

With the objective to illustrate some elements of leadership, teaching and assessment towards learning shown above, the next section will present a few examples of technological tools used at CIB as well as interdisciplinary projects carried out by the school. Additionally, we make some considerations about how effective we believe these tools were in this educational context.

Towards Education 3.0 at CIB: Evaluating Our Tech Experiences

At CIB, English is taught through a communicative approach and integrated to other disciplines (Music, Arts and Technology), giving teachers the opportunity to provide students with a chance of using the language in diverse scenarios. Thus, English classes are taught through interdisciplinary practices. Teachers are required to teach topics related to science and technology in English, instead of only covering aspects of the language itself.

The experiences described below were applied with fourth and fifth graders, whose proficiency levels are between B2 and C1, according to the Common European Framework of Reference (CEFR). These students have been studying English since their first school years and most of them were part of an immersion program offered by CIB, in which the students used to stay in the school extra hours every day in order to have English classes. Due to the implementation of the Education 3.0, this program has been extinguished since the system itself covers the immersion in the English language. In addition, the students with whom these tasks were carried out are part of the advanced group (at CIB students are separated into two groups according to their English levels, intermediate and advanced).

Once technology is present in students' lives, teachers have to keep up to date on current and emerging technologies and bring them into the classroom, relating the technology to their disciplinary contents and making use of these tools meaningfully and purposefully. One example of a tech system in which games and apps can be played and downloaded is *Osmo. Osmo* is a system that integrates the iPads with a smart base, a camera (which also works as a sensor) and physical pieces (such as dominoes pieces and letter cards) that can be read as instructions and tasks by the camera. Therefore, by creating an expanded space (like a hologram) in front of the iPad, the users can interact with the apps without touching the screen. Students construct things with the physical pieces in front of the iPad and the software recognizes the instructions. More specifically, *Osmo* is an educational game system that creates augmented reality[4] and interactivity between the users and the apps, allowing a more meaningful and hands-on interface between students and the games, instigating their curiosity and improving their learning. Several apps and games can be used with *Osmo*. At CIB, students have access to different platforms and games such as *Words*, which will be shortly explained below.

Words is an app that is used with *Osmo* connected to the iPad and whose main objective is to teach vocabulary. Some different tasks were carried out using *Words* and each one of them worked with different language skills. These activities can be used in different contexts. At CIB, they are normally used to teach vocabulary according to the content that the teacher wants to teach.

[4] Augmented reality (AR) is a live direct or indirect view of a physical, real-world environment, whose elements are *augmented* (or supplemented) by computer-generated sensory input such as sound, video and graphics.

The game can be played in different modes and with different categories (such as Geography, Family Members, etc.), which allow teachers to develop and work with different types of vocabularies. In addition to working with vocabulary, this game is a great closing game: at the end of each unit or content in which teachers worked with new vocabulary, Words can be used to observe and assess if the students have actually evolved and added different words to their lexicon.

As examples, *Words* was used in some different tasks. In one of them, the app was used in order to teach vocabulary for a market simulation. Before simulating a supermarket, the teacher used *Words* to work with vocabulary related to food and beverages. Once the students needed to interact and know the name of the items to successfully simulate buying food, the app was used to teach new words.

In order to work with communicative skills, the students played the game in pairs. One of the students saw the pictures of the foods that showed up on their screen and had to describe (without saying the name of the food) them to their partners. The classmates, in their turns, had to find out which was the item described and give the letter pieces to the other student (these pieces are used to put words together in front of *Osmo* and once the words are correctly spelled, the app opens a new picture and so on). The student who was trying to find out the food was allowed to ask questions in English.

A similar activity was carried out before an interdisciplinary task between Science and English. This time, *Words* was used to practice words related to animals. There are several benefits of using *Words* as opening or closing tasks. To open contents, the app prepares the students with the vocabulary that they are going to find in texts or videos. Once they are confident about the vocabulary, the students tend to feel more comfortable working with interdisciplinary lessons, because different words are not going to be an extra challenge while trying to learn a new content.

Using Words as a closing activity in class triggers a psychological reaction in the students: once they know the game is going to be played at the end of each unit or content, they pay more attention to vocabulary and try to expand their knowledge by learning new items, so they can excel in the game.

The tasks described above are usually complemented with project-based lessons, which we explain in the next lines.

Traveling around the World with Google Expeditions

In order to work and expand vocabulary about parts of the city and landmarks, as well as carry out an interdisciplinary activity between Geography and English, we used Google Expedition to perform an activity with the fourth graders.

Google Expedition is an app used on smartphones that, together with a device of augmented reality, allows the teacher to be a “tour guide” and show their students places of the world. The device (similar to goggles) creates the sensation of actually being in a specific place, once you are able to walk around, move your head and see different perspectives and angles of the place – which is, in fact, a 360 panoramic picture.

