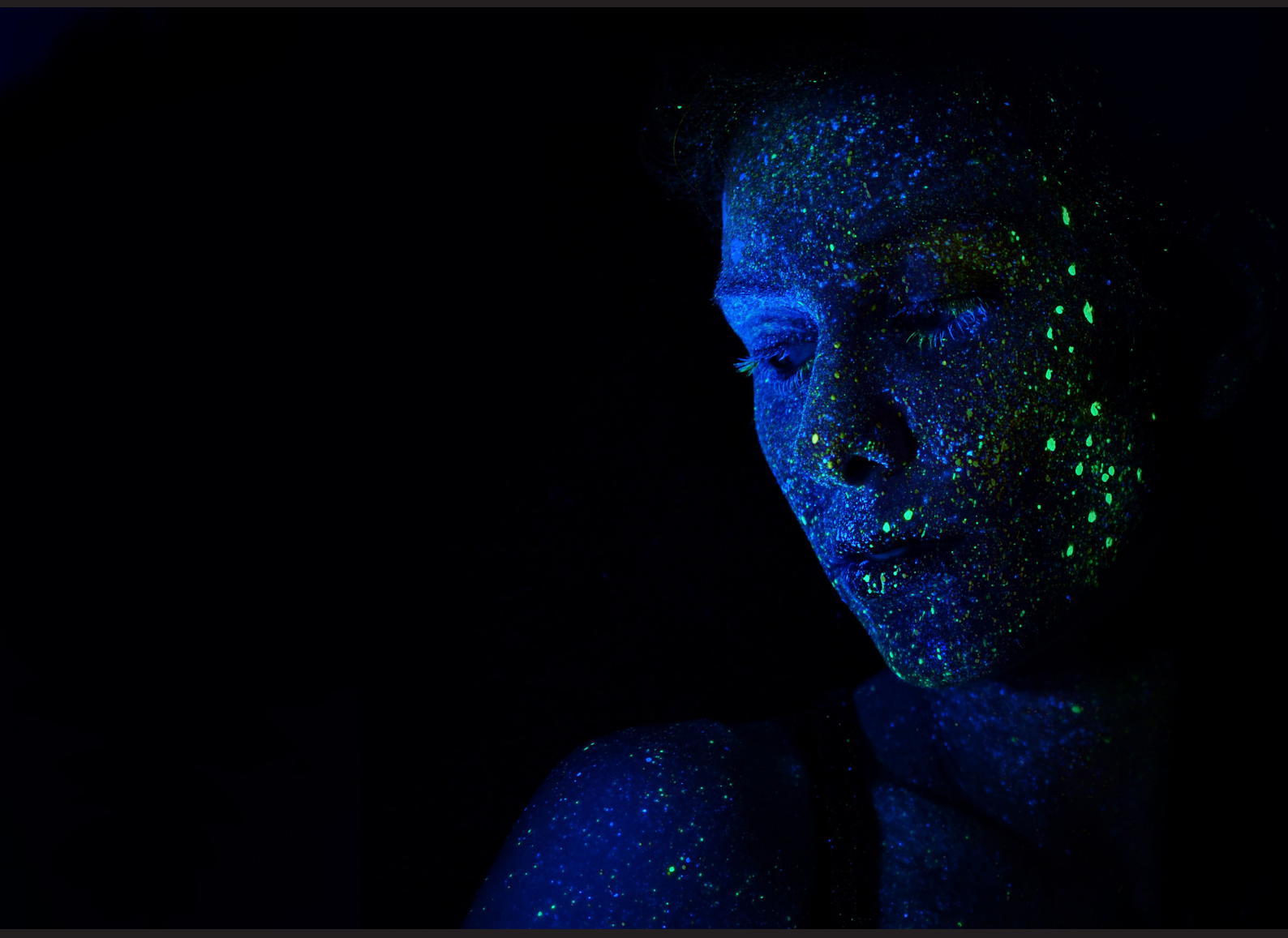
iafor

journal of education technology in education

Volume 8 – Issue 2 – 2020

Editor: Michael P. Menchaca

Editor-in-Chief: Yvonne Masters



ISSN: 2187-0594

iafor
IAFOR Journal of Education: Technology in Education
Volume 8 – Issue 2 – 2020

IAFOR Publications

The International Academic Forum

IAFOR Journal of Education: Technology in Education

Published by The International Academic Forum (IAFOR), Japan
IAFOR Publications, Sakae 1-16-26-201, Naka-ward, Aichi, Japan 460-0008

Executive Editor: Joseph Haldane
Publications Manager: Nick Potts

IAFOR Journal of Education: Technology in Education
Volume 8 – Issue 2 – 2020

Published July 17, 2020

ISSN: 2187-0594

ije.iafor.org

Cover Image: Cover Image: h heyerlein / Unsplash

IAFOR Journal of Education: Technology in Education

Volume 8 – Issue 2 – 2020

Edited by Michael P. Menchaca

Associate Editors:
Daniel Hoffman
De-Graft Johnson Dei

Foreword
(Musings from the Editor-in-Chief)

Technology in Education is our second issue for 2020. The issue's editorial team have worked hard, in difficult global conditions, to work with reviewers and authors to bring this issue to publication. Many thanks go to the editor, Michael P. Menchaca, and his two Associate Editors, Daniel Hoffman and De-Graft Johnson Dei. While we have a special issue, *COVID-19: Education Responses to a Pandemic*, opening for submissions later this year, we need to acknowledge now that technology in education has been at the forefront of many educationalists' minds. We look forward to receiving many different and thought-provoking submissions later in the year.

On reflecting on what might be said about technology and its use in education, I was reminded of the following comment:

> As far as technology itself and education is concerned, technology is basically neutral. It's like a hammer. The hammer doesn't care whether you use it to build a house or whether on torture, using it to crush somebody's skull, the hammer can do either. (Noam Chomsky).

Technology, the "knowledge or use of the mechanical arts and applied sciences" (one definition in *The Australian Pocket Oxford Dictionary*), has been in education for far longer than many current students would acknowledge. So often the term "technology in education" has come to mean the use of computers and the affordances of the Internet. Probably the first use of technology in education was the realization that you could use a stick to scrawl on the ground instead of using a finger with all the hazards that can entail. Rudimentary technology indeed, but technology nevertheless.

Please don't get me wrong: I am a fan of technology. As a university lecturer I ran tutorials in Second Life for my distance education students: but I used it with a purpose, developing a sense of social presence which has been shown to be important for engagement. I didn't make the technology drive the education. Education is and always must be the driving force behind any use of technology.

On those perhaps controversial musings, my thanks to the authors, the editor, the associate editors, the publications manager, Nick Potts, and to all the reviewers for bringing this issue to you, the readers.

Enjoy,
Yvonne Masters,
Editor-in-Chief

Editorial Advice

Preparing a submission to the *IAFOR Journal of Education* is more than writing about your research study: it involves paying careful attention to our submission requirements. Different journals have different requirements in terms of format, structure and referencing style, among other things. There are also some common expectations between all journals such as the use of good academic language and lack of plagiarism. To assist you in reaching the review stage for this or any other peer-reviewed journal, we provide the following advice which you should check carefully and ensure that you adhere to.

1. Avoiding Plagiarism

Plagiarism is a practice that is not acceptable in any journal. Avoiding plagiarism is the cardinal rule of academic integrity because plagiarism, whether intentional or unintentional, is presenting someone else's work as your own. The *IAFOR Journal of Education* immediately rejects any submission with evidence of plagiarism.

There are three common forms of plagiarism, none of which are acceptable:

1. ***Plagiarism with no referencing***. This is copying the words from another source (article, book, website, etc.) without any form of referencing.
2. ***Plagiarism with incorrect referencing***. This involves using the words from another source and only putting the name of the author and/or date as a reference. Whilst not as grave as the plagiarism just mentioned, it is still not acceptable academic practice. Direct quoting requires quotation marks and a page number in the reference. This is best avoided by paraphrasing rather than copying.
3. ***Self-plagiarism***. It is not acceptable academic practice to use material that you have already had published (which includes in conference proceedings) in a new submission. You should not use your previously published words and you should not submit about the same data unless it is used in a completely new way.

2. Meeting the Journal Aims and Scope

Different journals have different aims and scope, and papers submitted should fit the specific journal. A "scattergun" approach (where you submit anywhere in the hope of being published) is not sound practice. Like in darts, your article needs to hit the journal's "bullseye", it needs to fit within the journal's interest area. For example, a submission that is about building bridges, will not be acceptable in a journal dedicated to education. Ensure that your paper is clearly about education.

3. Follow the Author Guidelines

Most journals will supply a template to be followed for formatting your paper. Often, there will also be a list of style requirements on the website (font, word length, title length, page layout, and referencing style, among other things). There may also be suggestions about the preferred structure of the paper. For the *IAFOR Journal of Education* these can all be found here: https://iafor.org/journal/iafor-journal-of-education/author-guidelines/

4. Use Academic Language

The *IAFOR Journal of Education* only accepts papers written in correct and fluent English at a high academic standard. Any use of another language (whether in the paper or the reference list) requires the inclusion of an English translation.

The style of expression must serve to articulate the complex ideas and concepts being presented, conveying explicit, coherent, unambiguous meaning to scholarly readers. Moreover, manuscripts must have a formal tone and quality, employing third-person rather than first-person standpoint (when feasible), placing emphasis on the research and not on unsubstantiated subjective impressions.

Contributors whose command of English is not at the level outlined above are responsible for having their manuscript corrected by a native-level, English-speaking academic prior to submitting their paper for publication.

5. Literature Reviews

Any paper should have reference to the corpus of **scholarly** literature on the topic. A review of the literature should:

- Predominantly be about contemporary literature (the last 5 years) unless you are discussing a seminal piece of work.
- Make explicit international connections for relevant ideas.
- Analyse published papers in the related field rather than describe them.
- Outline the gaps in the literature.
- Highlight your contribution to the field.

Referencing

Referencing is the main way to avoid allegations of plagiarism. The *IAFOR Journal of Education* uses the APA referencing style for both in-text citations and the reference list. If you are unsure of the correct use of APA please use the Purdue Online Writing Lab (Purdue OWL), – https://owl.english.purdue.edu/owl/resource/560/01/ – which has excellent examples of all forms of APA referencing. Please note APA is used for referencing not for the general format of the paper. Your reference list should be alphabetical by author surname and include DOIs whenever possible.

This short guide to getting published should assist you to move beyond the first editorial review. Failure to follow the guidelines will result in your paper being immediately rejected.

Good luck in your publishing endeavours,

Dr Yvonne Masters
Editor-in-Chief, *IAFOR Journal of Education*

Table of Contents

From the Editor

Welcome to the *IAFOR Journal of Education*'s inaugural *Technology in Education* issue. While the Journal structure may be slightly altered at times, our commitment to interdisciplinary, international, intercultural, quality manuscripts remains. As editor, I rely heavily on an extensive group including the editor-in-chief, two associate editors, and an incredible team of reviewers. I am truly humbled by everyone's dedication, hard work, and support, especially given the challenges brought on by the global pandemic. Given current circumstances, technology becomes even more significant in facilitating collaboration in the world. Although IAFOR has reserved a special topic issue for manuscripts specifically related to the impact of COVID-19, technology, particularly in education, plays an important role in our collective progress.

The scope of *Technology in Education* is purposefully broad to ensure the greatest representation of contemporary knowledge impacting all learning, formal and informal. The journal's simple aim to improve education requires broad representation in scope and extensive comprehension in depth. To achieve such depth, one factor binds all published manuscripts, firm theoretical foundations. As editor, my one piece of advice to prospective authors: connect your study to **sound** theoretical or conceptual foundations.

Reflecting IAFOR's commitment to diverse knowledge and international collaboration**,** the nine published studies encompass:

- Five continents: Asia, Europe, Africa, North America, and Oceania;
- Seven countries: Malaysia, the Philippines, Turkey, Rwanda, the United States, Mexico, and Papua New Guinea;
- Three studies focusing on open education: MOOCs; Open Educational Resources; and Open Textbooks;
- Three studies focusing on online learning: learning management systems; online journalism; and a virtual language exchange;
- Three studies focusing on general e-learning: informal language learning through digital media; digital annotations; and digital literacy.

Please find below a brief summary of each article.

In the first article, Ruhil Amal Azmuddin, Nor Fariza Mohd Nor, and Afendi Hamat employ qualitative focus group and content analysis methods to investigate how digital annotation tools facilitate reading comprehension. Their "Facilitating Online Reading Comprehension in Enhanced Learning Environment Using Digital Annotation Tools" article examines how Malaysian students in a public university rely on digital annotation tools to assist in their overall reading comprehension. Their research suggests that students will benefit from training on how to approach annotation tasks in online environments.

Runchana Pam Barger, in her article, "Democratization of Education through Massive Open Online Courses in Asia," uses content analysis to examine the promise of Open Education to democratize education in Asia. The study indicates that while MOOCs can promote social and economic mobility, barriers, such as language, culture, and lack of digital literacy and technical knowledge, prevent underserved populations in particular from successfully pursuing a digital education. Collaboration between governments, corporations, non-government organizations,

and local communities is needed to provide the infrastructure and support necessary to promote more equitable opportunities for learning.

The third article, "Understanding the Characteristics of English Language Learners' Out-of-Class Language Learning through Digital Practices," by Ali Dincer, draws on mixed-methods to look at students' use of digital tools outside the classroom for English language learning at three state universities in Turkey. The study identifies the importance for teachers to link classroom teaching to outside digital tools such as social media, games, YouTube, and intelligent tutoring applications.

Ariana Eichelberger and Hong Ngo, in "Beyond the Basics: Adapting an Open Textbook to Accommodate a Flipped Class," utilize a mixed-methods approach to determine how undergraduate Biology students at a public university in Hawaii perceive an Open Biology textbook, including identification of design features, course satisfaction, and suggestions for improvement. Design decisions made based on conceptual frameworks as well as student feedback improved the text and the students' overall experience.

In "Learning Management Systems Adoption in Higher Education Using the Extended Technology Acceptance Model," Marissa R. Fearnley and Johnny T. Amora employ structural equation modeling to determine the influence of technology acceptance constructs among teachers in using a Learning Management System at a private college in the Philippines. Significant implications of the study include the importance of self-confidence and system quality in technology adoption.

In the sixth article, Iwona Kolodziejczyk, Philip Gibbs, Cecilia Nembou, and Maria Rodina Sagrista conduct regression analysis in a study of the level of digital skills among university students in Papua New Guinea. Their study, "Digital Skills at Divine Word University, Papua New Guinea," suggests that operational and formal skills are necessary, but not sufficient, for higher information skills. Compared to countries such as the Netherlands, the effects of the digital divide mean first year students in Papua New Guinea are at a disadvantage and face a steep learning curve in attaining digital literacy, thus needing exposure to digital skills much sooner.

Chesla Ann Lenkaitis, Shannon M. Hilliker, and Kayla Roumeliotis, through qualitative analysis, examine the effects of a virtual exchange among teacher training candidates learning to teach English to Speakers of Other Languages in their article, "Teacher Candidate Reflection and Development Through Virtual Exchange." Teacher candidates at a U.S. university partnered with English as a Foreign Language learners at a Mexican university to assist in language learning. The study supports direct language collaboration through virtual exchange as a contributor to teacher candidate success.

The eighth article, "Training Factors as Predictors of Students' Self-Efficacy Beliefs for Online Journalism Practice," authored by Joseph Njuguna, employs correlation analysis to determine the strength between training factors and students' self-efficacy in five Rwandan universities. The results show the importance of training in fostering students' beliefs and confidence in their capacity to perform online.

In the final article, "Developing an Open Educational Resource and Exploring OER-enabled Pedagogy in Higher Education," Beth Tillinghast relies on an interpretive qualitative approach to explore the perspectives of staff and faculty developing an Open Textbook using OER-

enabled Pedagogy in a public university in the United States. Constructs including attitude, performance expectancy, and facilitating conditions are found to be of critical importance in OER development. Further, the study recommends a team approach to OER development.

I hope you enjoy reading these articles as much as I enjoyed reviewing them.

Michael P. Menchaca
Editor, *IAFOR Journal of Education: Technology in Education*
tech.editor.joe@iafor.org

Notes on Contributors

Article 1: Facilitating Online Reading Comprehension in Enhanced Learning Environment Using Digital Annotation Tools

Dr Ruhil Amal Azmuddin is a university lecturer in Centre for Modern Languages, Universiti Malaysia Pahang. She has teaching experience spanning many years in renowned higher education institutions such as International Islamic University Malaysia (IIUM) and Limkokwing University. She obtained her PhD in English Language Studies from Universiti Kebangsaan, Malaysia and a Master of Educational Studies from University of Newcastle, Australia. Amal has published locally and abroad in various peer-reviewed and Scopus journals in her fields of interest, especially in reading English as a Second Language (ESL), Extensive Reading (ER), online reading strategies and teaching reading with technology. She has also presented at conferences locally and abroad in those areas. Her other writing experience includes a contribution to a chapter in a book, a module and a book on ER.
Email: ruhilamal@ump.edu.my

Dr Nor Fariza Mohd Nor, an Associate Professor at the Center for Research in Language and Linguistics, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia, is the Chair of the Center. She received her BA (Hons) in Modern English Language Education from Lancaster University, UK; MA in English for Specific Purposes from Warwick University, UK; and PhD in Applied Linguistics from University of Malaya, Malaysia. Her area of expertise and research interests are discourse studies (spoken discourse, e-discourse), critical discourse analysis and e-learning. Nor Fariza has presented at conferences and published her works in ISI, Scopus and indexed journals. She has also co-edited several books.

Dr Afendi Hamat is an Associate Professor at the Center for Research in Language and Linguistics, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia. His research areas are technology-assisted language learning and learning systems design. He has published various journal articles and books on his areas of research. His more recent work is cross-disciplinary in nature with collaboration in public health and health informatics.

Article 2: Democratization of Education through Massive Open Online Courses in Asia

Dr Runchana Pam Barger has a PhD in Cultural and Educational Policy Studies with a specialization in Comparative International Education. She is an Assistant Professor of TESOL (Teaching English to Speakers of Other Languages) in the Applied Linguistics and International Education Department at Wheaton College in Illinois, USA. She also is the Program Director of the English Partnership Programs at Wheaton College Graduate School. She was a U.S. Fulbright Scholar researching and lecturing in the Faculty of Education at Chiang Mai University in Thailand. Her research focuses on Massive Open Online Courses (MOOCs), technology, religion, gender, and cross-cultural studies in education. She is the author of *Religious Influences in Thai Female Education (1889–1931).*
Email: pam.barger@wheaton.edu

Article 3: Understanding the Characteristics of English Language Learners' Out-of-Class Language Learning through Digital Practices

Dr Ali Dincer has a PhD majoring in English Language Teaching. He is an Assistant Professor at Erzincan Binali Yıldırım University, Erzincan, Turkey. He also serves as the Head of Foreign Language Education in his faculty and Editor-in-Chief of *Erzincan University Journal of Education Faculty*. His primary research interests focus on psychological factors in language teaching including language learning motivation, autonomous language learning and classroom engagement. He is currently conducting research on out-of-class autonomous language learning with technology.
Email: adincer@erzincan.edu.tr

Article 4: Beyond the Basics: Adapting an Open Textbook to Accommodate a Flipped Class

Dr Ariana Eichelberger is an Associate Specialist faculty member with the Department of Learning Design and Technology at the University of Hawaii at Manoa. She has a PhD in Education specializing in Educational Technology. Dr Eichelberger is the Instructional Designer for the College of Education and leads its Instructional Support Group providing faculty professional development and technology support. She also works with the College's Distance Course Design and Consulting Group as an instructional designer developing online courses and programs. Her research areas of interest include online teaching, online course and program development, technology integration and faculty professional development.
Email: ariana@hawaii.edu

Dr Hong Ngo has a PhD in Education specializing in Learning Design and Technology. Dr. Ngo earned other advanced degrees in Educational Administration and Educational Technology. She works as an instructional designer and currently serves as a senior manager in the Academic Research of the Vietnam-USA Society English Centers. Her research interests include instructional design, online learning ecologies, educational leadership, school violence and family violence.
Email: hongngo@vus-etsc.edu.vn

Article 5: Learning Management System Adoption in Higher Education Using the Extended Technology Acceptance Model

Marissa R. Fearnley is an Assistant Professor teaching science at the School of Multidisciplinary Studies (SMS) of De La Salle-College of Saint Benilde (DLS-CSB) in Manila, Philippines. She also serves as the Director of the Center for Instruction, Research, and Curriculum (CIRC), the College's faculty development arm. She has a degree in Master of Public Health and Master of Learning and Teaching. Her research interests include technology-supported teaching and learning and professional development in higher education.
Email: marissa.fearnley@benilde.edu.ph

Johnny T. Amora is the Officer-in-Charge of the Center for Learning and Performance Assessment (CLPA) of DLS-CSB. Presently, he is the President of the Philippine Association of Researchers and Statistical Software Users (PARSSU). He facilitates seminars and workshops related to applied statistics and analytics. He holds a degree in Master of Applied Statistics, with research interests in the applications of statistical modelling in studies related to human sciences, academia, and business.