The first step was working with texts about different landmarks and cities in the world, in order to get familiar with the places before "traveling" there with Google Expedition. The second step was working with vocabulary regarding parts of the city and landmarks, identifying and naming important components in a town. After that, the teacher chose some scenarios (the same ones explored with the texts) and students were invited to visit these places using the goggles and Google Expedition. In order to make the experience more realistic, the teacher played on the speakers sounds related to the place they were seeing (sound of a beach, or a busy city, for instance).

The students were required to explore the places and later take notes about parts of the city they may have identified and describe which city they had seen, sharing their experiences with their classmates and discussing each one's feelings and impressions while seeing and exploring the locations.

In a second moment, only one student at time would explore one place using the goggles and simultaneously describe to their classmates the location he/she was sightseeing (without naming it). The other students would then try to guess the location their classmates were describing.

The activity awakened their desire to learn more about Geography and, to conclude the experience, the English teacher talked to them about the importance of learning English – which is a global language – to be able to actually travel to these places and communicate with people there. Also, during the activity the students had the chance of developing skills not only related to the language, but the ones expected by the Education 3.0 by communicating, contributing, and collaborating.

QR Code

QR code is an interesting tool that can be used for different educational purposes. It is basically a bar code, easily created online, that can be scanned through an app installed on a smartphone and that leads quickly (hence the name: Quick Response Code) to a link attributed to it.
At CIB, it has been used in different manners. One of the most common ones is to give the fast finisher students extra activities. When the English teacher prepares handouts to the students, he normally prints one or two QR Codes at the bottom of the page that leads to an online activity, text, song or video that is related to the content that is being studied. So, when a student finishes the original activity, he/she can take his/her smartphone, scan the code and have something extra to work with or to learn from.

One activity that was carried out with 4th graders in English was related to Present Progressive. After studying the structure and practicing the content, a closing activity was conducted using QR Code. The teacher hid some QR Codes around the school that would lead to an online picture or video of someone doing an activity. The students were told that twenty codes were hidden in the school and they had to explore the hallways, library, sport center, labs and other places to find these codes. Once they found them, the pupils had to scan the code, see the picture and write down the activity that the person or people on the image was/were doing. If they saw a picture of a girl singing, for example, they would have to write: "the girl is singing". This way, the students would wrap up the content that had been studied and practice English while having fun.

Figure 3: An example of a QR code used for the activity (you can actually use your QR code app to scan it).

Another activity that used QR code consisted of a challenge in groups with the 5th graders. Some QR codes were placed in the school and students received cards with the directions in English to find them. When they found the QR codes, they had to scan them and perform the activities that were required on the links. It was a complete interdisciplinary task, once the links led to tasks on Math problems, Geography and History questions, Literature and fragments of books, Music, Physical Education and Hebrew (the second foreign language taught at CIB). It was an activity to close a trimester and that required students to use the knowledge they developed in all the disciplines throughout the trimester.

In terms of limitations, it is obvious that technology can never replace real life experiences. In terms of practicing the language, getting in contact with native speakers and daily living the experiences would probably present better development regarding speaking and listening skills. Technology can be used to get the students in touch with native speakers (by using Skype, for example), but it is known that it does not replace daily contact. In addition, classes that are entirely based on technology are strict and depend completely on technology; therefore, any problems related to gadget, systems, internet and even electricity may interfere with the class plans. Thus, teachers must be aware that even tough technology is one of their greatest allies, they cannot become slaves of technology. The systems should not replace their roles as teachers, but serve the purpose of adding to their classes. To sum up, the use of technology in CIB classes has had a great impact on students' learning and motivation to study a foreign language. Parents are also providing positive feedback, saying their children had never been so enthusiastic about learning different contents as they are now.

In addition, since the implementation of the Education 3.0 and its "demand" of using technology in the classroom, the students have shown better results on the placement tests used in the school. Each year, placement tests by Oxford are applied in order to observe students' development and analyze pedagogical strategies based on the results. Since the incorporation of Education 3.0, the results have significantly increased, mainly the ones related to listening and speaking – once technology provides resources and materials that are more realistic, less inauthentic and less casted, like the input given by CDs and DVDs that were the resources teachers normally use to work with these skills in language classes.

It is true that teachers at CIB have to plan their classes more carefully, trying to integrate the four skills with the technological tools presented above. However, having said that, teacher argue that by leaving their comfort zone they could experience a brand new way of preparing lesson, collecting materials and co-constructing knowledge with their peers. According to the teachers, never have they been so thrilled and motivated to teach as they are after the implementation of all those tech tools.

Conclusions

As previously mentioned, it is unquestionable that digital technologies have supported educators and learners alike to develop skills and competencies never thought of before, such as the co-creation and co-construction of knowledge. This is particularly true especially in the field of English language education if seen as a way of enhancing connectivity and fostering communication and collaboration.