Article 6: Digital Skills at Divine Word University, Papua New Guinea

Dr Iwona Kolodziejczyk is an Associate Professor and Director of the Centre for Learning and Teaching at Divine Word University in Papua New Guinea. She is an active researcher; her research interests are in gender and technology, technology in higher education, and academic integrity in technology-enhanced academic practices.
Email: ikolodziejczyk@dwu.ac.pg

Dr Philip Gibbs is Professor of Social Research and Deputy President at Divine Word University, Papua New Guinea. He holds a Doctorate in Theology from the Gregorian University, Rome, and an MBA from Divine Word University, Papua New Guinea. Recent publications include Enga Tindi Pii. The Real World and Creative Imagination, in *Sung Tales from the Papua New Guinea Highland***s**; Using Mobile Phones to Track Anti-Witchcraft Violence in Papua New Guinea (with Sarah Logan); and with Miranda Forsyth, Contagion of Violence: The Role of Narratives, Worldviews, Mechanism of Transmission and Contagion Entrepreneurs, *International Journal for Crime, Justice and Social Democracy*.
Email: pgibbs@dwu.ac.pg

Dr Cecilia Nembou is Professor of Higher Education Leadership and Management and President of the Divine Word University in Papua New Guinea. She holds a PhD in Operations Research from the University of New South Wales, Sydney, Australia; Master of Science in Operations Research from the University of Sussex, Brighton, UK; Graduate Diploma in Statistics from the Canberra College of Advanced Education, Canberra, Australia; and Bachelor of Science in Mathematics from the University of Papua New Guinea, Port Moresby, Papua New Guinea. Her research interests include systems modelling and quantitative analysis for strategic planning, management and decision making, with particular focus on leadership and management in higher education. She has held various academic and senior management positions at the Divine Word University in Papua New Guinea, University of Wollongong in Dubai, and University of Papua New Guinea.
Email: cnembou@dwu.ac.pg

Ms Maria Rodina Sagrista is a Spanish communications specialist. She holds an Erasmus Mundus Master's Degree in Women and Gender Studies from the University of Granada (Spain) and Utrecht University (The Netherlands) and an Honours Degree in Audiovisual Communication from Ramon Llull University (Spain). She taught in the Communications Department at Divine Word University, Papua New Guinea, and has served with the UN Relief and Works Agency in Aman, Jordan and the International Rescue Committee in Mae Sot Thailand.
Email: mariarsagrista@gmail.com

Article 7: Teacher Candidate Reflection and Development Through Virtual Exchange

Dr Chesla Ann Lenkaitis received her PhD from Temple University in Philadelphia, Pennsylvania, USA. Before finishing her doctoral work and working at Binghamton University, Dr Lenkaitis worked as a public high school teacher for over 8 years. She dedicates herself to teaching Spanish and identifying the most effective ways to facilitate the learning and teaching of a second language (L2). Her areas of specialty include technology integration into the L2 classroom. More specifically, she examines the use of virtual exchange and its impact on L2 learning and teaching. Chesla Ann Lenkaitis has presented her research at various international conferences and her work has been published in journals including *Computer*

Assisted Language Learning, *Journal of International and Intercultural Communication*, and *Teaching and Teacher Education*. In addition, she co-edited the book *Engaging teacher candidates and language learners with authentic practice* and is an Editor of the *MEXTESOL Journal*.
Email: chesla.ann.lenkaitis@gmail.com

Dr Shannon M. Hilliker received her Master's in Teaching English to Speakers of Other Languages (TESOL) and PhD at the University at Albany in Curriculum and instruction with a focus on language learning. She has taught elementary and university level English as a Second Language (ESL) and teacher candidates since 1999. Dr Hilliker is an Assistant Professor of TESOL at Binghamton University (Binghamton, New York, USA) where she teaches linguistics and grammar classes, how to use technology in the classroom, and supervises internships for both pre- and in-service teacher candidates. Her research interests include rural education, teacher professional development, elementary ESL after school programs, international student success, and online conversation and culture exchange. Her main research agenda features studies related to virtual exchange between teacher candidates as well as teacher candidates and second language learners.
Email: hilliker@binghamton.edu

Ms Kayla Roumeliotis is a graduate student in the Elementary Inclusive Education program at Teachers College, Columbia University (New York, New York). She is a recent graduate of Binghamton University (Binghamton, New York), where she majored in psychology and completed two minors in education and Spanish. She is interested in how people acquire languages, how teachers can be prepared to teach languages, and the use of technology to facilitate learning.
Email: kr2788@tc.columbia.edu

Article 8: Training Factors as Predictors of Students' Self-Efficacy Beliefs for Online Journalism Practice

Mr Joseph Njuguna holds a Master's degree in Communication Studies. He is currently affiliated to the University of Rwanda as Research Associate as he finalizes his field research towards a PhD in Mass Communication. Mr Njuguna's research interests are in media convergence, journalism education, media policy and regulation as well as ICT for development.
Email: jnjuguna110@gmail.com

Article 9: Developing an Open Educational Resource and Exploring OER-Enabled Pedagogy in Higher Education

Dr Beth H. Tillinghast has a PhD in Learning Design and Technology from the University of Hawaii at Manoa. She also holds an MS in Library Science and an MA in Educational Technology. She has worked in education for over four decades, living and working in countries in Latin America, Southeast Asia, and the Middle East. She has recently retired from the University of Hawaii at Manoa Library as a librarian working in the area of scholarly communication. Her research interests include areas of open educational practices with a focus on Open Access and Open Educational Resources.
Email: betht@hawaii.edu

Facilitating Online Reading Comprehension in Enhanced Learning Environment Using Digital Annotation Tools

Ruhil Amal Azmuddin
Universiti Malaysia Pahang
Malaysia

Nor Fariza Mohd Nor
Universiti Kebangsaan Malaysia
Malaysia

Afendi Hamat
Universiti Kebangsaan Malaysia
Malaysia

Abstract

The use of technology has now become an integral part of higher education in Malaysia because of its positive outcomes in teaching and learning. Despite its use, students are not able to fully benefit from its full potential. This study investigated the use of digital annotation tools in Interactive Reading for Academic Disciplines to facilitate reading of English for Science and Technology materials in a blended course among university students. Data were collected from 12 students enrolled in English for Technical Communication in a public university on the East Coast of Peninsular Malaysia. Data collection consisted of online annotations and focus group interviews. Analysis was descriptive and thematic, using SPSS and NVivo software, respectively. Inter-rater reliability analysis was measured using Cohen Kappa reliability analysis that yielded an almost perfect score, proving that the data were reliable. The findings revealed that digital annotation tools facilitated reading comprehension among students in an online reading environment. Annotation analyses revealed consistency in interview data when students were able to paraphrase, extend and synthesize ideas. An implication from this study suggests that training students' regarding strategies on how to deal with annotation tasks should be mandatory. This is integral for students to achieve comprehension of English for Science and Technology materials in an online environment.

Keywords: digital annotation tools, online reading, English for specific purposes, English for science and technology

Online materials have now become one of the main sources of knowledge for students, especially in academic settings. With the spread of digital educational spaces such as blogs, Online Discussion Forums (ODF), Wikis and Learning Management Systems (LMS), there is a rising demand for materials that can be read in digital formats. Within this context, it is the educator's role to equip students to read online and explore online features so that they can make the most of the myriad of online resources (Gilbert, 2017) and also to enhance learner autonomy. If students are not well equipped, they will face challenges reading online because the materials change and distract readers with multimodal features (Cho & Afflerbach, 2017). Hence, teaching students how to read effectively online is crucial as library materials have been digitized to create e-books and online articles.

Research on online reading comprehension is expanding from traditional comprehension models to include "the purposes that drive online reading, communicative outcomes of online reading, and the continuously changing nature of the strategies, skills and dispositions that are required during online reading comprehension" (Leu Zawilinski, Castek, Banerjee, Housand, Liu & O'Neil, 2007, p.5). Moreover, according to Murugaiah (2016), a number of Computer-Assisted Language Learning (CALL) technologies (for example electronic dictionaries and multimedia annotations) are commonly employed in teaching and learning as they provide assistance for learners in various ways. For example, there is a belief that using various online annotation types is a good, supportive reading strategy for learners (Thoms & Poole, 2017). Huang (2014) conducted a study to examine the effectiveness of online versus paper-based reading strategy instruction on EFL learners' reading comprehension on fifty-seven students. The result revealed that the second most positive feedback was that the online highlighting function of the annotation tool facilitated incidental vocabulary learning because the colour-coded highlight function helped students tracked the parts that require attention. They also used the highlighting function to re-read for understanding. Ridder (2002, as cited in Huang, 2014) reported that the highlighted or visible hyperlinks increase students' willingness to consult electronic dictionaries. In some cases, annotations or dictionary definitions are available for students but these are not readily accessible and students cannot use these tools to their full potential. Herold (2014) contends that students need to work with the online tools, which are very useful, to learn at the highest level. Such online tools that can assist students in learning include Digital Annotation Tools (DAT). Hence, to understand ways in which DAT facilitate teaching and learning, this study addressed the following research questions:

1. What are the types of annotations made by students in Interactive Reading for Academic Disciplines (iREAD)?
2. How do annotation tools facilitate students reading of English for Science and Technology (EST) online materials?

Previous studies have concentrated on the effectiveness of annotations on reading comprehension. Some of these studies have concentrated on the use of annotations but have failed to delineate the actual process involved in using annotations to assist students to reach higher reading comprehension levels (Tseng, Yeh & Yang, 2015). However, far too little attention has been paid to the importance of annotations in teaching and learning. There is still much uncertainty that exists about the relation between annotation types and online reading comprehension. If teachers are not able to identify exactly which annotation types are useful for reading comprehension, they will not be able to determine reading instructions to promote students' comprehension levels. Thus, information obtained from what Malaysian English as a Second Language (ESL) university students do while reading EST online materials would contribute to the pedagogical aspect of English for Specific Purposes (ESP). This paper begins

with a literature review related to the study, then describes the methodology used, presents the results, provides a discussion of these, and lastly draws conclusions.

Literature Review

Theoretical Discussion

One reading model that is important in the current study is the Interactive Reading Model (Rumelhart, 1977). According to Rumelhart (1977), reading combines both bottom-up and top-down processes. Interactive models recognize the simultaneous interaction of lower level processing skills and higher-level cognitive skills. According to Duke and Pearson (2002), when it comes to comprehension, visual representation will help students understand, organize and remember. For example, highlighting information in a text is a supportive reading strategy as it allows readers to remember what they read and extract important elements. Thus, some elements of annotations conform to reading comprehension theories because these elements provide interactive reading opportunities that help students identify the key elements of paragraphs (Lo, Yeh & Seng, 2013). The key elements in the interactive reading model are important in the current study as students interact with texts by identifying parts of online reading materials through the use of DAT.

Previous studies report students' reading comprehension and their recall of information are based on a student's ability to recognize organizational structures (Lo et al., 2013, Gilbert, 2017; Ruhil Amal, Nor Fariza & Afendi, 2018). The ability to recognize organizational structures allows students to create a mental representation of the information and to see the logical links made by the author. Good readers can use text structures to retrieve the main ideas and to help them memorize propositions gained from reading. There is a large volume of published studies describing the role of teaching text structures to students (Duke & Pearson, 2002; Moss, 2004; Pardo, 2004). What is not yet clear is the impact of the types of annotations that students make in identifying text structures in achieving comprehension. This indicates a need to understand the various ways that DAT assist students in learning.

Blended Learning in Higher Institutions

The popularity of blended learning is increasing because it integrates online technology such as learning management systems and platforms, making learning more interactive. Previous studies recorded higher achievements and better attitudes toward learning when the effectiveness of blended learning was compared to conventional teaching approaches (Thang, Wong, Noorizah, Rosniah, Najihah & Kemboja, 2012). Educators use blended learning as an approach to teaching because of its potential to maximize learning and create a more efficient learning environment. For example, blended learning is believed to increase communication skills (Wang, Wooa & Zhao, 2009), improve critical thinking skills (Güzer & Caner, 2014), and to support collaborative learning (Haryani, Wan Faezah & Nor Aini, 2012). In Malaysia, 50% of courses in higher institutions offer online courses because it is an effective means to communicate within the teaching and learning context in the current era (Norazah, Mohamed Amin & Zaidan, 2011). Taken together, these studies reflect the benefits and need to incorporate blended learning in tertiary education contexts.

For example, in a blended learning English as a Foreign Language (EFL) environment, Lo et al. (2013) proposed an interactive approach in learning paragraph structure through the use of an online annotation system, *Paragraph Annotator*. Paragraph Annotator includes three highlight buttons; yellow for topic sentence, blue for controlling idea, and green for supporting details. These functions allow readers to analyze paragraphs and use annotation tools to add

personal ideas. Both a Cued Recall Test and a Free Recall Test were used to assess students' comprehension between experimental and controlled groups. The results revealed significantly better performance in both tests. However, the author overlooks the fact that annotation types contribute to performance. The results of this study suggest that online annotation technology provides EFL students with a flexibility to interact with the text that would not be accomplished in reading books alone.

Online Reading

With the development of technology, reading has shifted to using non-traditional media such as reading information on the world wide web in the form of videos, pictures, sounds, animations and hyperlinks known as online reading (Sung, Wu, Chen & Chang, 2015). According to Sung et al. (2015), reading online often creates a "hypertextual" form of reading that consists of nodes and hyperlinks. Reading this type of information requires the information to be read according to the order of the nodes. Even though hypertexts are considered to be non-linear, many still read them in a linear mode, merely transferring offline reading skills to online reading. This concept has recently been challenged by Kiili & Leu (2019) who believe in the complexity of the online reading and the challenges students face especially in collaborative online reading. There are specific strategies that are more appropriate for online reading.

However, there are various strategies used to manage online information and to navigate successfully by selecting links that are useful. This ability is required for successful online reading as it allows the reader to understand and construct potential meanings (Ruhil Amal et al., 2018). As proposed by Cho and Afflerbach (2017), there are three levels of building coherence in online reading: information comprehension; intertextual connection; and construction of reading paths. The first online reading strategy is related to traditional reading strategies such as infering, analyzing text information, and evaluating whether the text fulfills the reading objectives. The second online reading strategy, intertextual connection, refers to synthesizing multiple online sources that require multiple-text linking strategies to critically compare, evaluate, and corroborate the information found in diverse documents, to identify differences between sources, and to integrate content from different sources. The third strategy (construction of reading paths) refers to the construction of meaning through networked information technology that requires careful evaluation and selection of links. What is not clear is the impact of DAT on reading comprehension.

Digital Annotation Tools

More and more materials are becoming available as electronic documents, increasing the need for mechanisms that allow online annotations because annotation mechanisms have the potential to enhance reading online (Chiu-Jung & Pei-Lin, 2012). Annotation mechanisms such as EDUCOSM (Nokelainen, Kurhila, Miettinen & Tirri, 2003) and PAMS (Su, Yang, Hwang & Zhang, 2010), allow students to annotate the same documents, and share and provide feedback on the annotations (Tseng et al., 2015) to improve their reading comprehension. Several researchers contend that annotation methods such as underlining unfamiliar vocabulary, marking main ideas or key words, or adding notes for reflection improves reading comprehension (Marshall, 1997). These annotation methods minimize the cognitive load of the reading process (Chun & Payne, 2004), encourage understanding by connecting information in a text (Abuseileek, 2012), and improve critical reading skills (Johnson, Archibald & Tenenbaum, 2010). Annotation methods also provide interactive reading opportunities to identify key elements of paragraphs (Lo et al., 2013). Taken together, these are important processes in reading academic online materials.

Recent studies point out the importance of DAT to enhance teaching and learning because annotated texts allow for better comprehension in comparison to those without annotations (Chen, Hwang, & Wang 2012). For example, annotation software such as RedPencil encouraged students to be involved in their learning activities (Ahern, 2005). Students can easily use RedPencil to submit assignments and to view others' annotations or comments. It is not surprising that annotations can help students' comprehension in various ways. Despite this, much uncertainty still exists about the relation between annotation types and comprehension. In another study of an annotation technology called HyLighter, social annotation was examined. This study found students exhibited more critical-thinking skills than metacognition and comprehension skills when working in groups compared to working individually (Johnson et al., 2010). The study concluded that annotation, reflection and highlighting will not have a significant impact if conducted alone.

The ability to highlight the main points becomes an important reading strategy that guides students to achieve overall understanding of the online materials. Highlighting texts support reading because of three reasons as hypothesized by Li, Tseng & Chen. (2016). Firstly, highlighting is an encoding process that identifies key parts of a text. Secondly, highlighting texts captures readers' attention because they are able to recall texts easily compared to texts that are not highlighted. Lastly, highlighting texts acts as visual signals that allow retrieval of critical points during a reviewing process. Thus, annotations such as highlighting texts help learners monitor their understanding of the text as they decipher the L2 reading (Thoms & Poole, 2017). Together, these studies provide important insights into the need to utilize DAT to assist with the reading of online academic texts.

Methodology

The focus of the current study was to explore processes involved in reading EST materials in an online environment. This was conducted in an ESP course named English for Technical Communication (ETC) that utilized DAT in an online reading platform named Interactive Reading for Academic Disciplines (iREAD) for teaching and learning. Hence, a mixed method approach was used as the research design because descriptive statistical data from students' use of DAT were used to support the data gained from the focus group interviews.

Participants

The study adopted a purposeful sampling method to obtain rich data. Purposeful sampling refers to intentionally selecting a sample that explores the main concept being studied (Creswell & Plano 2011). Hence, a sample of 55 students from 614 students enrolled in English for Technical Communication from various Science and Technology courses for Semester 1, 2016/17 were selected. Twelve students were then selected to be a part of the qualitative data collection. There was an equal number of male and female students aged between 21 and 23 years old. All the students were taking the same English course; a compulsory level 2 English course at the university. Each student was provided a consent form to be a part of the study. The course is a blended course, where students met twice weekly for 2-hours tutorial and 2-hours computer labs. Students were participating because they had to for this class. However, during the initial briefing, students were briefed on the research project and were given options to move to other classes if they do not wish to participate. This is to ensure that they know their involvement is entirely voluntary and there are no repercussions for them not getting involved.