This paper aimed to address the topic of Education 3.0 and the use of technological tools for EFL classes in a school in the south of Brazil. It also reported how technology is being incorporated into the classroom to achieve interdisciplinary practices and discuss whether it has contributed to students' learning and linguistic competence. We described examples of technological tools and current existing projects and reflected on the benefits Education 3.0 has promoted and limitations we have experienced.

Regarding the examples, we understand that they can be applied to most contexts, but teachers who wish to use them in their classroom practices, might need to adapt ideas according to their students' needs, levels and interests, as well as their school settings and policies. We corroborate the opinion given by Rio, Delgado and Pasin (2015, p. 82), which highlights that

> The twenty-first century teacher must be qualified in order to transform education into very motivating and successful learning moments. Such professional commitment, aligned with the use of new technologies whenever possible, may highly benefit our students' learning processes by fostering both language skill development and cultural and linguistic awareness, two highly valued aspects in today's globalized and technological societies.

As for learners' feedback, which is part of the formative process of the Education 3.0 approach, we learned that the use of technology at CIB has had a great impact on students' motivation to learn a foreign language. Similarly, parents provided positive feedback, saying their children had never been so enthusiastic about learning different contents as they are now. Teachers at CIB have to plan their classes carefully to integrate the practice of listening, speaking, reading and writing with a diverse range of technological tools. The teachers state that, by leaving their comfort zone, they can experience brand new ways of preparing lessons, collecting materials and co-constructing knowledge with their peers and students. According to them, never have they been so thrilled and motivated to teach as they are after the implementation of the Education 3.0 approach.

As for language improvement, we assume that these technological tools have fostered students' listening and speaking abilities. Compared to the previous school year, students obtained better grades in the Oxford placement tests, explained in an earlier section. As far as limitations are concerned, quantitative and/or qualitative instruments should also support results from our practices. We suppose they would fill the lack of explaining the positive phenomena technology has on learning and report on possible drawbacks from it. In a near future, we intend to apply research instruments such as semi-structured questionnaires and interviews to account for the multiple facets of using technology in educational settings.

We strongly believe that technology should be used parsimoniously along with educational trends, which means to take into consideration elements like the institutional context, the learners' reality, the teachers' theoretical background and motivation to change, to name a few.

If educational spheres are not open to rethink their pedagogy and attitude towards contemporary views, it will be probably difficult to either change or rethink outdated paradigms. There is a strong tendency today to conceive education as a combination of rich, cross-institutional, cross-cultural opportunities within which the learners themselves play a key role as creators of knowledge artifacts that are shared with others. The main characteristics of Education 3.0 (communicating, contributing, collaborating, co-creating and connecting), highlighted in the tasks conducted at CIB, seem to have contributed to the students' overall improvement.

We believe that technology should work in concert with teaching challenges of the 21st century. The challenges involve the promotion of critical citizens, the raise of cultural awareness, the development of healthy solutions to problem-solving situations and the solid and consistent growth of ethical values. Technology, seen as transformative, is an ally of good practices and for the birth of life-changing leaders no matter their color, religion, gender orientation, age and national origin.

We finish our paper by quoting the U.S. Secretary of Education, John King (2017 National Education Technology Plan Update), whose words summarize and subsume our way of perceiving education:

> Technology can be a powerful tool for transforming learning. It can help affirm and advance relationships between educators and students, reinvent our approaches to learning and collaboration, shrink long-standing equity and accessibility gaps, and adapt learning experiences to meet the needs of all learners. Our schools, community colleges, adult learning centers and universities should be incubators of exploration and invention. Educators should be collaborators in learning, seeking new knowledge and constantly acquiring new skills alongside their students. Education leaders should set a vision for creating learning experiences that provide the right tools and supports for all learners to thrive.

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The Flipped Classroom: Teaching the Basic Science Process Skills to High-Performing 2nd Grade Students of Miriam College Lower School

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Abstract

Technology has greatly shaped pedagogical practices over time. However scholars posit that the developing technology-aided, -based, and -oriented instructional practices still need scholarly and systematic studies to prove their effectiveness. An emerging teaching strategy that highlights technology tools and programs is Flipped Learning: a strategy where technology redirects learning from large groups to individuals. The research described here hypothesizes that there is a significant difference between the basic science process skills test score means of elementary students in a Flipped classroom and those in a traditional classroom. To test this hypothesis, an experimental design was used as the participants were divided the into two groups: experimental and control. An instructional design was crafted to simultaneously teach both control and experimental groups within a one (1) hour schedule. The experimental group was asked to watch at home researcher-made videos that teach the basic science process skills. In class, these participants deepened understanding of the skills through varied activities. The control group was taught using the traditional method operationalized as 5E Inquiry-Based Model.Both pre- and post-tests were administered to check the relative test scores. A Mann Whitney U test was conducted to evaluate the difference between the basic process skills test mean scores. It is concluded that there is a statistically significant difference (at α=0.05, r = 0.42) with a large effect size between the two variables.

Keywords: flipped classroom; flipped-learning method; science process skills; STEM education.

Introduction

Technology has drastically changed the educational paradigm in terms of content, pedagogy, and practice. Bishop and Verleger (2013) state that there are two related movements that changed the face of education in the new century. First is the technological movement which "enabled the amplification and duplication of information at an extremely low-cost" (p. 2). The other is the free software movement which allows content to be accessed openly on the Internet. From printed materials, technology has offered countless ways of acquiring information for building knowledge.

As students in the current generation are exposed to technological advancements, there is a great demand for educators to keep up with the trends. This is to avoid disconnection between the experiences inside the classroom and that in real life. The current K-12 Program of the Philippine Department of Education aims to equip graduates with the information, media, and technology skills needed for both school and work. This is a proof that educators of the 21st century learners are compelled to consistently utilize technological tools and programs to carry out and enhance instruction.

An emerging teaching strategy that highlights technology tools and programs is Flipped Learning.

> In a Flipped Learning setting, teachers make lessons available to students to be accessed…Teachers can deliver this instruction by recording and narrating screencasts of work they do on their computers, creating videos of themselves teaching, or curating video lessons from trusted Internet sites. (Hamdan, McKnight, McKnight, & Arfstrom, 2013, p. 4)

Flipped Learning traces its roots in active learning, a process that utilizes various activities which engage the learners at both individual and collaborative levels, transferring the learning responsibility to their own ability and pace (Trantafyllou & Timcenko, 2014; Tucker, 2012).

In the traditional classroom, the bulk of the class time is spent on the students' first exposure to the topic. This exposure may be facilitated through teacher lectures, student-centered activities, or even technology-mediated instruction. In most cases, deeper understanding of concepts is attained at the latter part of lesson. At times, it is achieved through take-home exercises and activities. On the other hand, students in the Flipped classroom receive first exposure to the concepts outside the classroom through online or offline videos. Learners may access the content at home or in school during breaks and dismissal. In this way, face-to-face class time will be spent mostly on attainment of deeper understanding of the concepts.

The purpose of this study is to examine the effectiveness of the Flipped Learning method in teaching the basic science process skills to high-performing 2nd grade students of Miriam College Lower School, an premier exclusive school for girls in the Philippines. Hence, it aims to answer the question, *Is there a significant difference between the basic process skills test score means of the students in the Flipped classroom and in the traditional classroom?* Employing a systematic study of the problem will contribute to the development and utilization of Flipped Learning method in the elementary classroom, a relatively under-researched topic in the study of the emerging technology-enhanced instructional approach.

Literature Review

Defining the Method

Through the efficient use of class time for deepening of concept understanding and skill fluency, the Flipped Learning method may serve as an effective approach to improve retention and learning transfer (Estes, Ingram, & Liu, 2014). Learner retention is better improved in the flipped classroom because the students control their own pace of learning. Unlike in the traditional classroom where the learning pace is dictated by the teacher and strictly followed, learners in the flipped classroom do not receive such pressure to finish at the same time their classmates do.

Flipped Learning attests that lectures are still effective in delivering instruction. In fact, it actually preserves the tenets of traditional pedagogy: engagement/motivation, direct teaching, and evaluation. However, the emerging instructional practice suggests a modification in terms of the first two tenets. It recommends that engagement and direct instruction be implemented in a different manner at a different time, with due respect to learners' capacities to comprehend and retain concepts. Because lectures in a flipped classroom are delivered in a video format to be watched outside class time, learners have the liberty to watch and finish the film whenever and wherever they want. In effect, the students utilize the class time for more productive interactions and engaging activities focused on application and deepening of pre-learned content from the viewed material (Bishop & Verleger, 2013). These implications strengthen the attainment of Flipped Learning's primary objective: to improve the quality and efficiency of the teaching-learning process through maximized class time (Estes, et al, 2014; Demski, 2013; EDUCAUSE Learning Initiative, 2012; New Media Consortium, 2014; Kronholz, 2012; Sparks, 2011).

People may at times associate the Flipped Learning model with online learning and blended learning. These three modes of learning are distinct from one another. Online learning exclusively occurs digitally and does not require face-to-face interaction among teachers and students (Cavanagh, 2012). Virtual class meetings, assignments and lecture happen online through a course management website usually, but not always, asynchronously. On the other hand, blended learning fuses online and face-to-face classes. It has an online element, which may occur during class time (Allen, Seaman, & Garrett, 2007).

Hamdan et al. (2013) mentioned that Flipped Learning is built on four pillars. These are factors that need to be met for the method to occur.

1. **Flexible environments**
   Flexibility in classroom environments varies in many different aspects. In one, teachers may be flexible in the physical structure of the classroom. The re-arrangement of the classroom fixtures may provide for group work, research, performance, and other activities needing personalized space design. . Flexibility may also pertain to assessment. Hamdan et al. (2013, p. 2) further adds that educators may be "flexible in their expectations of student timelines for learning and how students are assessed".