Instruments

Focus Group Interview protocols. One of the instruments used to collect data was through Focus Group Interview (FGI) protocols. The objective was to collect a shared understanding that focused on the current study and to generate data from the group. The interview protocol was designed to gauge the opinions of students about the use of DAT in iREAD. The questions were created by the researcher, which were then verified by experts in the field. The FGI protocol consists of questions related to the use of DAT such as highlighting and writing down annotation notes.

Online reading system: iREAD. An online reading platform called the Interactive Reading for Academic Disciplines (iREAD) was used to obtain annotation data. The system was developed by Universiti Kebangsaan Malaysia experts (Nor Fariza, Afendi, Hazita, Noorizah & Vengadasamy, 2014) with various functionalities such as DAT, discussion forums, video and audio features. Although the system consists of various online tools, the current study highlights just one of the main features, the annotation tools. The annotation tools in iREAD contain two features. The first feature allows students to highlight online reading materials with various colours such as yellow, red and green. The second feature allows students to write notes, comments or information about the texts that were highlighted.

Online reading materials. Text selection was based on an ETC module utilized by students during the semester. Each text was analyzed according to the Flesch Kincaid Readability Index that generates the level of difficulty of the reading texts. This allows the researcher to determine the suitability of the texts according to the students' proficiency level. Table 1 summarizes the topics covered during the two weeks.

Table 1: Topics in English for Technical Communication

Week	Topic	Flesch reading ease
5	Process Explanations: How to use a compass	63.9 – Standard/ average
6	Directional Process: At the factory, from bean to bar	54.9 – Fairly difficult to read

In Week 5, the lesson required students to read a 397-word essay about how to use a compass. The essay is written in a technical description format that consists of the vital elements (i.e main parts, dimensions) required in a complete write up. The essay consists of four paragraphs describing how to use a compass and how compasses work. The readability index for this essay was 63.9 – making it standard or average difficulty. The idea of selecting an average readability text was to introduce a more difficult text in the following week. Hence, in Week 6, students were required to read an essay entitled "At the factory: from bean to bar" with a readability index of 54.9, which was fairly difficult to read. Here, students were required to highlight and summarize in their own words the process of making chocolates.

Data Collection Procedures

Annotation data were collected in Week 5 and 6 during a 14-week semester. For the annotation activities, students were required to highlight parts of the text and then rewrite in their own words what each highlighted text meant. This involved four steps in using the digital annotation tools: selecting the element to be highlighted; applying the corresponding highlighted color (yellow, green or red); adding comments to the highlighted text; and, clicking the save button. At the same time, students were encouraged to use red highlighter to identify the topic sentence,

yellow to identify central ideas and green for supporting details. However, not all students used the colored highlighter accordingly. Figure 1 labels the process for using the digital annotation tools.

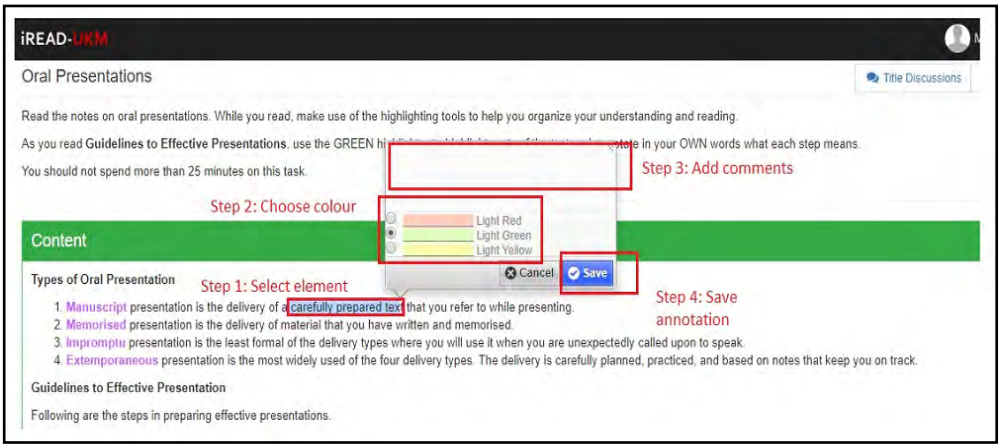


Figure 1: Screenshot of annotation process

Each annotation consists of either a word, a sentence-length, or a paragraph, which were made using the DAT in iREAD, where each annotation was considered to be a unit of analysis. The data were tabulated and described according to the themes created and illustrated in the findings. FGI was conducted in Week 7, after the students completed activities related to Technical Descriptions and Process Explanations. FGIs were conducted in two groups with 6 students in each group. The focus of the interview was to reflect on the use of DAT to facilitate reading of EST online materials while completing the activities in iREAD. Data were analyzed thematically.

Data Analysis

The study analyzed annotations using content analysis based on categories adapted from Marshall (1997) as cited in Tseng et al. (2015) where *Minf* refers to marking information. Two forms of *Minf* were categorized by the researcher as highlighted texts that identify keywords or main ideas, and written notes that are rephrases of a keyword or main idea and summarized ideas. The second type of annotations were *Mvoc,* which refers to marking vocabulary. Thus, two different highlights identify different elements of the online text.

The FGI data were analysed using the six steps proposed by Creswell (2014), which includes preparing and organizing the data, exploration of data through coding, creating themes, representing themes through narratives, interpreting the results and, validating the accuracy of findings. Data were validated using Cohen Kappa inter rater reliability analysis based on the developed themes. The calculation yielded a K value of 0.7, which indicated a substantial agreement, showing that the data analysis had a high reliability.

Results

In order to understand types and ways annotation tools facilitated reading of EST online materials, data are described thematically under two headings: identify paragraph structure, and improve understanding. The data described are gained from FGI and annotations made by students.

Identify paragraph structure

The following section discusses the use of iREAD's annotation tools in identifying paragraph structure when reading "How to use a compass". The data are presented in the form of interview excerpts (as depicted in words and phrases which are in bold) as well as a tabular format through the activities students completed. The researcher highlighted the bold words that identify the important points stated by students during the interviews. Students believe that annotation tools assist them in identifying paragraph structure when reading a text. The interview excerpts in Table 2 demonstrate this point.

Table 2: Interview excerpts 1

Student	Interview excerpts
Student L	We can know the passage flow and also we can **know how many main parts, how many sub-parts** according to the body. The body and the parts
Student S	Let's say when we highlight, we can know **what the paragraph is about** like this part we can talk about **body then we can know the sub-part**. This paragraph is talked about **body part, the function, dimension or description** to us. I can know my reading progress
Student V	**I can highlight the main idea, sub parts, main parts to let me recall back what I have read.** Oh, this is what source of description is. This is that and all that.
Student C	We do the activity for the technical description. So we want to know that which part you want to highlight first. For example, you want to **know the size, the material, the colour**, so we will focus on that

The interview excerpts in Table 2 are students' claims that annotation tools assist them in identifying parts of a paragraph structure such as "main parts", "sub-parts", "dimension", "description" and "color" in understanding a technical description. In view of this, online annotations made by students were analyzed in order to validate students' ability to recognize paragraph structure of a technical description as claimed by students in the interviews. The annotation activity that was explored was based on the lesson in Week 5 (see Table 1). For this particular activity, none of the students highlighted texts on vocabulary *(Mvoc)*. Table 3 summarizes the types of annotations made by students.

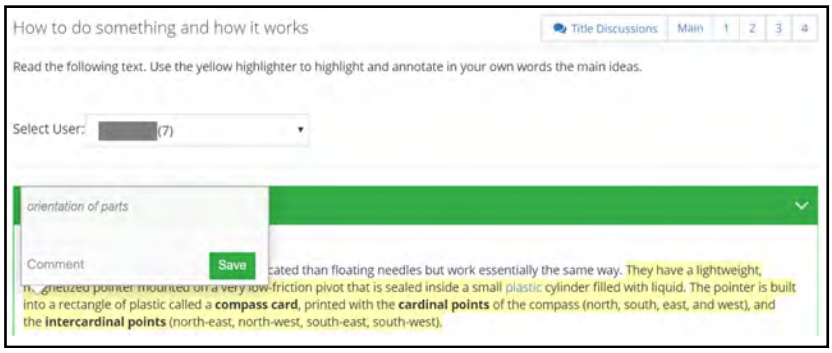
Table 3: Summary of annotations on Process Explanations

No	Student	Highlighted text *(Minf)*	Written notes *(Minf)*
1	Student E	9	6
2	Student T	8	8
3	Student L	4	4
4	Student G	8	8
5	Student S	0	0
6	Student K	4	4
7	Student V	7	7
8	Student J	1	1
9	Student C	6	6
10	Student R	9	8
11	Student H	4	4
12	Student A	6	0
	Total	**66**	**56**

Based on Table 3, all of the annotations made by students were content-based annotations (*Minf*). This means all annotations highlighted and written were identification of paragraph structure. There were 85% of written notes and only 15% were highlighted texts. This denotes students were able to identify parts of a technical description. The following screenshots are examples illustrating annotations made by students in identifying parts of a paragraph structure.

As shown in Figure 2, Student V was able to annotate parts of a paragraph structure. First, Student V identified 'orientation of parts' as a key component in the introduction of a technical description. Then, Student V identified "1st step" as part of how to use the compass. The other annotations were also "2nd step" and "3rd step". Student V was able to annotate 7 parts of a paragraph structure (see Table 3). These annotations are consistent with her claims in interview excerpt: *I can highlight the* ***main idea, sub parts, main parts*** *to let me recall back what I have read.* The bold words identify the important points stated by students during the interview.

Annotation No. 1:



Annotation No. 2:

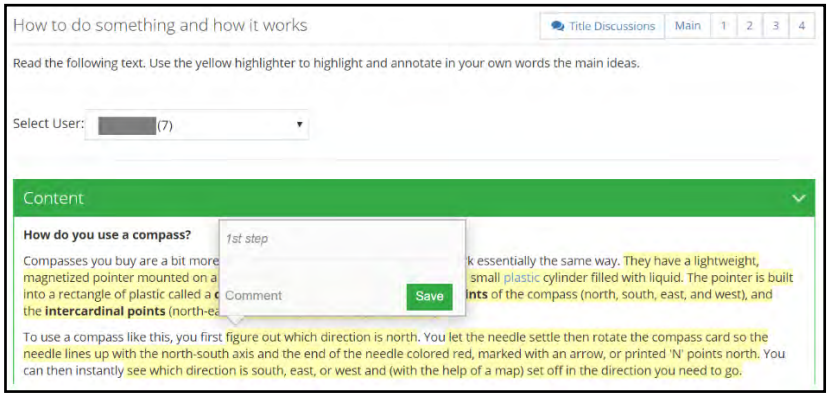
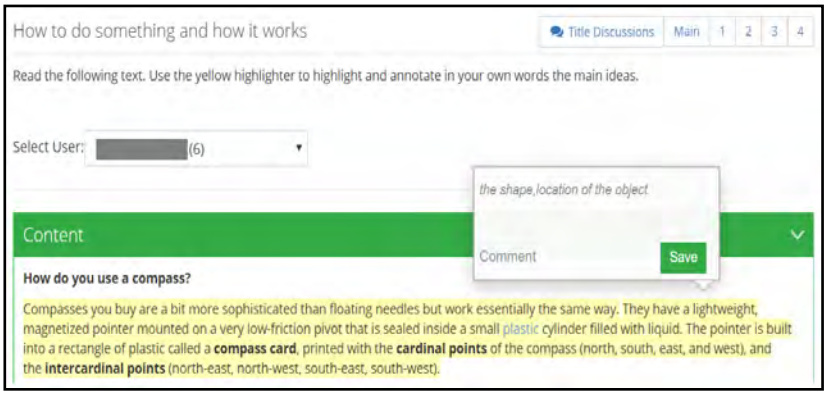


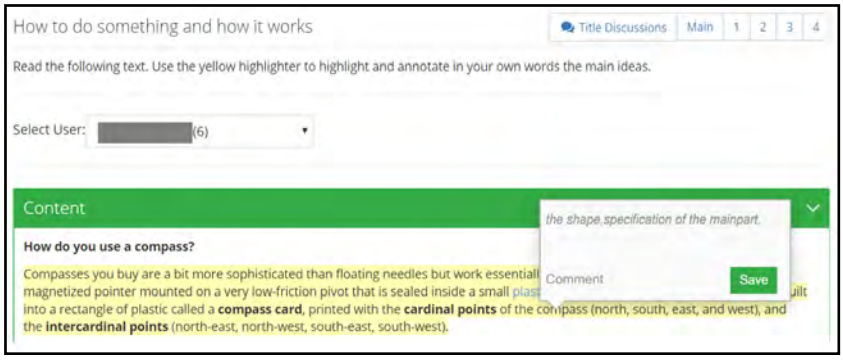
Figure 2: Screenshot of annotation No. 1 and 2 by Student V

Figure 3 demonstrates three examples in identification of paragraph structure by Student C.

Annotation No. 1:



Annotation No. 2:



Annotation No. 3:

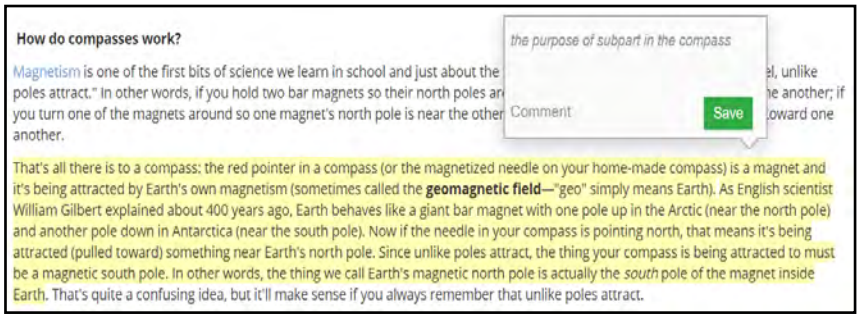
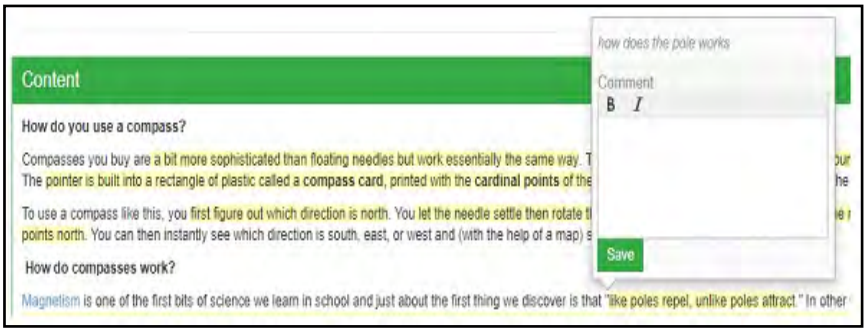


Figure 3: Screenshot of annotations Nos. 1, 2 and 3 by Student C

Annotations Nos. 2 and 3 were both part of introduction of a technical description that consists of "the shape and location of the object" as well as "the purpose of sub-part" as part of the content element in a technical description. Overall, Student C is consistent in being able to identify paragraph structures as claimed in interview excerpt "…*you want to know* ***the size, the material, the colour****, so we will focus on that.* The bold words identify the important points stated by students during the interview.

Figure 4 demonstrates two examples in identification of paragraph structure made by Student E.

Annotation No. 1:



Annotation No. 2:

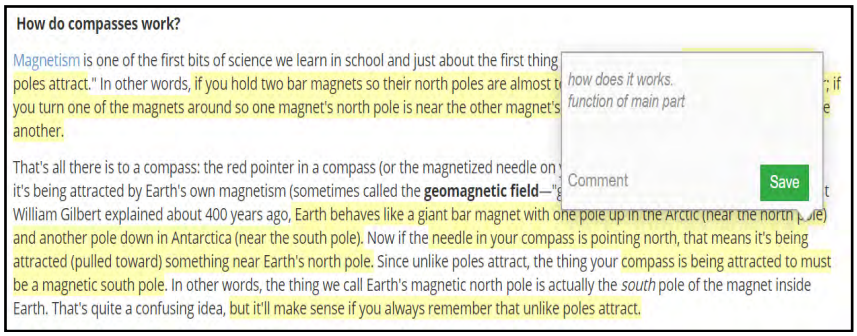


Figure 4: Screenshot of annotation no. 1 and 2 by Student E

Student E was able to annotate “how does a pole work” and “function of main part” as seen in Figure 4. In total, he was able to make 12 annotations (see Table 3), in which 3 did not include any written notes. This indicated that Student E understood parts of an essay on a technical description and was able to identify technical description essay structure.

Improves Understanding

Another major finding was that reading online materials using DAT helps students comprehend the texts better because they are able to paraphrase the text based on their own understanding (as depicted in words and phrases which are in bold). The researcher highlighted the bold words that identify the important points stated by students during the interviews. This theme was derived from interviews about “key stages of making chocolates”. The interview excerpts in Table 4 demonstrate this point. The researcher highlighted the bold words that identify the important points stated by students during the interviews.

Table 4: Interview excerpts 2

Student	Interview excerpts
Student K	We **annotate in our way, so we understand better**…**we can just summarize** all the main point then we can know about what the passage say about. It is more clear when reading the text
Student E	For me the annotation tools is quite useful because when the key-point is there and **how they elaborate** is very important and maybe we **can rephrase it** into another words so that we can **easily understand** about that
Student L	I think it [annotation tools] is useful because it is **easier for us to understand what the text is going to talk about.**

Based on Table 4, students K, E and L believe that DAT provide the opportunity to annotate the information read online using their own linguistic knowledge to achieve comprehension. This allows for the opportunity to elaborate the online information to reach comprehension. As a result, learning becomes meaningful when understanding is attained.

According to students, using DAT when reading online materials improves understanding because they were given the opportunity to highlight and then rewrite (through written annotations) the ideas. This was important for students because the online reading materials were complicated because of its S & T entities. This is further elaborated in Table 5. The researcher highlighted the bold words that identify the important points stated by students during the interviews.

Table 5: Interview excerpts 3

Student	Interview excerpt
Student E	I can **read much more better** than before this, because last time some of the words I really can't understand, throughout iREAD and those annotation by phrase and all that, **I can easily understand some of the new word** that never seen before
Student H	While we are writing or going to present something. We have the ideas. The manufacturing of the rice, the process. **Those are all ideas that I now know and understand**
Student C	Erm after we do some activity that we feel that we will **more easy to understand** about what really want to do in the activity related about the activity and what not to do.
Student A	It **makes me more understand** the text and helps me **analyze from sentence to sentence,** assists me to find out main idea and explanations. Gives me an **overall understanding** of the text that I read
Student K	We can, we use the tools so that **we can easily know every details** of the subject about. Yeah, we can also know important, **what the subject is mainly about** the parts or something. So when **I do this it makes reading become easier to understand** because I can organize it this way
Student R	Because previously when I read all these scientific passage, it is all in exam, it is all for exam purpose. So that we just like read the question and find the answer, but through this iREAD, we actually **reading a passage, analyze the passage and then we understand in our own ways**

All six students believe that DAT assisted them in understanding because it provides an outlet to express comprehension of S & T information. As illustrated in Table 5, one possible implication in achieving comprehension of EST online materials is when students were able to summarize the main points. These responses illustrate the students' ability to understand the online materials because they were able to annotate the reading text in a way which is

comprehensible to them. For example, when students were able to paraphrase and elaborate the reading materials that relate to their academic background, they were also able to organize their understanding accordingly. What this means is that topics such as processes that seem to be complicated may be less complicated to understand. This is significantly important because learning S & T in a SL can be rather challenging.