2. **Learning culture shift**
   Because of the deliberate shift in delivering information from the teacher to the students, Flipped learning requires a big change in the pedagogical structure. "Students move from being the product of teaching to the center of learning, where they are

actively involved in knowledge formation through opportunities to participate in and evaluate their learning in a manner that is personally meaningful" (Hamdan et al., 2013, p. 3). This shift also transforms the role of the teacher in the learning process – from being a sage to serving as a guide. (Szparagowski, 2014; Bergmann, Overmyer, & Wilie, 2013). The learning shift may be described as directed towards the constructivism, where the teacher facilitates learning as students discover their own ways of acquiring the knowledge and skills.

3. **Intentional content**
   Planning plays an important role in carrying out the Flipped Learning method. Since video lectures are given ahead of actual interaction, educators must "evaluate what content they need to teach directly" (Hamdan et al., 2013, p. 3). Teachers must also deliberately provide students with effective learning materials that will supplement the video.

4. **Professional educators**
   Critics of the Flipped Learning may posit that since videos are the ones delivering instruction, they may soon "replace" the work of the educators. Hamdan et al. (2013) strongly rejects this speculation. Only professional educators may effectively decide upon when and what to shift instruction from the class to the individual learning space. This testifies that exploring the Flipped Learning does not mean "flipping" all the topics in class. Gojak (2012) even noted that the biggest challenge of the educators is how to utilize the affordances of the model for efficient delivery of instruction.

Advantages and Challenges of Flipped Classrooms

Herreid & Schiller (2013) surveyed a more than 15,000 members of the National Center for Case Study Teaching in Science Listserv to give reasons why "flipping works". The findings of the study proved that the emerging instructional approach provides more opportunities for authentic student scientific research with the increased use of equipment in the classroom. It was also found that make-up work for lessons missed may be facilitated outside the classroom and beyond class time. In addition, teachers also expressed interest and recommendation of Flipped Learning method.

Herreid & Schiller (2013) further mentioned two pressing concerns on the utilization of the Flipped classroom:

1. Since the premise of Flipped Learning transfers the learning responsibility to the students, learners may tend to resist to the new method. They may find it hard to adjust in terms of regulating their study habits outside class time (i.e. watching or reading the material at home or in other places). If they fail to do so, they may end up unprepared as they come to class for the enrichment activities.

2. The materials that are created or curated must be very carefully tailored to the in-class activities so the students feel the homework has validity. Teachers found it difficult to find existing quality videos. If the teachers fail to ensure strong connection between the in-class activities and materials assigned, students may lose interest in the method and may perform less than expected.

A convenient way to "tailor" the video for activities that will be facilitated in class is to actually *create* it. In Flipped learning, videos that students watch may be *created* or *curated*. Videos are created when teachers serve as filmmakers and use appropriate software to produce the video. Creating the videos make Flipped learning more personal to the students as it is their teacher who actually discusses. On the other hand, *curating* the videos means selecting readily available files in various internet platforms. In most cases, links of the curated videos are sent to the students for watching.

In addition to the concerns raised by Herreid & Schiller (2013), Cerrone (2014) also mentioned that internet access at home may be another difficulty. To address this concern, schools in various countries set-up a viewing spot in the classroom or elsewhere in the campus which houses a computer with the copies of the flipped videos. This way, students may watch the video during breaks.

Even if there are concerns raised in the implementation of the Flipped learning method, Bergmann (2012, as cited in Cerrone, 2014, p.9) emphasizes that the success of the strategy "is not in the videos itself, but in the fact that delivering the content in a different way will open up may opportunities for expanded learning in the classroom".

Flipped Learning in Elementary Classrooms

The Flipped Learning method applied in elementary settings is not that explored and researched. It is often employed in intermediate to graduate levels. Its effectiveness in these populations of varying contexts has been proven in a plethora of researches (Zeng, Xiang, Yue, Zeng, Wan, & Zuo, 2017; Lew, 2016; Cerrone, 2014; James, 2014; McLaughlin, Roth, Glatt, Gharkholonarehe, Davidson, Griffin, Esserman, & Mumper, 2014; Estes, 2014; Szparagowski, 2014; Trantafyllou & Timcenko, 2014; Bishop & Verleger, 2013; Herreid & Schiller, 2013, among others). The Flipped Learning method requires higher learning responsibility and basic digital literacy skills. All of which are already developmentally expected of students in the intermediate until graduate levels.

Not much research on Flipped elementary classrooms has been systematically done and documented for scholarly purposes. The demand for personal responsibility and more higher digital literacy skills may impede exploration of the method in lower grades. In the Philippine context for example, it is not until the 4th grade that students are introduced to information and communication technologies (ICT) competencies. The absence or lack of technological-navigational skills of students may contribute to the ineffectiveness or failure of the Flipped classroom method if implemented in these classrooms. This research aims to suggest that the emerging instructional approach may be utilized in the early grades. Setting aside expectations dictated by the curriculum, the familiarity of young learners to technology and their frequent use of it may be enough pre-requisite in carrying out technology-aided, -based, and -oriented classroom practices.

Methodology and Methods

Research Design

An experimental design was employed to test the hypothesis that there is a significant difference between the test score means of the students in the Flipped classroom and the ones in the traditional one. In this research design, there were two groups of participants: control

and experimental. Both the groups underwent pre- and post- tests. In between the administration of the two tests, the control group received the traditional instructional method while the experimental group was subjected to the Flipped Classroom method. The independent variables in the research were the two instructional methods while the dependent variables were the test scores of both control and experimental groups.

Research Participants

The proposal for this study was presented to the immediate supervisor of the author to seek approval for conduct. The proposal was approved for implementation. The subjects of the research are the students enrolled in Miriam College Lower School (MCLS) Program for the Development and Enhancement of English, Mathematics, and Science Skills (ProDev+). ProDev+ is a special after-class academic program of MCLS that caters to high-performing Grades Two (2), Four (4), and Five (5) students in the major subjects Reading, Language, Mathematics, and Science. The program is divided into two clusters: English Track (for Language and Reading) and STEM Track (for Mathematics and Science). The objectives of the program are as follows:

1. The students should be able to discover their interests and curiosities in the fields of Communication Arts-English and STEM (Science, Technology, Engineering, and Mathematics) through active participation in various activities.
2. The teachers should be able to provide opportunities for high-achieving students to maximize their potentials through enrichment activities in Communication Arts-English and STEM.

This research is focused on the performance of Grade 2 students in the STEM Track. There were no other Grade Two (2) classes of the same program. Hence, the participants in the sole class are considered as the total population of the research.

Selection Process. The 20% highest performing Grade 2 students in Mathematics and Science (average of both final grade in the previous school year and rating in the past quarter of the current school year) were invited to take the qualifying exam in 2015. The qualifying exam consisted of questions that will be covered in the duration of the whole program. There were a total of 54 students who took the exam. The 24 students who garnered highest scores in the exam were invited to enroll in the program. The number of students selected was the cut-off set by the program proponent. This is to ensure that there is a small teacher to student ratio in the special class.

Determining the Control and Experimental Groups. The researcher employed purposive sampling in determining the students to be included in each of the experimental research groups. The 24 students were ranked according to their program qualifying rating (average of both final grade in the previous grade level and rating in the past quarter of the current school year).

After ranking the students enrolled in the program, the researcher purposively grouped them into two (2) – with both having the near-equal Program Qualifying Rating average of 95.68. Then through balloting, the researcher randomly assigned each group as experimental and control. Below were the results of the assigning process.

Table 1: Determining the Control and Experimental Groups.

Control Group		Experimental Group	
Student	Program Qualifying Rating	Student	Program Qualifying Rating
A	97.88	B	97.63
C	97.46	D	97.33
E	97.00	F	96.83
G	96.79	H	96.75
I	96.46	J	96.33
L	95.46	K	95.63
N	95.08	M	95.33
P	94.79	O	95.08
R	94.63	Q	94.67
T	94.50	S	94.50
V	94.04	U	94.21
W	93.96	X	93.92
Average	95.68	Average	95.67

Data Gathering

The research was conducted over a period of six (6) weeks. The researcher met the class once a week for a one (1) hour session. The six (6) sessions were allotted for the pre-test, intervention method, and post-test.

Methods

A traditional method of instruction was implemented in the control group. It is operationalized at the context of Science and Technology education at Miriam College Lower School. The aforementioned subject area currently utilizes the 5E Inquiry-Based Model of instruction. It enables the students to *engage* in different activities to jumpstart learning and tap prior knowledge*, explore* to build understanding*, explain* to deepen understanding*, elaborate* to extend and apply concepts in real-life*,* and *evaluate* his/her own learning. On the other hand, the experimental group experienced Flipped Classroom instruction.

The lessons were focused on the development of the basic science process skills which are observing, comparing, measuring, classifying, predicting, and inferring. Observing is the process of gathering information about an object using the five senses of hearing, seeing, smelling, tasting, and feeling. Observations can be classified as *qualitative* and *quantitative*. Qualitative observations use words to describe objects while quantitative observations use numbers and figures. Comparing is the process of studying the similarities and differences of two or more objects. Measuring is the ability to effectively use laboratory tools to arrive at accurate observations. Classifying is the process of sorting and grouping things together according to a specific attribute, quality, or property. Predicting means providing a smart guess on what will happen after a specific event or situation. Inferring means using clues and figures in arriving at sensible details and conclusions.