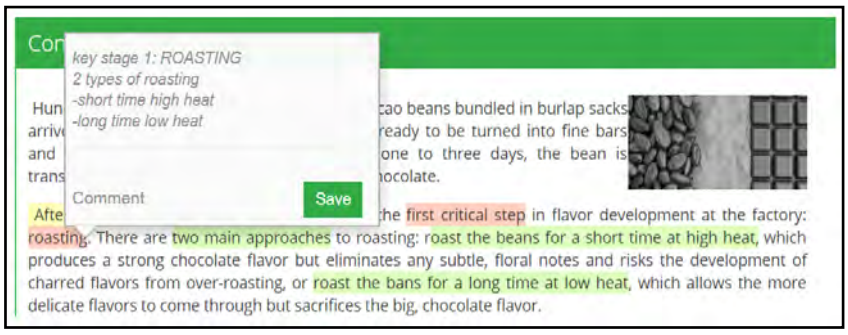
In order to validate the data obtained from the interviews, the study analyzed the annotations made by students. This consists of *Minf* for both highlighted texts and annotation notes made by students. The purpose is to confirm the students' ability to understand the EST online reading materials as claimed in the focus group interviews. Table 6 summarizes the annotations made by students based on the activity in Week 6 (see Table 1).

Table 6: Summary of annotations on Directional Process

No	Student	Highlighted text *(Minf)*	Annotation notes *(Minf)*
1	Student E	26	10
2	Student T	32	4
3	Student L	22	22
4	Student G	9	9
5	Student S	16	6
6	Student K	16	16
7	Student V	0	0
8	Student J	3	2
9	Student C	26	14
10	Student R	29	11
11	Student H	24	17
12	Student A	4	0
	Total	**207**	**111**

Table 6 reveals a total of 207 texts that were highlighted and 111 of which included written notes. This means that 54% were the reproduction of main ideas. This shows that students understand the texts as claimed in the FGIs. They reproduced the main ideas based on their background knowledge and linguistic knowledge. This is complementary to Schema Theory (Carrell, Devine & Eskey, 1988), where background knowledge is matched with textual data. Samples of annotations made by some of the students are shared in Figure 5.

Annotation No. 1:



Annotation No. 2:

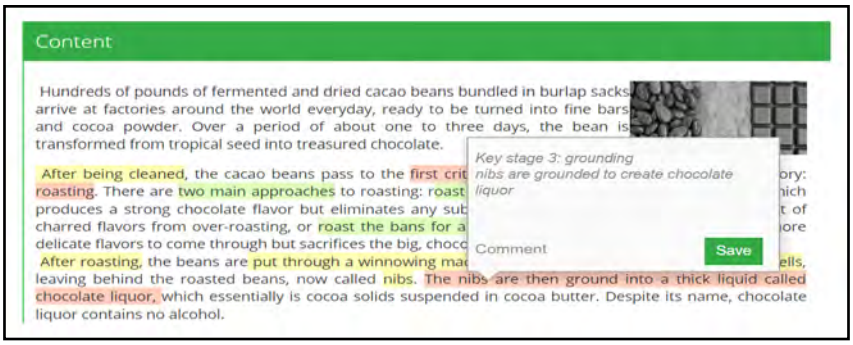
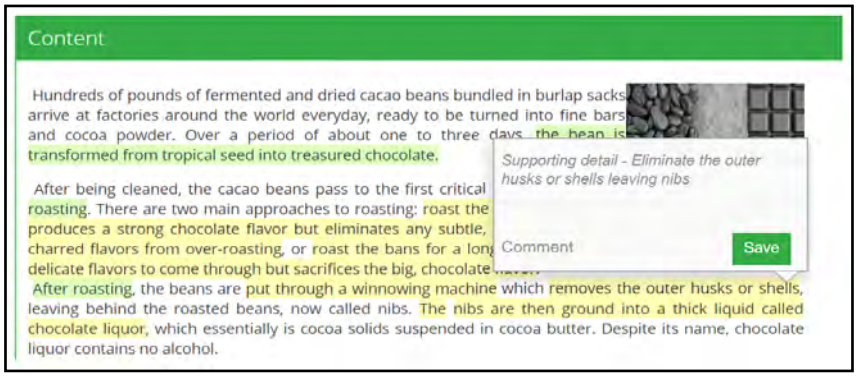


Figure 5: Screenshot of annotation no. 1 and 2 by Student R

Based on Figure 5, Student R was able to elaborate the first step of making chocolates which is "roasting". Throughout this activity, Student R was also able to identify each key stage systematically. For example, he was able to identify the third stage which is "grounding". As seen in annotation no. 3, he paraphrased the idea through changing the sentence based on his knowledge and interpretation. This is an indication of the use of support reading strategy (Anderson, 2003). As such, Student R was able to use proper reading strategy to facilitate reading of EST online materials.

Annotation No. 1:



Annotation No 2:

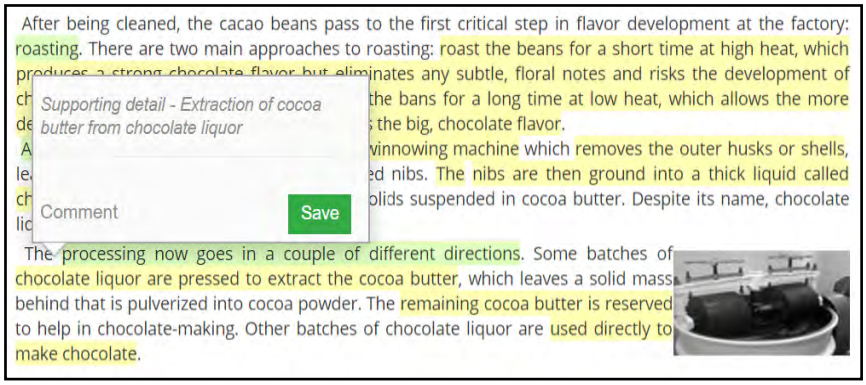
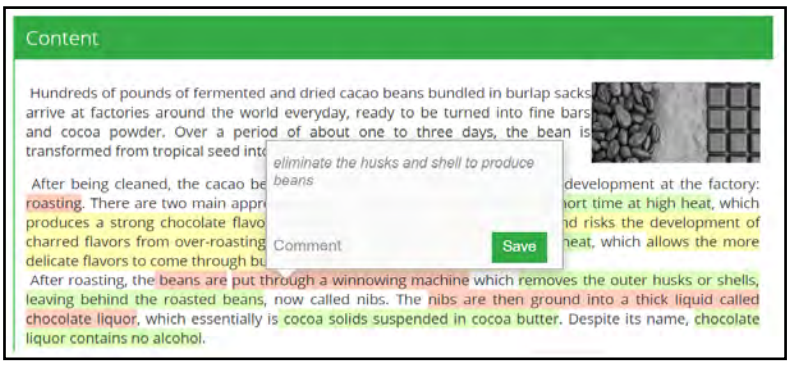


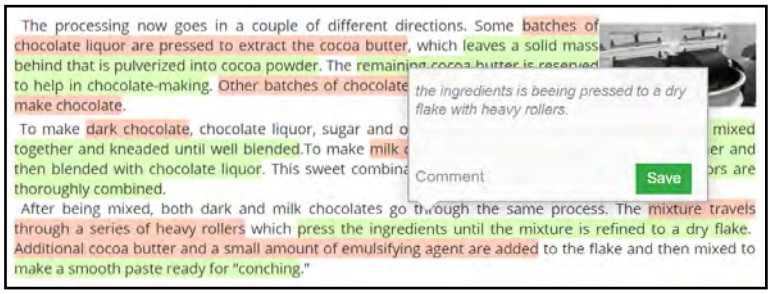
Figure 6: Screenshot of annotation No.1 and 2 by Student L

Figure 6 provides data on annotation notes made by Student L. Student L was able to identify 'supporting details' and elaborate each supporting details. For example, in both annotations, Student L managed to write the supporting details based on his own interpretations. This is consistent with his interview extract "*I think it [annotation tools] is useful because it is* ***easier for us to understand*** *what the text is going to talk about*". The bold words identify the important points stated by students during the interviews. Thus, Student L was able to show his understanding of EST online materials through the annotations that were made. Figure 7 are annotations made by Student T.

Annotation No. 1:



Annotation No. 2:



Annotation No. 3:

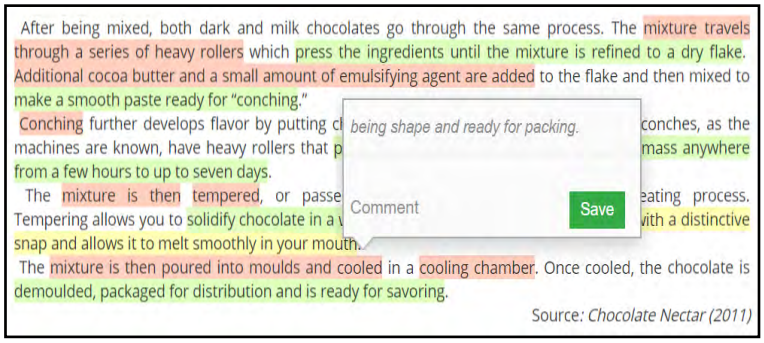


Figure 7: Screenshot of annotation numbers 1, 2 and 3 by Student T

Figure 7 illustrates three examples of annotation notes made by Student T. For annotation No. 1, Student T rephrased the idea of the first sentence in the paragraph to illustrate understanding of the new information read. In annotations Nos. 2 and 3, Student T was able to rewrite the

sentence into his own understanding by interpreting the text based on his knowledge, thus generating meaning. This was seen throughout the annotation activity that Student T completed. According to Schema Theory, reading is an interactive and constructive process, where reading generates meaning through the process of relating the textual information to existing knowledge (Carrell et al., 1988). Hence, annotations made by Student T illustrate that.

Discussion

The examples shared on written annotations produced by some of the students demonstrates that students were able to identify paragraph structure as admitted by students in the FGIs. The findings are consistent with previous research that concluded identifying paragraph structures as an important entity to assist students in understanding of main ideas, thus develop reading comprehension (Carrell et al., 1988; Meyer, Wijekumar, Middlemiss, Higley, Lei, Meier & Spielvogel et al., 2010). In relation to this, identification of paragraph structure is important for reading comprehension. This is because identifying paragraph structures leads to recognizing and understanding main ideas of the paragraphs (Lo et al., 2013). In addition, utilizing DAT assists students to understand these technical S & T materials, making reading academic texts in English less complicated for ESL learners.

The findings revealed a close relation to Schema Theory where reading is considered a constructive and active process that require readers to understand information based on retrieving and applying previous knowledge. As hypothesized by Li et al (2016), highlighting texts supports reading as it identifies key parts, recall information and act as visual signals. All of these elements are important for ESL learners who are reading ESP texts in their SL. Moreover, highlighting coupled with written annotations is powerful because it contextualizes and synthesizes ideas. These findings play a complementary role in the Interactive Reading Model (Rumelhart, 1977). It is believed that interactive reading provides opportunities to help identify key elements of paragraphs which conforms to some elements of annotations. This allow students to be explicitly ready to deal with syntactic and discourse features that are generally used in the language of EST more easily with the use of DAT. In addition, data obtained with regards to identifying paragraph structure and improved understanding were triangulated with annotation analyses, confirming the validity and importance of DAT.

Finally, a number of important limitations need to be considered. Firstly, there were some technical constraints in using iREAD such as the inability for students to change the highlighted colors twice. Instead, double highlighting was made. Secondly, DAT in iREAD should include social annotation functions to integrate a more holistic approach to teaching and learning. This would encourage collaborative learning among students. This could significantly increase a more interactive teaching and learning approach that is important at tertiary level.

Conclusion

The results reveal that DAT facilitate understanding of EST online materials, since DAT facilitate the process of adding, editing and modifying information in electronic form without making any changes to the resource itself. This was demonstrated in examples discerned from the annotations in which most students were able to identify paragraph structure and improve understanding of the reading materials. The various colors, such as yellow and green, in the highlighting tools assist in reducing the cognitive overload because the highlighting tools appear to provide meaningful cues for students. The highlighting process and written annotations are significant in the process of contextualizing and synthesizing ideas, which

consequently leads to interactive reading. The process of contextualizing and synthesizing ideas will enable students to be prepared and ready in dealing with syntactic and discourse features that are generally used in the language of EST more easily. Furthermore, the highlighting features allow students to focus on the reading task, while being engaged in the annotation process. The annotations can also be seen as an additional layer of information to the existing resources offline, such as discussion in class with the lecturer and other students. To support this, data obtained on how the students identify the paragraph structure as part of the comprehension process in reading the materials were triangulated with annotation analyses. The results confirmed the validity and importance of DAT.

With regards to the Schema Theory, where reading is considered a constructive and active process that requires readers to understand information based on retrieving and applying previous knowledge, highlighting texts significantly supports reading as it identifies key parts, aids recall information, and acts as visual signals. Past studies have proven that learners' comprehension would also be higher when important words, phrases and sentences are highlighted as opposed to when they were not highlighted.

The present study is one of few studies that examined ESL students annotation types in reading EST online materials in Malaysia. There is a need for future research identifying types of annotations based on various ESP subjects such as English for Medical Purposes and English for Legal Purposes. Different subject areas may affect learners use of annotations. Learners may provide different forms of annotations given in different contexts. Different texts and tasks may lead to different approaches in annotating by the learners. This study found a significance in online reading platforms such as iREAD in assisting students in reading EST online materials in their SL. Overall, DAT was able to assist, facilitate and support learning; in a vital area. Reading is an important skill and plays a significant role in successful learning.

Acknowledgement

This research was supported by Universiti Malaysia Pahang (UMP) research ID: RDU 1603142.

References

Abuseileek, A. F. (2012). The effect of computer-assisted cooperative learning methods and group size on EFL learners' achievement in communication skills. *Computers & Education, 58*, 231–239. https://doi.org/10.1016/j.compedu.2011.07.011

Ahern, T. C. (2005). Using online annotation software to provide timely feedback in an introductory programming course. *Proceedings of 35th ASEE/ IEEE frontiers in education conference*. IEEE. https://doi.org/10.1109/FIE.2005.1611917

Anderson, N. J. (2003). Scrolling, clicking, and reading English: online reading strategies in a second/foreign Language. *Reading Matrix: An International Online Journal, 3*(3), 1–33.

Carrell, P. L., Devine, J., & Eskey, D. E. (1988). *Interactive approaches to second language reading*. Cambridge Unversity Press. https://doi.org/10.1017/CBO9781139524513

Chen, Y.-C., Hwang, R.-H., & Wang, C.-Y. (2012). Development and evaluation of a Web 2.0 annotation system as a learning tool in an e-learning environment. *Computers & Education, 58*(4), 1094–1105. https://doi.org/10.1016/j.compedu.2011.12.017

Chiu-Jung, C., & Pei-Lin, L. (2012). Comparisons of learner-generated versus instructor-provided multimedia annotations. *Turkish Online Journal of Educational Technology, 11*(4), 72–83.

Cho, B.-Y., & Afflerbach, P. (2017). An evolving perspective of constructively responsive reading comprehension strategies in multilayered digital text environments. In E. I. Susan (Ed.), *Handbook of research on reading comprehension*. Guilford Press.

Chun, D. M., & Payne, J. S. (2004). What makes students click: Working memory and look-up behavior. *System, 32*(4), 481–503. https://doi.org/10.1016/j.system.2004.09.008

Creswell, J. W. (2014). *Research Design : Qualitative, quantitative, and mixed methods approaches*. SAGE Publications.

Creswell, J. W. & Plano Clark, V. L. (2011) (Eds.). *Designing and conducting mixed methods research*. SAGE Publications.

Duke, N. K., & Pearson, P. (2002). Effective practices for developing reading comprehension. In A. E. Farstrup & S. Samuels (Eds.), *What research has to say about reading instruction*. International Reading Association.

Gilbert, J. (2017). A study of ESL students' perceptions of their digital reading. *The Reading Matrix: An International Online Journal, 17*(2), 179–195.

Güzer, B., & Caner, H. (2014). The past, present and future of blended learning: An in depth analysis of literature. *Procedia - Social and Behavioral Sciences, 116*, 4596–4603. https://doi.org/10.1016/j.sbspro.2014.01.992

Haryani, H., Wan Faezah, A., & Nor Aini, A. R. (2012). The adoption of blended learning among Malaysian academicians. *Procedia - Social and Behavioral Sciences, 67*, 175–181. https://doi.org/10.1016/j.sbspro.2012.11.318

Herold, B. (2014). *Q&A: Judging online vs. offline reading skills*. Editorial Projects in Education Inc.

Huang, H. (2014). Online versus paper-based instruction: comparing two strategy training modules for improving reading comprehension. *RELC Journal, 45* (2), 165–180. https://doi.org/10.1177/0033688214534797

Kiili, C. & Leu, D. J. (2019) Exploring the collaborative synthesis of information during online reading. *Computers in Human Behaviour*, *95*, *146–157*. https://doi.org/10/1016/j.chb.2019.01.033

Johnson, T. E., Archibald, T. N., & Tenenbaum, G. (2010). Individual and team annotation effects on students' reading comprehension, critical thinking, and meta-cognitive skills. *Computers in Human Behavior, 26*(6), 1496–1507. https://doi.org/10.1016/j.chb.2010.05.014

Leu, D. J., Zawilinski, L., Castek, J., Banerjee, M., Housand, B. C., Liu, Y., & O'Neil, M. (2007). What is new about the new literacies of online reading comprehension? In A. J. E. Leslie Susan Rush, Allen Berger, (Eds.), *Secondary school literacy: What research reveals for classroom practice* (pp. 1–18). National Council of Teachers of English.

Li, L.-Y., Tseng, S.-T., & Chen, G.-D. (2016). Effects of hypertext highlighting on browsing, reading, and navigational performance. *Computers in Human Behavior, 54*, 318–325. https://doi.org/ 10.1016/j.chb.2015.08.012

Lo, J.-J., Yeh, S.-W., & Sung, C.-S. (2013). Learning paragraph structure with online annotations: An interactive approach to enhancing EFL reading comprehension. *System, 41*, 413–427. https://doi.org/10.1016/j.system.2013.03.003

Marshall, C. C. (1997). *Annotation: From paper books to the digital library.* Proceedings of the 2nd ACM international conference on digital libraries. ACM. https://doi.org/10.1145/263690.263806

Meyer, B. J. F., Wijekumar, K. Middlemiss, W., Higley, K., Lei, P. W., Meier, C., & Spielvogel, J. (2010). Web-based tutoring of the structure strategy with or without elaborated feedback or choice for fifth- and sevent-grade readers. *Reading Research Quarterley, 45*(1), 62–92. https://doi.org/10.1598/RRQ.45.1.4

Moss, B. (2004). Teaching expository text structures through information trade book retellings. *Reading Teach, 57*(8), 710–718. https://doi.org/ 10.2307/20205422

Nokelainen, P., Kurhila, J., Miettinen, M., Floreen, P., & Tirri, H. (2003). Evaluating the role of a shared document-based annotation tool in learner-centered collaborative learning. *Proceedings of the 3rd IEEE international conference on advanced learning technologies*. IEEE. https://doi.org/ 10.1109/ICALT.2003.1215056

Nor Fariza, M. N., Afendi, H., Hazita, A., Noorizah, M. N., & Vengadasamy, R. (2014). Application of collaborative learning theory as a learning feature in iREAD UKM: A conceptual Framework. In Pixel (Ed.), *Proceedings of the ICT for language learning conference*. Librariauniversitaria.it Edizioni, (pp. 490–493).

Norazah, M. N., Mohamed Amin, E., & Zaidan, A. B. (2011). Summary of findings on the status, trends, & challenges of e-learning implementation. In E. Mohamad Amin (Ed.), *E-learning in Malaysian higher education institutions: Status, trend and challenges* (pp. 107–115). Ministry of Higher Education.

Pardo, L. S. (2004). What every teacher needs to know about comprehension. Reading Teach, 58 (3), 272–280. https://doi.org/10.1598/RT.58.3.5

Ruhil Amal, A., Nor Fariza, M. N., & Afendi, H. (2018). Using iREAD in understanding online reading strategies applied by Science and Technology students. *International Journal of Web-based Learning and Teaching Technologies, 13*(3), 18–32. 10.4018/IJWLTT.2018070102

Rumelhart, D. E. (1977). Toward an interactive model of reading. In S. Dornic (Eds.), *Attention and performance VI* (pp. 721–747). Erlbaum Associates.

Su, A. Y. S., Yang, S. J. H., Hwang, W.-Y., & Zhang, J. (2010). A Web 2.0-based collaborative annotation system for enhancing knowledge sharing in collaborative learning environments. *Computers & Education, 55*(2), 752–766. https://doi.org/10.1016/j.compedu.2010.03.008

Sung, Y.-T., Wu, M.-D., Chen, C.-K., & Chang, K.-E. (2015). Examining the online reading behavior and performance of fifth-graders: Evidence from eye-movement data. *Frontiers in Psychology, 6*, 1–15. https://doi.org/10.3389/fpsyg.2015.00665

Thang, S. M., Wong, F. F., Noorizah, M. N., Rosniah, M., Najihah, M., & Kemboja, I. (2012). Using a blended approach to teach English for academic purposes: Malaysian students' perceptions of redesigned course materials. *International Journal of Pedagogies and Learning, 7*(2), 142–153. https://doi.org/10.5172/ijpl.2012.7.2.142

Thoms, J. J., & Poole, F. (2017). Investigating linguistic, literary, and social affordances of L2 collaborative reading. *Language Learning and Technology, 21*(2), 139–156. https://doi.org/ 10125/44615

Tseng, S.-S., Yeh, H.-C., & Yang, S.-h. (2015). Promoting different reading comprehension levels through online annotations. *Computer Assisted Language Learning, 28*(1), 41–57. https://doi.org/10.1080/09588221.2014.927366

Wang, Q., Wooa, H. L., & Zhao, J. (2009). Investigating critical thinking and knowledge construction in an interactive learning environment. *Interactive Learning Environments, 17*(1), 95–104. https://doi.org/10.1080/10494820701706320

Corresponding author: Ruhil Amal Azmuddin
Contact email: ruhilamal@ump.edu.my

Democratization of Education through Massive Open Online Courses in Asia

Runchana Pam Barger
Chiang Mai University, Thailand
and Wheaton College, USA

Abstract

Massive Open Online Courses have been a recent phenomenon in providing large-scale interactive participation and open access to courses online. Depending upon internet availability and familiarity with digital learning practices, this alternative could provide education for many people. This paper explores whether technology such as massive online open courses can democratize education by providing opportunities and access for those who desire formal learning. This paper reviews literature on massive online open courses as well as the benefits and challenges of these courses in adult education. Using computer-based content analysis, this paper also examines recent research (2010-2019) on massive online open courses and the implications of using them to provide widespread access to higher education in Asia. The findings show that offerings in many Asian countries help promote social and economic mobility for their people by providing continuing educational, professional, and personal development through courses online. Yet barriers involving digital literacy, technical capabilities, and language as well as culture, prevent the underserved from pursuing this digital education. This paper provides future research suggestions for collaboration of educational organizations to use massive online open courses in engaging life-long skills for people in Asia.

Keywords: MOOC, democratization, education access, technology, Asia

The theme of the 2015 World Education Forum, sponsored by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) and the Republic of Korea, was "equitable and inclusive quality education and lifelong learning for all by 2030: transforming lives through education" (UNESCO, 2015b, p. 11). The preamble of the Incheon Declaration defined education as an essential and universal right for all humans to create and ensure peace, equipping people for employment with the hope that they have social and economic means for self-sustainability (UNESCO, 2015a, Preamble 5). The report stressed the value of education in promoting gender equality and equity by supporting gender-sensitive policies, improving teacher training, and creating curriculum to decrease discrimination and violence against females in schools (UNESCO, 2015a, Preamble 8). The preamble called for donors from affluent nations to provide funding and resources, such as educational technology, to help educators from all around the world provide quality of learning opportunities for women and the underserved (UNESCO, 2015a, Preamble 9–16).

Based on the World Education Forum and the Incheon Declaration's mandates, this paper examines a web-based educational offering known as Massive Open Online Courses (MOOCs) to explore as a potential means to increase educational affordability. MOOCs have provided large-scale interactive participation and open access to courses online. Depending on the internet availability in some of these developing countries, this alternative may provide adults a chance to a obtain higher education degree. This paper explores whether technology such as MOOCs can democratize education by providing opportunities and access for those who desire higher education and professional development. This paper also reviews literature on MOOCs as well as the benefits and challenges of them in adult education. Specifically, the paper examines recent research (2010-2019) related to the massive open online courses in Asia and applies content analysis to explore themes and associations with technology and its implications in providing education for people in Asia, including the underserved communities.

Literature Review

Since the 1990s, online learning has been on the rise (Alcorn et al., 2015). A recent report from the Babson Survey Research Group reports that distance education has grown dramatically over the past fourteen years (Seaman et al., 2018). In particular, public research universities have increasingly offered MOOCs as a tool for students and senior academic leaders believe that MOOCs will attract potential students (Allen & Seaman, 2013).

Many claim to have coined the term MOOC. Some researchers have stated that it originated during the early 2000s with the emergence of technologies such as open source and open courseware platforms (Bozkurt et al., 2016; Zawacki-Richter & Naidu, 2016). Some sources attribute the term MOOC to Daniel Barwick, an associate professor of philosophy in New York. In 2007, Barwick discussed the need for major universities to find methods to improve learning for large numbers of students (Lederman, 2007; Seaman et al., 2018). Other sources say that Dave Cormier, the Manager of Web Communication and Innovations at the University of Prince Edward Island, coined the term MOOC (Bozkurt et. al, 2016; Hollands & Tirthali, 2014). Cormier pointed out that over 2,000 students from the general public took a 2008 University of Manitoba online course, titled "Connectivism and Connective Knowledge," that George Seimens and Stephen Downs created, at no cost (Adham & Lundquist, 2015; Alcorn et al., 2015; Bozkurt et al., 2016; Hollands & Tirthali, 2014). The term MOOCs gained even greater popularity after an artificial intelligence online class at Stanford University logged enrollment of over 150,000 students (Alcorn et al., 2015; Waldrop, 2013).

MOOCs have three overall characteristics: they are courses that are *massive, open, and online*. They are massive in that they are characterized by a very large number of enrolled students from the range of hundreds to hundreds of thousands. They are also massive in that they provide large-scale interactive participation for the public. MOOCs are open in that they often use learning platforms that are open-source and they are free or low-cost to anyone who is interested. They are online in that curriculum and assessment are also open so anyone who has an internet connection can join the course. An important attribute of these digital classes is that learners are free to study anywhere without restrictions or limitations (Adham & Lundquist, 2015).

MOOCs are categorized as either "cMOOCs" or "xMOOCs" based on their differing philosophies and methodologies. Connectivist MOOCs, also known as cMOOCs, are courses in which learners use learning platforms such as wikis, social media, blogs, or websites such as Peer to Peer University (www.p2pu.org) to network and collaborate with one another (Bates, 2014; Smyrnova-Trybulska, et al., 2016). CMOOCs are heavily dependent upon learning communities to create knowledge together (Adham & Lundquist, 2015; Lane, 2016). Important tenets of cMOOCs include autonomy of the learner, diverse demographics of learners, interaction and cooperative learning between participants, and openness in the courses (Bates, 2014). XMOOCs depend upon traditional classroom structures containing specifically designed platform software, video lectures, and automated assessments (Adham & Lundquist, 2015; Bates, 2014; Smyrnova-Trybulksa et al., 2016). Coursera, Udacity, and edX courses are examples of xMOOCs. XMOOCs provide alternatives to the traditional university residential model, as students take courses online. XMOOCs focus on a teaching-centered model rather than the learner-centered focus of cMOOCs. Because of the more formal nature of xMOOCs, students who take xMOOCs can earn certificates and they are more popular than cMOOCs because of their instructivist content. Recent online education research examines xMOOCs, and therefore this particular paper focuses on the latter course offerings.

Democratization as Comparative Education Framework

Comparative education is the application of social scientific methods and theories to international issues of education (Epstein, 2002). One issue that comparativists have examined is the role of democratization on education. An underlying notion of democracy is the human right to vote in a political process, to have accessible distribution of financial resources, and to have the essential right to be treated justly (Davis, 2008). Comparative education examines the impact of democratization in local, national, and global communities (McGinn, 1996). In an ideally democratized community, people would be able to freely make their own decisions that would benefit themselves locally and globally. This includes decisions involving education access and opportunities for their citizens. This section examines the political, educational, and social impacts that democratization has on international education.

Comparative education research examines the role of democratization and political participation (Blankenship & Kubicek, 2018; McGinn, 1996; Murati, 2015; Zajda, 2008). Research examines the correlation of active participation in politics when governments promote education access and opportunities (McGinn, 1996; Murati, 2015). Democratization through citizenship education promotes peace and freedom, and schools should be institutions that allow them to work on democratic principles to influence society (Murati, 2015). Comparative education research shows mixed results on the impact of democratization in emerging countries. Countries that attempt to promote democratization have not implemented it well typically have political corruption such as the lack of accountability of public officials

as well as mismanagement of governmental funding (Powell et al., 2016). In Pakistan, for example, educational disparity is widened as the government has not provided adequate funding for education in the countryside versus their urban counterparts (Powell et al., 2016). However, other countries, such as Ukraine, attempt to democratize education through improving technology. One way in which Ukraine's educational system has reduced academic corruption is through data management software to protect privacy, systematize registration, and track grades for their students (Powell et al., 2016).

Comparativists have also researched democratization and its educational impacts in implementing free markets and capitalist ethics (Davies, 2008). Economically, a democratized government would distribute funding for education, incorporate civic education, and decentralize power to local officials (Davies, 2008; McGinn, 1996; Murati, 2015). Democratization in education should include decision-making from all aspects of an educational institution from the faculty, staff, parents, and students (McGinn, 1996; Murati, 2015). A democratic education curriculum incorporates teaching and learning of skills such as direct communication, deliberative process, negotiation, collaborative sharing, critical thinking and problem solving (McGinn, 1996).

Furthermore, democratization in education would also promote equitable education and access to educational opportunities to benefit all social groups (OECD, 2006; Zajda, 2008). Educational equity includes teaching and learning social justice issues, raising consciousness of power relations and providing materials to share voices of all groups of people, especially the marginalized (Sefa Dei & Shahjahan, 2008). Sefa Dei and Shahjahan, research educators in the field of equity and diversity studies, stated that "equity affirms that physical, material, emotional, social, and spiritual well-being of both self and collective… the affirmation arises from the recognition of each other's fundamental freedoms and rights to valued goods and services of society, while at the same time fulfilling accompanying responsibilities" (2008, p. 49). Comparative education research also examines the relationship between democratization and women's rights. These include an increase in participation of women in politics, written policies and laws advancing gender equality, a reduction in gender-based violence, funds for women's health, and alterations in family law to support women (Blankenship & Kubicek, 2018).

Methodology

This paper examines the relationship between online education and democratization of education. In particular, the main research question is as follows: Does online education, specifically using MOOCs, provide for the democratization of education for people in Asia. Democratization is examined in terms of allowing people to have the choice to not only learn, but also to participate in their society, whether it is socially, politically, or economically. This research explores whether people, especially the underserved, can access online education that is effective for their professional and/or personal growth.

This study explores research on the efficacy of massive open online courses to democratization, which was carried out from 2010 to 2019. The research method used is content analysis, which examines the frequency of terms, such as words and phrases, in texts to make inferences about the associations and possible connotations within the documents (Columbia University Mailman School of Public Health, 2019). Content analysis can be both quantitative and qualitative (Seuring & Gold, 2011). However, this study uses qualitative methods as documents and texts are examined. Types of content analysis include conceptual and relational analysis.

Conceptual analysis examines patterns or themes in texts that occur often, whereas relational analysis explores the relationship between concepts and its importance (Columbia University Mailman School of Public Health, 2019). The study explored the conceptual and relational links between massive open online courses, educational access, and opportunities for people.

Initially, the process began as a deductive approach examining whether MOOCs democratize education for people in various countries in Asia. In particular, the initial research question focused on whether some Asian educational ministries or institutions offer low-cost courses that would benefit academic as well as vocational skills to their people. Specific themes such as the history, policies, benefits, challenges, and suggestions emerged in MOOC research on education access and opportunities through manual document analysis. An inductive approach was used to understand the more recent concepts or themes written in the literature from 2015 to the present.

The inductive approach used for this study employed a qualitative content analysis collected from 48 academic books and journals on issues related to MOOCS in Asia. The author hoped to identify MOOC trends relating to education access and opportunities. In particular, the research employed a similar type of methodology to Zawacki-Richter et al.'s (2018) automated content analysis in identifying themes and concepts of MOOC research using the program Leximancer. This text-mining statistical tool carefully extracts themes from documents to locate patterns and trends. Leximancer compiles various texts and documents, codes common themes, and creates a visual concept map creating categories that connect frequently-occurring information from the documents (Leximancer, n.d.). Figure 1 shows the phases of the research process that I conducted:

Figure 1: Phases of the Research Process

Forty-eight academic journals and book chapters were selected using the keywords *MOOCs, MOOC,* and *Asia.* These were found in two research databases: *Google Scholar and ERIC*. All of the 48 documents were selected using the following criteria: peer-reviewed journal or book chapter specifically focusing on MOOCs in Asia from 2010-2019, written in English, and online full-text accessibility. Limitations of the study include a smaller content analysis sample (48 documents) and the documents selected for analysis only being written in English, which narrowed the range of research able to be analyzed.

In addition to the manual coding of certain democratization themes such as access, opportunity, provision, literacy, mobility, Leximancer breaks down the themes in the 48 documents to categories and relationships between those categories to create a visual concept map.

Results and Discussion

Figure 2 illustrates the concept map derived from Leximancer, the automated content analysis software. The concept map contains concept circles of frequent words or phrases that are connected to other concepts on the map (Leximancer Pty Ltd, 2018).

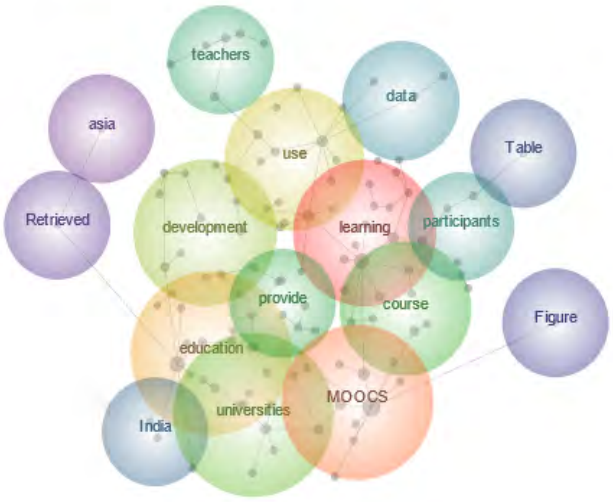


Figure 2: Concept Map of MOOCs in Asia

The concept map generates the highest-level occurring terms. Important terms are heat-colored; for example, the "hottest" important concept appears in red, the next hottest is orange, and continues according to the color wheel (Leximancer Pty Ltd, 2018). In Figure 2, the hottest concepts appear to be *MOOCs* and *learning*, while *education* and *use* are the next most significant terms. Figure 3 below shows the interconnectivity of the concepts. Concepts that appear together often are in the same pieces of documents (Leximancer Pty Ltd, 2018).

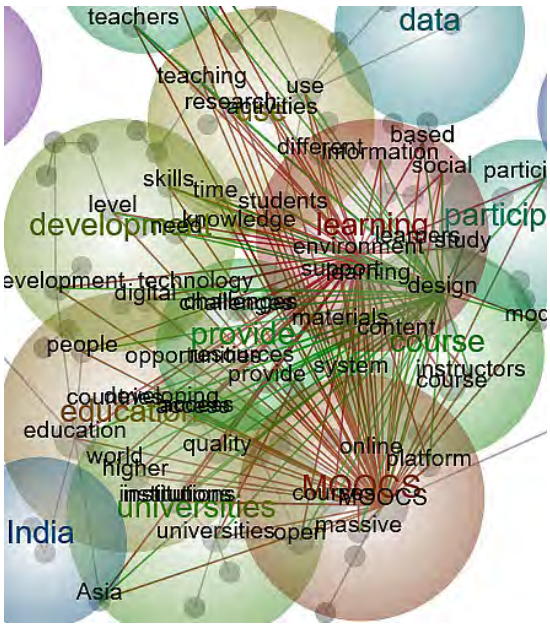


Figure 3: Relationships between Concepts

From Figure 3, the *learning* and *MOOC* red circles appear to be very connected with other concept circles as seen with the dark red lines. The *learning* and *MOOC* circles, which are the hottest or most-frequented concepts connect to other concept terms of *development, provide, courses, education, universities* and *use*. This concept summary indicates the relative importance of *education, learning,* and *MOOCs* as compared to other terms. From this analysis, three themes have emerged because of the text-mining analysis and the concept map that relates to democratization of education: miscellany of MOOCs in Asia; provision and development of MOOC education in Asia; and opportunities and barriers of Asian learners to access MOOCs.

Miscellany of MOOCs in Asia

From the content analysis, the *MOOC* concept circle is the central theme of the literature. The sub-themes within this concept circle include terms such as *online, courses, open, platform,* and *massive.* The text-mining analysis connected the importance of MOOCs in Asia and the variety of MOOC offerings provided in countries such as Malaysia, India, Nepal, and China.

Some Asian universities have used MOOC platforms such as Coursera, edX, and Udacity, created by the collaboration of U.S. top universities and companies (Liyanagunawardena et al., 2013; Chen, 2013; Beigi et al., 2015). Countries such as India and Brazil contribute 14 percent of enrolled students in edX, Coursera, and Udacity (Kanwar, 2014). The National University of Singapore joined Coursera, while Nanyang Technology joined ITunes U (Chen, 2013). In 2012, edX announced its growing network to many international universities, including Asian universities, to meet global demand and increase access to quality education (edX, 2013). Asian universities include Tsinghua University and Peking University in China, the University of Hong Kong and Hong Kong University of Science and Technology in Hong Kong, Kyoto University in Japan, and Seoul National University in South Korea (edX, 2013).