Before direct instruction, the experimental group was tasked to bring home a compact disc (CD) containing a video about the lesson on the next meeting. In case of technical difficulties with the CD, the group may watch the video online using the link given. The group should

watch the video at home and take notes and questions on their notebook. Upon meeting for instruction, the students will engage in a group discussion about the video then perform an Application activity.

Given the two implemented methods, it is assumed by the researcher that lesson plans prepared for both instructional strategies are parallel with each other. Both methods aimed at introducing and evaluating the learning of assigned topic/s for every session. It is only the process that sets the difference between the two strategies. After the conduct of this research, the control group was given copies of the videos that the experimental group utilized. In addition, it was also guaranteed that the performance of participants in the research did not in any way affect their actual performance in the program.

Instructional Design. Each class meeting lasts for one (1) hour from 2:00 – 3:00 PM. The researcher crafted an instructional design that was able to simultaneously address both control and experimental groups within the one (1) hour schedule. The table below describes the lesson flow.

Table 2: Instructional Design.

Control Group	*Schedule*	Experimental Group
Activity		*Activity*
Researcher facilitates the Engage activity and provides instructions for Explore activity.	2:00 – 2:10 PM	Students prepare questions for discussion.
Students perform the Explore activity.	2:10 – 2:30 PM	Researcher facilitates discussion and gives instruction for Application activity.
Researcher facilitates the Explain and Elaborate activities.	2:30 – 2:50 PM	Students perform the Application activity.
Students answer the Evaluate activity.	2:50 – 3:00 PM	Students answer the formative assessment tool. Afterwards, researcher provides instructions for the next Homework.

Data Analysis

The researcher utilized both descriptive and inferential statistics in analyzing the data gathered. The descriptive statistics was used to organize and simplify the data from the test scores of the students. Mann-Whitney Universal (*U*) Test was used to compute for the *U*-values which shall be used to test the hypothesis that there is a significant difference between the basic science process skills test score means of students in the Flipped classroom and in the traditional classroom. Mann-Whitney *U* Test is a non-parametric test which aims to compare difference between two groups with variables that are not normally distributed.

Results and Discussion

Statistical Procedures

A Mann-Whitney *U* test was conducted to evaluate the research hypothesis that there is a significant difference in the basic process skills test mean scores of students in the Flipped

classroom and in the traditional classroom. The null hypothesis was also constructed to proceed with the statistical analysis. The two hypotheses were represented below.

Let U_1 = U-value of the experimental group and
U_2 = U-value of the control group.
$H_0 : U_1 = U_2$
$H_a: U_1 \neq U_2$

In the succeeding tables, the label Group A refers to the experimental group while Group B refers to the control group.

The changed score of each sample in the group was calculated.

Table 3: Changed Scores.

Group A	+6	+14	+8	0	+4	+5	+2	+17	+20	+2	+15	+3
Group B	+3	+5	+6	+7	-4	+5	+3	0	-2	+2	+2	-7

From the list of changed scores, it is important to note that majority (at 11 over a total sample of 12) of the students in the experimental group received a positive change of score from pre- to post- test. This may initially indicate that the method of instruction being tested is successful. On the other hand, a quarter of the sample (at 3 over a total sample of 12) in the control group received a negative change in score from the pre- and post- test. The changed scores were then ranked.

Table 4.1: Rank of Changed Scores.

Group	A	A	A	A	A	B	A	B	A	B	B	A
Changed Score	+20	+17	+15	+14	+8	+7	+6	+6	+5	+5	+5	+4
Rank	1.0	2.0	3.0	4.0	5.0	6.0	7.5	7.5	10.0	10.0	10.0	12.0

Table 4.2: Rank of Changed Scores (cont.).

Group	A	B	B	A	A	B	B	A	B	B	B	B
Changed Score	+3	+3	+3	+2	+2	+2	+2	0	0	-2	-4	-7
Rank	14.0	14.0	14.0	17.5	17.5	17.5	17.5	20.5	20.5	22.0	23.0	24.0

It may be noted that the upper ranks are occupied by students in the experimental group. It is an indication that the highest changes in score from pre- to post- test were garnered by students subjected to manipulation of instructional method.

The rank points were classified according to the groups.

Table 5: Summation of Rank Points.

Group A	1.0	2.0	3.0	4.0	5.0	7.5	$\sum R_1 = 114$
	10.0	12.0	14.0	17.5	17.5	20.5	
Group B	6.0	7.5	10.0	10.0	14.0	14.0	$\sum R_2 = 186$
	17.5	17.5	20.5	22.0	23.0	24.0	

The medians of the ranks in Group A and B are 8.75 and 15.75, while the means are 9.5 and 15.5 respectively. After running the Mann Whitney *U* test using online software, the following values were obtained.

Table 6: Mann-Whitney *U* Test Results.