As global edX, Coursera, and Udacity platforms have their online courses in English, many countries in Asia have adapted to create MOOCs for their own cultural and linguistic context (Buhl & Andreason, 2018). Some nation-states have prioritized MOOCs as part of their national education plans (Buhl & Andreason, 2018). Countries that have created local MOOCs as part of their educational strategies include Taiwan, China, Indonesia, Japan, Malaysia, Philippines, South Korea, Singapore and Thailand (Chen, 2013; Laurillard & Kennedy, 2017; Sari et al., 2019). In 2013, Tsinghua University founded the XuetangX platform in China, which also is part of the Chinese Association of Higher Education (Laurillard & Kennedy; Xuetangx, 2019). In Indonesia and Malaysia, MOOCs have been derived from government initiatives to create access to education for their people, especially when brick and mortar institutions are limited (Norman et al., 2015; Sari et al, 2019). In 2015, the Malaysian Ministry of Education collaborated with four public universities, National University of Malaysia, University Putra Malaysia, MARA University of Technology, and University of Malaysia Sarawak, to launch Malaysia MOOCs (Nordin et al., 2016). The Ministry of Education and Culture, along with Ciputra University and Universita Terbuka, collaborated in creating MOOCs in Indonesia (Sari et al., 2019). In Japan and Korea, JMOOCs and KMOOCs were created by an inter-organizational conglomerate of academic, business, and governmental institutions (Shigeta et al., 2017; Upadhyay & Anandpara, 2020,). Similar to the East Asian counterparts, ThaiMOOCs, launched by universities and governmental initiatives in Thailand, had their aim to develop life-long opportunities, innovation, and quality education for diverse groups of people (Chaimin, 2019). SWAYAM, otherwise known as Study Webs of Active-Learning for Young Aspiring Minds, "is a progamme initiated by the Government of India and designed to achieve the three cardinal principles of education policy including access, equity and quality…to take the best teaching learning resources to all, including the most

disadvantaged" (SWAYAM, 2019, para. 1). Furthermore, Katmandu University in Nepal has recently piloted a MOOC course on basic programming which is one of the first locally developed MOOCs in the country (Ghimire, 2018; Singh, 2018).

Educational Development and Provision of MOOCs

In the concept map of MOOC academic literature from 2010-2019, the *education* term emerged. The content analysis of the research literature describes the MOOC impact on providing education opportunities and access to people. In implementing the analysis and interpretation of each the 48 academic journals and book chapters in detail (see Figure 1: Step 4), another theme that emerged is the educational development and provision of MOOCs. Factors that can hinder democratization of education of MOOCs to those people are the physical infrastructure of technical capabilities and digital literacies of people understanding how to use MOOCs.

In India, where there could be possibly 40 million extra university student spots needed by the next decade, MOOCs in SWAYAM can help learners to achieve as much as 20 percent of their educational curriculum (Buhl & Andreasen, 2018; Chatterjee & Nath, 2014). MOOC advocates in India hope that online learning can help increase the literacy rates and help learners with employment training (Upadhyay & Anandpara, 2020). The rise of Indonesian MOOCs, offered at higher education institutions such as Ciputra University and Universita Terbuka, aim to help the underserved to find quality education at an affordable and accessible cost (Sari et al., 2019). MOOCs can also offer benefits to Nepali society such as open and free learning opportunities, affordable and inclusive education, and developing Nepalese teacher professional development (Ghimire, 2018; Singh, 2018).

Technical capabilities. According to Liyanagunawardena, Williams, and Adams (2013), access to educational technology encompasses the physical, motivational, and intellectual knowledge of understanding how to use digital devices. Some studies find a disparity for less privileged groups in obtaining internet access in various parts of the world. For some countries in Asia, internet access can be a challenge because of poor national infrastructure. For example, parts of Sri Lanka have limited electricity and their internet centers tend to be in more urban areas (Liyanagunawardena et al., 2013). As recently as in 2017, internet usage in Nepal was less than 50 percent (Ghimire, 2017). Furthermore, Southeast Asian learners cannot afford electronic equipment to enroll in MOOCs (van de Oudeweetering & Agirdag, 2015).

Access for women is more restricted where the internet is sparse. Women in Asia often go to public libraries rather than internet cafes because they perceive the former as safer (Laurillard & Kennedy, 2017). According to the World Bank, women also have less access to certain technology devices, as over 1.7 billion women in low- and middle-income countries do not own mobile phones (World Bank, 2016). Furthermore, women have less access due to cultural norms and pressures from families and friends not to use the internet (Laurillard & Kennedy, 2017).

Slow internet connection poses an obstacle for all learners accessing MOOCs that contain large files or that stream videos (Liyanagunawardena et al., 2013). In a survey conducted with Nepalese engineering students who took the MOOC course entitled "Fundamental Concepts of C Programming", the students stated that slow internet access was a main barrier to MOOC participation and completion (Shakya & Shrestha, 2018). Poor internet connection, especially in small towns and rural regions, can disrupt learning in various parts of the world (Adham & Lundquist, 2015). However, some governments and other organizations have developed

MOOCs to support low-bandwidth connections. Murugesan, Nobes, and Wild (2017) observed a MOOC course for researchers from developing countries. This research and writing course was delivered in a Moodle site of low-bandwidth methods including high-quality textual content and videos or graphics that were low in size. Over 2,830 learners from over 90 countries participated in the course. In this low-bandwidth methods course, they found that over half of the learners were from the Majority World including Asian countries such as Sri Lanka, India, Nepal, and the Philippines (Murugesan et al., 2017). Over 45 percent of the participants in the MOOC research course were women. Furthermore, contrary to the typical findings, the women had a higher completion rate in relation to the men, engaging better in discussion forums and reflective dialogue, which is an indicator of digital literacy as well (Murugesan et al., 2017).

Digital literacy. Access to technology does not equate with proficiency of use. A young Sri Lankan female teacher once responded in an interview about using MOOCs that although she had good internet connectivity and technological resources, she did not know how to use them (Liyanagunawardena et al., 2013). Her response underscores that for women and the underserved in Asia, digital literacy is vital to the sustainability and completion of MOOCs. Digital literacy includes information processing, competently navigating online tools, building community through discussion forums, self-discipline in reading and completing assignments, tasks, and quizzes, and having the ability to self-learn (Trehan et al., 2017). For many nations in the world, computer literacy is still in the early stages. A little over 20 percent of Sri Lankan adults are proficient at using digital technology (Liyanagunawardena et al., 2013). In Chinese and Indian universities, those with information literacy, that is, better internet skills and the desire to learn through videos, have been more likely to succeed in MOOCs than those who were not as technically able (Trehan et al., 2017). Even educators and students who have been exposed to technology have a difficult time in understanding the process of implementing or using MOOCs. In India, teaching assistants who helped the lead instructors for the SWAYAM online courses have a challenging time with technical skills and handling of MOOCs (Buhl & Andreasen, 2018). For Nepalese students who took the pilot MOOC course in Kathmandu University, they expressed confusion regarding the assignment expectations such as posting discussions that they eventually dropped out of the course (Ghimire, 2018). To counteract these issues with digital literacy, recommendations for improvement in MOOC retention include clear instructions with modeling examples from the instructor and technology orientation (Ghimire, 2018). This is because prerequisite knowledge of using MOOCs, such as background knowledge and programming skills, poses additional barriers for some women and the underserved in Asia in taking MOOCs (van de Oudeweetering & Agirdag, 2015).

Lingual/Cultural/Social/Economical Factors for Asian Learners of MOOCs

Another category, which emerged in the concept map analyzing MOOCs in Asia documents from 2010-2019, is *learning.* The *learning* concept examines the social, cultural, and physical aspects of the learners and it appears that the design and pedagogy of MOOCs influences them. Cultural differences of Asian online learners can be a factor in MOOC education, as well as language, communication tool use, plagiarism, time zone differences, instructional styles, language and other cultural factors (Chen, 2013).

Language and culture. Not only do women learners and the underserved in Asia need to have sufficient digital literacy, they need to understand English. Many MOOCs originated in America and Europe where their universities and providers created the learning platforms (Laurillard & Kennedy, 2017). Only a small proportion of students in the Majority World are multilingual (Liyanagunawardena et al., 2013). This creates obvious challenges, as seen in MOOC creation in Nepal. This includes difficulty in the comprehension of the video lectures

and texts, the pace and tone of the lecturers, creating discussion posts, and understanding assessment as English is not their first language (Ghimire, 2020).

Culture also plays a role in completing online courses. MOOCs have certain discourses such as instructions, humor, or content in the discussion forums that other diverse learners may not understand (Liyanagunawardena et al., 2013). In some cultures, quality learner engagement involves direct teacher to student interaction (Laurillard & Kennedy, 2017). Intercultural communication also is a factor as students from collective and high context cultures, like those in Asia, stated problems in understanding their classmates' viewpoints without visual signals (Bayeck et al., 2018). In a required Malaysian Ethnic Relations MOOC undergraduate course, students expressed that having Malaysian instructors who speak the same language as them is a factor in helping them understand the video lectures better as the teachers can identify with their local culture (Nordin et al., 2016). In many countries in Asia such as Nepal and India, traditional face-to-face classroom, rote learning and plagiarism is engrained in the education context; thus, instructors of MOOCs need to be aware of the challenges they faced when assessing their students (Ghimire 2020; Mohapatra & Mohanty, 2017).

Suggestions to improve the quality of MOOCs to their diverse learners include providing inclusive guidelines to respectively post on discussion forums, a variety of audio-visual material, and flexibility on assessments to attract those with different learning styles (Liyanagunawardena et al., 2013; Laurillard & Kennedy, 2017). Furthermore, learning engagement would increase if MOOCs enabled their diverse learners to share their personal stories with one another, using local and global contexts to help them understand the course content.

Regarding gender, MOOCs have the potential to offer and expand educational opportunities for women in Asia and the Majority World (Alcorn et al., 2015; Liyanagunawardena et al., 2013). Liyanagunawardena et al., (2013) state that MOOCs can benefit females in nations where access to education would be limited, such as in Afghanistan or in Nepal. Video conferencing on the social value of MOOC based discussions can provide women access to more senior global faculty than they would have in their local classroom (Laurillard & Kennedy, 2017).

MOOCs have the potential to democratize education for people with limited learning opportunities, as universities, commercial, government, and non-profit providers realize that these open online courses cannot be a "one-size-fits-all" platform. Creators of MOOCs need to take into account the context of the learners, including the national infrastructure, schooling, technical educational background, language, and culture.

Economic and social mobility. As countries in Asia seek more labor, MOOCs can be a viable option for women and those who cannot afford traditional higher education to improve job-related skills. A large number of Indian learners have signed up for edX MOOCs at Harvard, MIT, and Penn (Alcorn et al., 2015). About 20 percent of the students in these MOOC courses are women and those in rural residences of India (Alcorn et. al, 2015). Many Indian learners have used MOOCs for professional development, to improve their current job skills, or to transition to new positions, primarily in STEM fields. In a 2014 survey of 780,000 learners who completed a Coursera MOOC course from approximately 212 countries, 72 percent of the survey respondents chose career benefits and 61 percent reported educational benefits (Zhenghao et al., 2015). Interestingly, people from Asia, people with lower socioeconomic status, and those with less education reported they benefited more from MOOCs than their elite

counterparts (van de Oudeweetering & Agirdag, 2015; Zhenghao et al., 2015). The former respondents stated that completing a Coursera MOOC assisted them with tangible career benefits such as getting a raise, finding a new job, or improving upon a skill for a job promotion (Zhenghao et al., 2015). Furthermore, the survey responders from the Majority World such as those in Asia and people with lower socioeconomic status said they believed that the MOOCs helped them improve their educational output, (i.e., transferring the MOOC to academic credit or attaining knowledge). Other studies support the trends that when learning job-specific skills, learners from the Majority World such as those in the Philippines were more likely to complete MOOCs than those in the Western countries (Garrido et al., 2016; Murugesan et al., 2017).

MOOCs that cater towards women and the learners of the Majority World through their content are likely to have their learners complete their courses. For example, in a MOOC entitled "Understanding Dementia", learners can retake assessments as many times as necessary for them to understand the content (van de Oudeweetering & Agirdag, 2015). Another MOOC known as "Web Science" contains materials that non-native English learners can understand (van de Oudeweetering & Agirdag, 2015). In a MOOC on research writing for researchers in developing countries, the low-bandwidth materials in the course and the asynchronous flexibility of the course allowed female learners to complete the course, especially as many of them have additional work and familial responsibilities (Murugesan et al., 2017).

Economic and social mobility are motivating factors for some women enrolling in MOOCs. Other motivating factors include the participation of a friend or colleague in an online platform (Bayeck, 2016). A higher number of women took a Penn State Coursera MOOC course on "Creativity, Innovation, and Change". The course attracted participants from over 82 different nations, including China, the United States, India, Canada, Mexico, Brazil, Nigeria, Egypt, France, and Germany (Bayeck, 2016). Over 90 percent of the female respondents mentioned that they took the course because of their friend. Eighty-one percent of respondents identified job-related skills and connection with others as reasons that they took the course (Bayeck, 2016). In terms of female participation, group work and collaboration were important factors for women to complete the courses, especially as the topic of the course was engineering.

Conclusion and Future Research

MOOCs are open, low-cost, and unrestricted for any learner to enroll in them. Educators have predicted that internet platforms would result in democratization of education by providing educational access for all. They further have identified MOOCs as allowing those who have been excluded from residential higher education to participate in online courses (Adham and Lundquist, 2015). In reviewing the literature and engaging in qualitative content analysis on the impact of MOOCs on the democratization of education in Asia, researchers have examined the effects of technical capabilities, digital literacies, and language, as well as culture, on women and the less privileged potentially using MOOCs for educational opportunities. Many Asian universities have used a variety of MOOCs as part of their national plans to provide opportunities for their people to receive higher education or continuing professional development. Countries that have higher enrollments of people using MOOCs include those that have solid technical infrastructure and educational policies encouraging their people to enroll in MOOCs as part of their educational requirements. Recent research on MOOCs in Asia still shows a disparity of enrollees who are either male, people in their 20s-30s, those who live in the urban areas, middle-to-upper social class, and learners who are competent in English. Yet more countries in Asia, such as in Nepal, Indonesia, and Malaysia are providing more

internet availability and educational curriculum that provide digital literacy and MOOCs in their local language to help the underserved with support to use MOOCs.

Multitudes of learners from around the world have enrolled in MOOCs. However, not all learners have taken advantage of the online learning platforms. To make MOOCs even more accessible to females and the Majority World, MOOC providers in the United States and abroad should collaborate with various organizations such as governments, multinational corporate sponsors, non-government organizations and community centers to work for underserved groups to maximize the potential in providing education to these groups. The democratization of education through MOOCs requires partnering organizations to improve the MOOCs infrastructure, offer better broadband internet connectivity, and equip the less privileged groups with sufficient digital literacy to enable them to maximize the benefits MOOCs have to offer. MOOC providers should also research and take the time to invest in culturally and linguistically responsive content for their potential clients. As populations in the Majority World increase, including those in Asia, the need to utilize technology will rise. Traditional brick and mortar higher education institutions will not be able to accommodate such multitudes of people. In order to meet the 2015 World Education Forum's aim of equitable and inclusive quality education and lifelong learning for all by 2030, local governments, grass-root organizations, and donors from affluent nations need to provide ample technological and educational resources to create more MOOCs for women and those in the Majority World. Further research will examine the extent to which global-based MOOCs such as Coursera or edX, and local-based MOOCs in China, India, Indonesia, Japan, Malaysia, Nepal, Thailand, and other Asian nation-states have altruistic intentions of providing educational access, equity, and opportunity for women and the underserved in Asia.

References

Adham, R. S. & Lundquist, K. O. (2015). MOOCs as a method of distance education in the Arab world: A review paper. *European Journal of Open, Distance and e-Learning*, *18*(1), 123–139. https://doi.org/10.1515/eurodl-2015-0009

Alcorn, B., Christensen, G., & Kapur, D. (2015). Higher education and MOOCs in India and the Global South. *Change: The Magazine of Higher Learning*, *47*(3), 42–49. https://doi.org/10.1080/00091383.2015.1040710

Allen, I. E. & Seaman, J. (2013). *Changing course: Ten years of tracking online education in the United States.* Babson Park, MA: Babson Survey Research Group and Quahog Research Group. https://www.onlinelearningsurvey.com/reports/changingcourse.pdf

Bates, T. (2014, October 13). Comparing xMOOCs and cMOOCs: Philosophy and practice. *Online Learning and Distance Education Resources.* https://www.tonybates.ca/2014/10/13/comparing-xmoocs-and-cmoocs-philosophy-and-practice/

Bayeck, R. Y. (2016). Exploratory study of MOOC learners' demographics and motivation: The case of students involved in groups. *Open Praxis*, *8*(3), 223–333. https:// doi.org/10.5944/openpraxis.8.3.282

Bayeck, R. Y., Hristova, A. Jablowkow, J. W., & Bonafini, F. (2018). Exploring the relevance of single-gender group formation: What we learn from a massive open online course (MOOC). *British Journal of Educational Psychology*, *49*(1), 88–100. https://doi.org/10.1111/bjet.12528

Beigi, M., Wang, J. and Shirmohammadi, M. (2015). ARHD! Take the opportunity and pioneer vocational MOOCs. *Human Resource Development International*, *18*(2), 203–212. https://doi.org/10.1080/13678868.2014.978663

Blankenship, J. & Kubicek, P. (2018). Democratization and gender equality in Sub-Saharan Africa. *The Journal of the Middle East and Africa*, *9*(1), 27–50. https://doi.org/10.1080/21520844.2018.1449458

Bozkurt, A., Keskin, N. O., & de Waard, I. (2016). Research trends in massive open online course (MOOC) theses and dissertations: Surfing the tsunami wave. *Open Praxis*, *8*(3), 203–221. https://doi.org/10.5944/openpraxis.8.3.287

Buhl, M. & Andreasen, L. B. (2018). Learning potentials and educational challenges of massive open online courses (MOOCs) in lifelong learning. *International Review of Education*, *64*, 151–160. https://doi.org/10.1007/s11159-018-9716-z

Chaimin, C. (2019). MOOC: Lifelong learning in the 21st century. *Journal of Humanities and Social Sciences, Chiang Mai Rajabhat University*, 46–70. https://so01.tci-thaijo.org/index.php/husocjr/article/download/201022/142538/

Chatterjee, P. & Nath, A. (2014). Massive open online courses (MOOCs) in higher education - Unleashing the potential in India. Proceedings of *2014 IEEE international conference on MOOC, innovation, and technology in education*, (pp. 256–260). IEEE. https://doi.org/10.1109/MITE.2014.7020283

Chen, J. C. (2013). *Opportunities and challenges of MOOCs: Perspectives in Asia.*

IFLA WILIC 2013, Singapore. http://library.ifla.org/157/1/098-chen-en.pdf.

Columbia University Mailman School of Public Health. (2019). *Content Analysis*. https://www.mailman.columbia.edu/research/population-health-methods/content-analysis

Davies, L. (2008). Interruptive democracy in education. In J. Zajda, L. Davies & S. Majhanovich (Eds.), *Comparative and global pedagogies: Equity, access, and democracy in education* (pp. 15–32). Springer.

EdX (2013, May 21). *EdX continues to grow its network of the world's leading institutions of higher education to meet global demand and increase access to quality education* [Press release]. https://www.edx.org/press/edx-expands-xconsortium-asia-doubles

Epstein, E. H. (2002). Globalization of education. In J. W. Guthrie (Ed.), *Encyclopedia of education* (2nd ed., pp. 936–939). Macmillan.

Garrido, M., Koepke, L., Andersen, S., Mena, A. F., Macapagal, M., & Dalvit, L. (2016). *An examination of MOOC usage for professional workforce development outcomes in Colombia, the Philippines, & South Africa.* Seattle: Technology & Social Change Group, University of Washington Information School. https://tascha.uw.edu/publications/an-examination-of-mooc-usage-for-professional-workforce-development-outcomes/

Ghimire, B. K. (2018). Maximizing continuous professional and academic development through MOOC. In NELTA ELT Forum 2018 volume 4. Kathmandu: Nepal English Language Teacher's Association. (114–123).

Hollands, F. M., & Tirthali, D. (2014). MOOCs: Expectations and reality. Full report. Center for Benefit-Cost Studies of Education, Teachers College, Columbia University, NY. https://files.eric.ed.gov/fulltext/ED547237.pdf

Kanwar, A. (2014, March 28). *Old wine in new bottles? Exploring MOOCs* [White paper]. Commonwealth of Learning, 1–7. http://dspace.col.org/bitstream/handle/11599/1019/2014_Kanwar_Old_Wine_Transcript.pdf?sequence=1&isAllowed=y

Lane, A. (2016). Emancipation through open education: Rhetoric or reality? In P. Blessinger and T. J. Bliss (Eds.), *Open Education: International Perspectives in Higher Education* (pp. 31–50). Open Book Publishers. https://doi.org/10.11647/OBP.0103.02

Laurillard, D. and Kennedy, E. (2017). *The potential of MOOCs for learning at scale in the Global South.* Centre for Global Higher Education. http://www.researchcghe.org/perch/resources/publications/wp31.pdf

Lederman, D. (2007, December 6). Does class size matter: Daniel Barwick challenges the assumption that small is always best in the college classroom. *Inside Higher Ed*. https://www.insidehighered.com/views/2007/12/06/does-class-size-matter

Leximancer. (n.d.). *What is Leximancer: Automatic Content Analysis* [PowerPoint slides]. https://static1.squarespace.com/static/539bebd7e4b045b6dc97e4f7/t/5b0f8eab70a6ad58c23e862c/1527746234314/Leximancer+Introduction.pdf

Leximancer Pty Ltd. (2018, April 12). *Leximancer User Guide, Release 4.5*. https://doc.leximancer.com/doc/LeximancerManual.pdf

Liyanagunawardena, T. R., Williams, S., & Adams, A. A. (2013). The impact and reach of MOOCs: A developing countries' perspective. *eLearning Papers*, 38–46. http://centaur.reading.ac.uk/32452/1/In-depth_33_1.pdf

McGinn, N. (1996). Education, democratization, and globalization: A challenge for comparative education. *Comparative Education Review*, *40*(4), 341–357. https://doi.org/10.1086/447398

Mohapatra, S. & Mohanty, R. (2017). Adopting MOOCs for affordable quality education. *Education and Information Technologies*, *22*(5), 2027–2053. https://doi.org/10.1007/s10639-016-9526-5

Murati, R. (2015). Conception and definition of the democratization of education. *Journal of Education and Practice*, *6*(30), 173–183. https://files.eric.ed.gov/fulltext/EJ1081375.pdf

Murugesan, R., Nobes, A., & Wild, J. (2017). A MOOC approach for training researchers in developing countries. *Open Praxis*, *9*(1), 45–57. https://doi.org/10.5944/openpraxis.9.1.476

Nordin, N., Norman, H., Embi, M. A., Mansor, A. Z., Idris, F. (2016). Factors for development of learning content and task for MOOCs in an Asian Context. *International Education Studies*, *9*(5), 48–59. https://doi.org/10.5539/ies.v9n5p48

Norman, H., Dogan, H., Nordin, N., Mahamod, Z., Halim, L. (2015). An Asia-Europe massive open online course for lecturer training development of pedagogical strategies for MOOCs. *Proceedings of Public University Dean's Council 2015 Seminar, Malaysia*. https://www.researchgate.net/publication/281782494_An_Asia-Europe_Massive_Open_Online_Course_for_Lecturer_Training_Development_of_Pedagogical_Strategies_for_MOOCs

OECD. (2006). *Education Policy Analysis: Focus on Higher Education*. Paris. OECD.

Powell, D.V., Kuzmina, S., Cwick, S., Khalid, T. & Sofo, S. (2016). Democratization of education in emerging countries. *Journal of Interdisciplinary Education*, *15*(1), 1–36. https://www.researchgate.net/publication/304836394_Democratization_of_Education_in_Emerging_Countries

Sari, A. R., Bonk, C. J., Zhu, M. (2019). MOOC instructor designs and challenges: What can be learned from existing MOOCs in Indonesia and Malaysia? *Asia Pacific Education Review*. 1–24. https://doi.org/10.1007/s12564-019-09618-9

Seaman, J. E., Allen, I. E., & Seaman, J. (2018). *Grade increase: Tracking distance Education in the United States.* Babson Survey Research Group. http://onlinelearningsurvey.com/reports/gradeincrease.pdf

Sefa Dei G. J. & Shahjahan, R. (2008). Equity and democratic education in Ghana: Towards a pedagogy of difference. In J. Zajda, L. Davies & S. Majhanovich (Eds.), *Comparative and global pedagogies: Equity, access, and democracy in education,* (pp. 49–70). Springer.

Singh, A. B. (2018). Accessing the role of massive open online courses (MOOCs) in higher education: Opportunities and challenges for learning. In *NELTA ELT Forum 2018 volume 4* (pp. 97–113). Kathmandu: Nepal English Language Teacher's Association. https://www.nelta.org.np/uploads/images/files/NELTA%20ELT%20Forum%20Vol%204%202018.pdf

Shakya, M. & Shrestha, S. (2018). *MOOCs for higher education in Nepal.* Quezon City: Foundation for Information Technology Education and Development, Inc.

Shigeta, K., Koizumi, M., Sakai, H., Tsuji, Y., Inaba, R., & Hiraoka, N. (2017). A survey of the awareness, offering, and adoption of OERS and MOOCs in Japan. *Open Praxis*, *(9),* 195–206. https://doi.org/10.5944/openpraxis.9.2.568

Smyrnova-Trybulska, E., Ogrodzka-Mazur, E., Szafrańska-Gajdzica, A., -Morze, N., Makhachashvili, R., Noskova, T., Pavlova, T., Yakovleva, O., Issa, T., & Issa, T. (2016). MOOCs – Theoretical and practical aspects: Comparison of selected research results: Poland, Russia, Ukraine, and Australia. *Proceedings of the International Conferences on Internet Technologies & Society (ITS), Education Technologies (ICEduTECH), and Sustainability, Technology and Education* (ED571589). ERIC. https://files.eric.ed.gov/fulltext/ED571589.pdf

Seuring, S. & Gold, S. (2011). Conducting content-analysis based literature reviews in supply chain management. *Supply Chain Management: An International Journal*, *17*(5), 544–555. https://doi.org/10.1108/13598541211258609

SWAYAM. (2019). *About SWAYAM*. MRHD Government of India. https://swayam.gov.in/about

Trehan, S., Sanzgiri, J., Li, C., Wang, R., Joshi, R. M., (2017). Critical discussions on the massive open online course (MOOC) in India and China. *International Journal of Education and Development using Information and Communication Technology*, *13(*2), 141–165. https://files.eric.ed.gov/fulltext/EJ1153318.pdf

UNESCO. (2015a). *Incheon Declaration.* Paris: UNESCO. http://webarchive.unesco.org/20160930040522/https://en.unesco.org/world-education-forum-2015/incheon-declaration

UNESCO. (2015b). *World Education Forum 2015 final report.* Paris: UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000243724

Upadhyay, S. & Anandpara, M. (2020). ICT best practice: MOOC courses in higher education. *1st National conference on role of higher education in sustainable development in India (RHESDI) 2020*, 25–29. https://wvvw.easychair.org/publications/preprint_download/Mc9X

van de Oudeweetering, K. & Agirdag, O. (2015). MOOCs as accelerators of social mobility? A systematic review. *Educational Technology & Society*, *21*(1), 1–11. (EJ1165986). ERIC. https://www.j-ets.net/ETS/journals/21_1/1.pdf

Waldrop, M. M. (2013). Online learning: Campus 2.0. *Nature*, *495,* 160–163. https://doi.org/10.1038/495160a

World Bank. (2016, May 17). *World development report 2016: Digital dividends*. http://www.worldbank.org/en/publication/wdr2016

Xuetangx (2019). *About us*. https://next.xuetangx.com/about

Zajda, J. (2008). Globalization, comparative education and policy research: Equity and access issues. In J. Zajda, L. Davies & S. Majhanovich (Eds.), *Comparative and global pedagogies: Equity, access, and democracy in education,* (pp. 3–14). Springer.

Zawacki-Richter, O. & Naidu, S. (2016). Mapping research trends from 35 years of publications in distance education. *Journal of Distance Education*, *37*(6), 245–269. https://doi.org/10.1080/01587919.2016.1185079

Zawacki-Richter, O., Bozkurt, A., Alturki, U., & Aldraiweesh, A. (2018). What research says about MOOCs – An explorative content analysis. *International Review of Research in Open and Distance Learning*, *19*(1), 242–259. https://doi.org/10.19173/irrodl.v19i1.3356

Zhenghao, C., Alcorn, C., Christensen, G., Eriksson, N., Koller, D., & Emanuel E. J. (2015). Who's benefiting from MOOCs and why. *Harvard Business Review.* https://hbr.org/2015/09/whos-benefiting-from-moocs-and-why

Corresponding author: R. Pam Barger
Contact email: pam.barger@wheaton.edu

Understanding the Characteristics of English Language Learners' Out-of-Class Language Learning through Digital Practices

Ali Dincer
Erzincan Binali Yildirim University
Turkey

Abstract

This study aims to understand the extent to which English as a foreign language learners use technology for their autonomous language learning beyond the classroom. With a cross-sectional survey design approach, the study focuses on learner characteristics. It first investigates the existing language learner profiles of 512 English major university students concerning autonomous language learning and out-of-class technology engagement. Then, details regarding the characteristics of existing learner profiles in terms of language proficiency, daily technology use time, a variety of digital tool use and the most beneficial tools are outlined. Within this frame, cluster analyses suggested two clusters: more autonomously engaged with digital tools and less autonomously engaged with digital tools. The findings showed that more autonomously engaged students tend to have greater language-learning proficiency than the less autonomous group. The more autonomously engaged students also spent more time daily and used various digital tools in comparison to less autonomous technology users. While online websites and social media were the most frequently used digital tools for both groups, the use of podcasts, blogs and online language courses differed. According to the provided tool lists of learners, students benefited significantly from social media, online websites, dictionaries, and intelligent tutoring system applications (apps). Online games, YouTube, Instagram and other smartphone apps, which allow students to practice vocabulary and speak with foreigners, also had considerable influence on language development. The study findings provide insights for language teachers aiming to extend learners' in-class language-learning experiences beyond the confines of the classroom.

Keywords: autonomous language learning, learning through digital practices, out-of-class language learning, technology engagement

Following the rapid development of digital technology, the worldwide digital population now encompasses nearly 60% of the global population, with over 4.5 billion active users (Kemp, 2020). According to a recent report and statistics, the average time spent on the Internet is almost seven hours per day, mainly on social media, watching television, listening to streaming music and gaming. Among these activities, the use of social media is the most favored Internet activity, and 45% of the world population is on social media, spending a minimum of two hours each day. Almost all social media users visit social media sites via their smartphones. Millennials are the biggest users of social media among the generations (Kemp, 2020; Moshin, 2020). These statistics show that people are engaged with technology much more than before, for information seeking, content creation, playing games, broadcasting, communication, education, and pleasure, among other things. As a result, technology is undeniably an indispensable part of daily life. English language, with over two billion native and non-native speakers, serves as a communication tool by delimiting boundaries between people from different countries and creating an authentic virtual atmosphere (Ethnologue, 2019).

Unifying the potential of widespread use of digital technology and the importance of English in the globalized world, it is necessary to understand what goes on outside the classroom to meet the constantly changing needs of today's digital learners. Unlike the great importance of bridging inside and outside learning, the majority of applied linguistic research focuses on what transpires inside the classroom as well as classroom-based application, and there remains limited research concentrating on learning language beyond the classroom, specifically in digital settings (Chick, 2018; Lai, 2015, 2017; Reinders & Benson, 2017; Richards, 2015). Little attention has been given to how language learners bolster their language skills and what language learner profiles exist in learner-led informal settings (Gonulal, 2019).

This article focuses on English as a foreign language (EFL) learners' out-of-class language learning experiences through digital practices and reports on a survey study conducted with university students in Turkey. Specifically, it investigates the existing characteristics of English major language learners with a closer focus on their technology-mediated autonomous language learning experiences. The article firstly reviews relevant research for understanding language learners' out-of-class digital practices and then presents the study methodology and findings. Lastly, it discusses the findings regarding the emerging learner profiles and draws conclusions. Therefore, it expands our understanding of what language learners do beyond the confines of school to learn English in the digital era.

Literature Review

High proficiency of language achievement and development depends on learners' out-of-class engagement as well as in-class engagement (Benson, 2011; Chick & Ho, 2017; Dincer & Dariyemez, 2020; Lai, 2017; Lai et al., 2015; Richards, 2015). Although great strides have been made in understanding foreign language learners' out-of-class language learning practices and gains for language development in earlier studies (e.g., Benson, 2011; Hyland, 2004; Inozu et al., 2010; Murray & Kojima, 2007), less is known about what today's youth do to study language beyond the classroom in the digital era that exists today. Internet and digital technology have become ubiquitous and changed the traditional teaching routines of people all over the world (Larsen-Freeman & Anderson, 2013; Mazer et al., 2007). With a transition from traditional definitions of computer-assisted language learning (CALL) to more modern methods including mobile learning, the importance of digital tools and integration of technology into daily life has exponentially gained popularity in the language education domain (Reinders & White, 2016).

Learners' online informal language experience has great value for language development in the age of digital abundance (Chick, 2018). Recent research has emphasized that engagement in the prevalent digital practices for language learning not only plays a supporting role in language development for learners, but also a complementary role for in-class language learning (Alice & Ho, 2017; Lai, 2017; Lai et al., 2018; Nunan & Richard, 2015). Digital tools provide meaningful and authentic language-learning opportunities for learners and might serve as a panacea for learners who have no or limited change in exposure to authentic daily language in an out-of-school setting (Dincer & Dariyemez, 2020; Gonulal, 2019; Lai et al., 2016; Richards, 2015; Xodabande, 2018). Today, learner autonomy and technology-enhanced language learning have not been isolated from each other; they are together and interconnected (Reinders & White, 2016). To excel in language, learners should have an inner capacity to be aware of their needs and desire to track their progress (Alice & Ho, 2017). Despite its importance for language development, there is limited focus on technology-enhanced out-of-class language learning, and there is a recurrent call for more research into autonomous language learning through digital practices and learner characteristics (Chick, 2018; Dincer & Dariyemez, 2020; Gonulal, 2019; Lai, 2017; Lai et al., 2018; Reinders & Benson, 2017; Reinders & White, 2016).

There is a scarcity of literature about language learners' online informal language learning, and the connection between autonomous language learning and digital practices in the applied linguistics domain is not clear. Via interviews, Lai et al. (2016) elicited the perception matches between language teachers and students regarding teacher involvement in fostering autonomous language learning with technology beyond the classroom. They found that there are mismatches between perceptions and teachers, although teachers have minimal responsibility for the autonomous language development of students and play a passive role in learners' out-of-class use of technology for language learning as they overestimate students' skills. In later research, Chick (2018) provided research agendas on autonomous language learning beyond the classroom and digital practices by way of a qualitative ethnographic approach. Based on the model of Benson (2011) for searching out-of-class language learning, she mapped her language-learning experience on Duolingo (an intelligent tutoring system). Chick found that, in her learning experience, there exist environmental factors beyond her control and it is hard to turn a leisure activity into recreational learning. Duolingo provides a structured pedagogy for learning and goes beyond the structural lessons. Although the locus of control is voluntary participation in the starting point, such digital practices restrict decisions on learning at some points.

Connecting various studies (e.g., Benson, 2011; Richards, 2015), Chick concluded that autonomous language-learning experience is a useful indicator of successful language learning, and digital practices might be tools for understanding language learning as a whole. Emphasizing the use of any digital tool for various purposes, Lai and colleagues (2018) recently identified three types of technological experiences of language learners engaged outside the classroom using multiple data collection techniques. These types are instruction-oriented (i.e., conscious and intentional information-seeking process for expanding knowledge and language development), entertainment and information-oriented (i.e., not fully unintentional and a disorganized method of obtaining and sharing information for daily life needs and personal needs), and social-oriented (i.e., intentional use of social media to interact and communicate with English speakers). These distinct learner profiles are important for educators and researchers to understand language learners' out-of-class experiences.

In another study, Xodabande (2018) researched 114 Iranian EFL learners' preferences in various digital technologies, in a context where people have some online restrictions and censorship. Xodabande found that, despite the restrictions, EFL learners are highly engaged with technology for foreign language, whereby electronic dictionaries, Internet sites and films are the most favored digital tools. Gender was also found to be a significant factor. While male students engage in online games to facilitate learning, female students are more inclined to listen to English music. In more recent research, Kuznetsova and Soomro (2019) surveyed 137 foreign language learners' out-of-class Web 2.0 practices for learning various languages, including English. They found that video sharing websites and social networking sites are the most widely used digital technologies and male students' digital practices are significantly more frequent than females, verifying some earlier research (Cai et al., 2017; Xodabande, 2018).

Despite significant progress in understanding the nature of language learners beyond the classroom, the literature has been invaded by the umbrella term "out-of-class language learning", which comprises all activities and includes the technology. The extant research does not provide a clear picture of language learners' digital practices without teacher guidance and direction. There is a need for research on autonomous language learning with digital practices beyond the classroom. One certain aspect of out-of-class language learning with technology is that "there is a great range of diversity in environments, intentionality, interest, structure, and duration" (Chick, 2018, p.76).

Improving understanding of characteristics of language learners regarding autonomy and technology engagement and investigating their engagement in the digital practices for language learning might serve as a master key to unlock innovative techniques for classroom pedagogy and bind formal to informal learning (Chick, 2018; Kuzetsova & Soomro, 2019; Lai & Gu, 2011; Lai et al., 2015). Considering the affordances of language engagement through digital practices beyond the classroom and the scarce research on autonomous language learning through digital practices, there is much yet to be discovered on specific language learners' distinct characteristics in this unexplored field of research. By way of a survey approach, this study specifically focuses on learning English beyond the classroom with digital tools and students' own initiatives, and aims to understand to what extent EFL learners use technological tools for their self-directed language learning beyond the classroom. With a particular focus on language learners' characteristics, the following research questions guided the study:

1. What different language learner profiles exist among English language learners in terms of autonomous language learning and out-of-class technology engagement?
2. What are the characteristics of language learner profiles in terms of language proficiency, daily technology use, and digital tools used?

Theoretical Framework

This survey research was grounded on the main tenets of modern motivation theory, self-determination theory [SDT] (Deci & Ryan, 1985; Ryan & Deci, 2017). SDT provides an understanding of the psychological and social foundations of autonomous learning in life (Lou et al., 2018). Briefly, it suggests that people have innate psychological needs (i.e., autonomy, competence and relatedness), and these universal needs are met through people's interactions in a social context (Deci & Ryan, 1985; Ryan & Deci, 2017). Within language education, the satisfaction of the needs is crucial for motivated engagement, and results in more autonomous language learning and engagement (Noels et al., 2019).

Despite the increased research on what happens in the classroom, limited research focus has been placed on understanding what happens beyond the classroom, specifically language learning through digital practices within the SDT framework. Connecting the SDT and the recent perspective on the technological experiences of language learners (Lai et al., 2018), this study hypothesizes that autonomous language learning is positively linked to technology engagement in language learning. Accordingly, the students who feel more autonomy in language learning are prone to be more engaged with language learning beyond the classroom through digital tools. Then, investigating the learner profiles will shed light on future research agendas on autonomous language learning through digital practices in the language-learning domain.

Method

Research Design

A cross-sectional survey design was adopted to investigate the nature of language learners' out-of-class language learning experiences. According to Creswell (2012), this is the most popular form of survey design in educational research. The researcher collects data to make inferences about a particular population of interest at a given point and thereby takes snapshots of the population (Creswell, 2012; Hall, 2008). With a non-experimental approach, this study focused on emerging profiles of English language learners' out-of-class language learning through digital practices. It investigated their profiles from various perspectives such as learners' perceived language proficiency, daily time spent for language learning, and variety of digital tools in language learning.