Group	*U*	*p*	*z*	*r*
Experimental	108.0	0.0202	-2.05	0.42
Control	36.0	0.0404		

The smaller *U*-value ($U_2 = 36.0$) was chosen to compare with the *U* critical value of 37.0 at the alpha level of 0.05. This indicates that the null hypothesis must be rejected and the alternative hypotheses be accepted. Flipped classroom method employed in the experimental group held a significant difference in the test scores compared with the control group.

Discussion

The significant difference between the test performance of the students in the two groups widens the scope of Flipped Learning's effectiveness as applied in school settings. To provide a perspective of discussion, a parallel study conducted by scholars in the United States of America may be cited as a benchmark. Ingram, Wiley, Miller, & Wyberg (2014), implemented the Flipped Learning method in 4th and 5th grade Mathematics classes. Results of the study inform that students gained increased interest in the subject area. The participants also expressed desire to have their classes 'Flipped' in the next school year (62% in 4th grade and 59% in 5th grade).

According to Ingram et al. (2014) the Flipped classroom works because "you can rewatch it (the videos) or pause it or fast-forward it but if the teacher was talking in class instead of a video, you cannot do that" (p. 20).

In this particular study of Flipped Learning application in 2nd grade classrooms, several anecdotes from the students in the experimental group were noted by the researcher. The following quotes were noted as the classes went on.

> *Student A*: I enjoy watching the videos at home. I used both the CD and YouTube.
> *Student B*: I already know the lesson today!
> *Student C*: Oh! This (referring to the activity sheet given) is what I saw in the video.
> *Student D*: When are you going to give the next video? I rewatched it many times!

These quotes from students attest to the study of Ingram, et al. (2014) that the method develops within the learners interest and sense of readiness for the lesson. It must also be noted that as the research with 2nd graders ended, the students in the experiemental group expressed desire to continue with watching the videos at home and coming to class for enrichment activities. In

this light, Ingram et al. (2014) are validated when they posit that the Flipped Learning method provides for more effective learning dynamics.

However, Ingram et al. (2014) also suggested a possible implication of the Flipped learning method to varying intellectual profiles of learners as they found that low-achieving students expressed difficulty in managing a Flipped classroom. They posit that the method seems to be run in a fast-paced manner. This is an area in the implementation of Flipped learning method that needs to be further researched. In conjecture, this finding of the scholars may not be reflected in this research with 2nd graders mainly because the students enrolled in the program are deemed high-achieving.

Even if there is not a corpus of literature on the implementation of Flipped elementary classrooms, several educators worldwide document their exploration of the method through personal blogs. Van der Eyken (n.d.) of the United Kingdom employs Flipped learning method in his 2nd grade classes and found it effective in terms of capturing and sustaining the interests of the students. He documents his methods through his blog, The Flipped Classroom: Ideas, Resources, and Experiences (https://flippedexperience.blogspot.com). As documented in the blog, Creative Education (https://creativeeducator.tech4learning.com), Doubet (n.d.) of the United States of America explores the method with her Kinder and 1st grade students. Having very young students, Doubet implements a variation of the method, which she calls 'In-class Flipping'. In-class flipping facilitates in school the home activity provision of the authentic Flipped method. This means that the students study the resources in school before teacher proceeds to instruction and enrichment.

There is potential in implementing the Flipped learning method in elementary classrooms. However it is important to take into consideration the differences in learning profiles of younger students compared with those in the intermediate and higher levels. With the high learning responsibility and digital literacy requirements to run the method, younger students must be oriented and instructed properly to yield optimum results.

Conclusion

The objective of the study was to evaluate if there is a difference between the mean scores of two sets of samples on a test of basic science process skills. The first set of samples with n = 12 experienced the Flipped classroom learning method, while the other set with same number of samples were given the traditional classroom method. Both of the groups took pre- and post-tests on basic science process skills. A Mann Whitney *U* test was conducted to evaluate the difference between the basic process skills test mean scores. It is concluded that there is a statistically significant difference with a large effect size between the two variables (mean ranks of Group A and B are 9.5 and 15.5 respectively; U_1 = 108 and U_2 = 36, z = -2.08, α = 0.05, upper limit level of significance = 107 and lower limit level of significance = 37, r = 0.42).

The results of this research opens an opportunity for scholars to explore a rather under-researched area of application of the Flipped Learning method – in the elementary settings. This research straight-forwardedly concluded that in its contextualized setting, the emerging instructional approach is deemed effective. It is recommended that further studies must be conducted to assess the impact of the approach to the students – their perception and evaluation of outcomes. In addition, studying young students' digital literacy may provide a better understanding of Flipped Learning method's effectiveness and ineffectiveness as applied in the

elementary classrooms. It may be deemed that while theoretically, more sophisticated digital literacy skills are needed for flipped classrooms, it may be the innate interest of the students in technology use that possibly entice them to see the approach as effective. After all, young learners now are exposed to technological tools at an early age and they learn to navigate quickly, supervised or unsupervised. These unique characteristics of young learners must be taken advantage of in considering approaches to improve the teaching-learning process.

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