Study Context

The study was conducted with English major students studying in the English Language Teaching (ELT) and English Language Literature (ELL) departments of three state universities in Turkey. The students who graduate from these departments with a BA diploma and certain training certificates might work as English teachers in state schools after taking teacher placement tests. It was expected that these students' experiences with digital tools would be different from the students in the non-English major departments where mother tongue is the medium language.

Participants

512 university-level language learners (n = 362; 70.7% female) whose ages ranged from 17 to 32 (M = 20.59; SD = 2.46) participated in the study. They were enrolled in the two English majors related to learning and teaching English at a tertiary level in Turkey (ELT = 304; ELL = 208). Students were from various classes concerning their majors, and a majority of them were in the first year of their major (n = 200; 39.1%). Their overall perceived language proficiency from receptive (reading and listening) and productive skills (writing and speaking) changed from A2 to C2 in accordance with six levels (A1, A2, B1, B2, C1, C2) of the Common European Framework Proficiency Matrix (n = 185; mostly B2, 36.1%).

Instruments

A survey form including demographic details (i.e., gender, major, and year in the university, perceived level of proficiency), a language learning through digital practices questionnaire, psychometric scales of learner autonomy and out-of-class technology engagement were used as the data collection instruments.

Language learning through digital practices. The questionnaire consisted of three questions regarding students' digital practices. The first question was about daily time spent using technology, from the least (one hour) to high (four hours). The second question was about digital tools students might use while learning on their own. The students chose what digital tool/s they used to learn a foreign language on their own from the given 10 most cited digital tools in the relevant literature (e.g., Benson, 2011; Lai, 2017; Richards, 2015). The third question was in the open-ended format, about the most beneficial digital tool/s used with regularity and their reasons of preferences.

Learner autonomy. The scale was adapted from Nakata (2011) to measure the students' autonomous language-learning experiences. It was a five-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). It had eight items concerning out-of-class learning (e.g., I decide what to learn outside the classroom; $\alpha = .77$). Higher mean scores from the items indicate higher agreement and autonomy levels.

Out-of-class technology engagement. The scale (Lai et al., 2018) assessed the degree to which learners engage in language learning by using digital tools with a five-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). The scale started with the prompt "I use digital tools outside the classroom, mainly …" and was followed by 11 items. The scale had three dimensions: instruction-oriented technological experience had three items (e.g., to help me memorize the vocabulary and grammar; $\alpha = .70$); the entertainment- and information-oriented experience had five items (e.g., to use the language to go after personal interest; $\alpha = .74$); and the social-oriented technological experience dimension had three items (e.g., to connect with native speakers or other learners of the foreign language; $\alpha = .80$). In each dimension, a higher mean indicated stronger agreement and engagement.

Data Collection and Analysis

The data were collected using a paper-based survey in spring 2019. After departmental approval was obtained for data collection, the students were invited to participate in the study. The students were informed about the purpose of the study and instructed about the meaning of learning English with digital tools with examples by the collaborators. They were also informed about anonymity and encouraged to answer the open-ended question. It took approximately 15 minutes to complete the survey.

To answer the research questions, first, the surveys were screened, and those with a significant amount of missing data (e.g., not completing one of the scales) and outliers (i.e., strongly agreeing with all items or strongly disagreeing with all items) were excluded (25 out of 537). After the reliability analysis, a cluster analysis followed, allowing researchers to extract learners' out-of-class technology profiles. The analysis enabled the researcher "to create a new categorical variable that minimizes the amount of variation within categories" (Staples & Biber, 2015, p. 243). Following the steps of the Staples and Biber (2015) analysis, a hierarchical cluster analysis was run, with the Z-scores of two main variables (i.e., out-of-class technology experience and autonomous language learning). The analysis suggested a two-cluster solution. Based on the determined language learner profiles, both quantitative and qualitative data from the survey were descriptively analyzed. For the quantitative data analysis, the SPSS 22.0 packet program was used. In the qualitative data analysis, NVivo software version 12 was used to review word frequencies and to produce a words cloud. In the presentation of the quantitative findings, descriptive tables were used. For the qualitative data, students' excerpts from the open-ended questions were provided with the capital letter of the cluster and the student data identification number (i.e., M123).

Findings

Learner Profiles in Out-of-Class Language Learning Through Digital Practices

The first research question concerned existing language learner profiles in terms of autonomous language learning and out-of-class technology engagement. The hierarchical cluster analysis suggested a two-cluster solution (Cluster 1, n = 330; Cluster 2, n = 182). The findings are presented in Table 1.

Table 1: Comparison of learner profiles in terms of autonomous language learning and out-of-class technology engagement

Main variables	Sub-variables	Cluster 1		Cluster 2	
		M	***SD***	***M***	***SD***
Autonomous language learning	Learner autonomy	4.12	.44	3.40	.57
Out-of-class technology engagement	Instruction-oriented	4.11	.50	3.38	.83
	Entertainment and information-oriented	4.25	.44	3.44	.63
	Social-oriented	4.11	.71	2.99	.84

The results indicated that the students in Cluster 1 highly agreed with the scale items and were thereby named 'More autonomously engaged with digital tools' ($M \geq 4.00$ = Agree). The students in Cluster 2 had a moderate level of agreement and were named 'Less autonomously engaged with digital tools' ($M < 4.00$ = Moderately Agree).

After the determination of the clusters, the demographic characteristics of the groups were analyzed. According to the descriptive statistics, both clusters had similar demographic characteristics, such as age (Cluster 1: M_{age} = 20.67, SD = 2.42; Cluster 2: M_{age} = 20.43; SD = 2.53) and department distribution.

Two groups of descriptive findings are presented in Table 2. According to Table 2, most of the participants in both groups were females (*Min.* = 64.3%), from the ELT department (*Min.* = 57.1%), and first year of study (*Min*. = 39.4%).

Table 2: Demographics of the clusters

Demographics		More autonomously engaged (n = 330)		Less autonomously engaged (n = 182)	
		f	***%***	***f***	***%***
Gender	Male	85	25.8	65	35.7
	Female	245	74.2	117	64.3
Major	ELT	200	60.6	104	57.1
	ELL	130	39.4	78	42.9
Year in university	Preparatory	55	16.7	40	22.0
	First year	122	37.0	78	42.9
	Second year	43	13.0	16	8.8
	Third year	39	11.8	21	11.5
	Fourth year	71	21.5	27	14.8

In sum, there were two types of learner profiles in terms of digital practices and autonomous language learning beyond the classroom. The clusters had similar demographic details regarding frequencies in the variables (i.e., gender, major and year at the university).

Characteristics of language learner profiles

The second research question focused on understanding the nature of existing language learner profiles in terms of language proficiency, daily time spent, variety of digital tools used and most beneficial tools.

Language proficiency. First, the clusters' perceived language proficiency levels were compared in terms of receptive and productive language skills. Table 3 indicates the frequencies and percentages in terms of perceived language proficiency levels in receptive skills: reading and listening.

Table 3: Comparison of clusters in terms of receptive skills

Receptive skills		**More autonomously engaged (*n* = 319)**		**Less autonomously engaged (*n* = 181)**	
		f	***%***	***f***	***%***
Reading	A1 (Beginner)	0	0.0	0	0.0
	A2 (Elementary)	8	2.5	10	5.5
	B1 (Intermediate)	32	10.0	44	24.3
	B2 (Upper Intermediate)	111	34.8	78	43.1
	C1 (Advanced)	108	33.9	39	21.5
	C2 (Proficiency)	60	18.8	10	5.5
Listening	A1 (Beginner)	3	0.9	13	7.2
	A2 (Elementary)	33	10.3	33	18.2
	B1 (Intermediate)	72	22.6	42	23.2
	B2 (Upper Intermediate)	91	28.5	48	26.5
	C1 (Advanced)	76	23.8	37	20.4
	C2 (Proficiency)	44	13.8	8	4.4

According to Table 3, students who are more autonomously engaged with digital tools have higher perceived receptive language proficiency levels than those less autonomously engaged with digital tools (i.e., reading and speaking = B2 and C1). Over half of the students in both groups (i.e., Min. = 51%) perceived their levels to be over level B1.

Students' comparisons in terms of perceived levels in productive skills are presented in Table 4, which indicates the frequencies and percentages of the productive skills: writing and speaking.

Table 4: Comparison of clusters in terms of productive skills

Productive skills		More autonomously engaged (*n* = 319)		Less autonomously engaged (*n* = 181)	
		f	%	*f*	%
Writing	A1 (Beginner)	0	0.0	0	0.0
	A2 (Elementary)	28	8.8	28	15.5
	B1 (Intermediate)	73	23.0	56	30.9
	B2 (Upper Intermediate)	98	30.8	54	29.8
	C1 (Advanced)	88	27.7	38	21.0
	C2 (Proficiency)	31	9.7	5	2.8
Speaking	A1 (Beginner)	12	3.8	14	7.7
	A2 (Elementary)	34	10.7	52	28.7
	B1 (Intermediate)	102	32.0	46	25.4
	B2 (Upper Intermediate)	74	23.2	38	21.0
	C1 (Advanced)	71	22.3	25	13.8
	C2 (Proficiency)	26	8.2	6	3.3

In parallel to the findings of the receptive skills, the students in the more autonomously engaged with digital tools cluster showed higher perceived proficiency levels in productive skills than the students in the second group (i.e., more autonomously engaged = B2 and C1). These students had lower proficiency in writing skills in comparison to speaking skills (more autonomously engaged = $Max._{writing}$ 30.8% in B2 level; more autonomously engaged = $Max._{speaking}$ = 32.0% in B1 level). While the highest majority of the more autonomously engaged students perceived their speaking skills at B1 (i.e., more autonomously engaged = speaking 32.0%), the students in the less autonomously engaged with digital tools group perceived themselves at level A2 (i.e., less autonomously engaged = speaking 28.7%).

Daily time spent. Second, the clusters were compared in terms of their daily time spent using digital tools in language learning, and findings are presented in Table 5.

Table 5: Comparison of clusters in terms of daily time spent

Daily time spent	More autonomously engaged (*n* = 330)		Less autonomously engaged (*n* = 181)	
	f	%	*f*	%
Min. 1 hour	94	28.5	82	45.3
Min. 2 hours	140	42.4	70	38.7
Min. 3 hours	62	18.4	25	13.8
Min. 4 hours	34	10.3	4	2.2

The table shows that the students differed in terms of daily time spent on digital tools. According to the table, the majority of students in the more autonomously engaged with digital tools group spent a minimum of one to two hours (i.e., 70.9%). The great majority of students in the less autonomously engaged group also spent a minimum of one to two hours learning English digitally on a daily basis (i.e., 84.0%). Further, the table shows that students in the more autonomously engaged group spent much more time on digital language learning with a minimum of two hours than the less autonomously engaged group.

Digital tool use. Fourth, the clusters were compared in terms of the variety of digital tools that learners use, as shown in Table 6.

Table 6: Comparison of clusters in terms of tool variety

Tool variety	More autonomously engaged (*n* = 330)		Less autonomously engaged (*n* = 182)	
	f	%	*f*	%
1 tool	3	0.9	6	3.3
2 tools	26	7.9	47	25.8
3 tools	59	17.9	37	20.3
4 tools	64	19.4	41	22.5
5 tools	63	19.1	27	14.8
6 tools	48	14.5	14	7.7
7 tools	40	12.1	8	4.4
8 tools	16	4.8	2	1.1
9 tools	8	2.4	0	0.0
10 tools	3	0.9	0	0.0

Table 6 shows that the students in the more autonomously engaged group differ more in terms of digital tool variety than those less autonomously engaged. While the majority of students in the more autonomously engaged group use a minimum of five to 10 different digital tools (i.e., 73.2%), the majority of students in the less autonomously engaged group use one to four digital tools for language learning (i.e., 71.9%).

In addition to the digital tool variety comparison, students' preferences for most frequently used digital tools were determined. The comparison of clusters with regards to the tool frequency is presented in Table 7.

Table 7: Comparison of clusters in terms of tool use frequency

Tools	More autonomously engaged (*n* = 330)		Tools	Less autonomously engaged (*n* = 182)	
	f	%		*f*	%
1. Social media	297	90.0	1. Social media	156	85.7
2. Dictionaries	285	86.4	2. Dictionaries	151	83.0
3. Websites	223	67.6	3. Websites	91	50.0
4. Grammar & spelling checkers	169	51.2	4. Grammar & spelling checkers	64	35.2
5. Intelligent tutoring systems	159	48.2	5. Intelligent tutoring systems	52	28.6
6. Blogs	118	35.8	6. Online courses	39	21.4
7. Forums	100	30.3	7. Forums	35	19.2
8. Podcasts	93	28.2	8. Blogs	29	15.9
9. Online courses	88	26.7	9. Automatic speech recognition	28	15.4
10. Automatic speech recognition	69	20.9	10. Podcasts	25	13.7

While the first five tools listed in the table were the most commonly used digital tools by both groups, the remaining five tools differed between the groups. While social media, online dictionaries and online websites for language learning were the most frequently used digital tools for both groups, the use of podcasts and online language courses differed.

Most benefited digital tools. Fifth, students' answers to the open-ended question about the most beneficial digital tools for learning English were descriptively analyzed ($N = 307$). While answering the question, some of the students listed more than one digital tool as most beneficial, thereby making frequencies by tool higher than the number of participants. It should also be noted that two extra tools emerged from the data: online games and smartphone apps, allowing for speaking with native speakers for a fee. The findings are shown in Table 8.

Table 8: Comparison of clusters in terms of most beneficial digital tools

Tools	**More autonomously engaged (n = 215)**		**Tools**	**Less autonomously engaged (n = 92)**	
	f	***%***		***f***	***%***
1.Social media	89	41.4	1. Social media	32	34.8
2.Websites	50	23.3	2. Websites	23	25.0
3.Dictionaries	49	21.4	3. Dictionaries	20	21.7
4. Intelligent tutoring systems	42	19.5	4. Intelligent tutoring systems	14	15.2
5. Online courses	18	8.4	5. Online courses	5	5.4
6. Online games	13	6.1	6. Podcasts	5	5.4
7. Grammar & spelling checkers	9	4.2	7. Forums	4	4.4
8. Blogs	7	3.3	8. Blogs	2	2.2
9. Forums	6	2.8	9. Grammar & spelling checkers	2	2.2
10. Podcasts	5	2.3	10. Online games	2	2.2
11. Apps-Speaking	5	2.3	11. Apps-Speaking	1	1.1
12. Automatic speech recognition	2	0.9	12. Automatic speech recognition	0	0.0

Note. Values might not end in 100% due to rounding.

According to the most beneficial tool lists, students' preferences provided similar findings to the previous digital tool frequency list table. Social media, online websites, dictionaries and intelligent tutoring system apps were the most beneficial tools for all students. Different from the tool lists, some students indicated the benefits of online games and smartphone apps, which allow them to speak with native English speakers and people who use English for communication.

In addition to frequencies, to assess specific tools among all students' answers, a word cloud was generated, with a restriction of words with a minimum length of five letters and the 30 most frequently used words with stemmed words. The results are shown in Figure 1.

Figure 1: Word cloud

The word cloud formed from 307 students' open-ended responses indicated that, in addition to some broad tools stated, students also use specific tools. These tools are YouTube (online video-sharing platform and social media tool), BBC English (online language service of BBC World Service), Tureng (a bilingual online Turkish-English dictionary), Instagram (a social networking service), Duolingo and Memrise (intelligent tutoring systems for language learning).

The students emphasized the many benefits of learning English with digital tools. Digital tools allow learners to access the content anytime they want using their cellphones. On this issue, one student (M159) said: "I think YouTube is the most useful for me because I access everything about learning the language with easily [sic]." Another participant (L91) added: "I have benefited much with social media websites because I always can access it on my phone all the time."

Digital tools allow learners to practice numerous skills at once. L4 said: "YouTube, because I can improve more skills, such as listening, reading, speaking, compared to other tools." Another student said: "Podcasts, because they enhanced both my speaking and listening skills." (L47)

In addition to language development gains, students emphasized that language learning with digital tools is a win-win process. While being entertained, learning comes as a bonus, and learners broaden their horizons. On this issue, M81 said: "YouTube and Instagram. Especially memes, I follow on Instagram because it entertains me while learning." Focusing on the role of BBC English regarding language development, L90 pointed out that: "In this way, I not only improve my listening skills but also I know what happened all around the world."

Digital tools allow learners to access high-quality content in accordance with their own tastes and repeat the content anytime they want. Regarding this topic, L66 stated that: "BBC English

learning is the best. It is very qualified, and it has many good contents." M50 said: "Duolingo is very beneficial because you can repeat until you learn."

Moreover, digital tools allow students to practice the language in an interactive, authentic language learning setting and learn the daily language and colloquial expressions that are difficult to gather in-class. Emphasizing the social interaction version of YouTube, student M196 indicated that "Because on this platform, I watch dozens of videos, and we can discuss in the comments with other people." Focusing on the social role of online games, H45 said: "Games, because I hear original sentences which I could not hear before and interact with natives [English] in Clanset."

Some of the students also highlighted the complementary role of digital tools for in-class education. For instance, M75 indicated: "I benefit much from online websites. My lessons [in-class] are not enough to study learning English." Emphasizing the limited in-class course hours, L83 stated: "I have benefited from Blogs much because to improve my English, I have to use listening texts."

Discussion

This study has explored the learner profiles in self-directed language-learning initiatives through digital practices and mapped the nature of university students' out-of-class English language engagement using a survey design. Grounded on the main tenets of SDT, it was hypothesized that autonomous language learners are active learners outside the classroom, as well as in the classroom. They successfully self-direct their language learning without teacher direction. Then, the study connected learner autonomy and out-of-class technology engagement for learning English and aimed to investigate distinct characteristics of language learners. Two research questions guided the study, and the findings for each research question have been outlined.

To answer the research questions, first, a hierarchical cluster analysis was conducted, suggesting two distinct profiles in terms of autonomous language learning through digital practices: "More autonomously engaged" versus "Less autonomously engaged" students. This finding verified the hypothesis of the study. As expected, the students who feel greater feelings of autonomy in their learning are also the ones who are highly engaged in the learning process. In concurrence with the relevant literature, the findings showed that these two variables are closely associated and students with high levels of learner autonomy tend to have strong out-of-class technology engagement (Chick, 2018; Lai & Gu, 2011; Lai et al. 2015, 2016; Reinders & White, 2016). Further, it should be noted that, unlike the earlier literature suggesting that EFL learners have some problems taking responsibility in their learning process and need significant teacher guidance (Eksi & Aydin, 2013; Inozu et al., 2010), the means for both groups' out-of-class digital language-learning experience and autonomous language learning were relatively high. This outcome corroborates the recent studies about the findings of the technology-enhanced language practice, which suggest that students in the digital age take more initiative in their language learning despite waiting from their teachers (Haidari et al., 2019; Lai et al., 2018). This might be related to the rapid development of digital tools, smartphones and apps in the last decade (Jurkovič, 2019).

Based on the emerged learner profiles, a number of comparisons were conducted between the groups to understand the different learner profiles' engagement with a digital tool. Regarding the contrast within the perceived language proficiency levels, students who are more

autonomously engaged with digital tools tend to have a higher proficiency both in receptive and productive language skills than the less autonomously engaged students. In parallel to literature (e.g., Dincer & Yesilyurt, 2017), students have lower proficiency levels in productive skills in EFL contexts. According to daily time spent and variety of used tools, more autonomously engaged students spend greater time daily for learning English online and use a wider variety of digital tools than the less autonomously engaged students. As Lai and Gu (2011) stated, perceived language proficiency is associated with learners' use of technology to seek language-learning resources and opportunities beyond the classroom. Students who have studied the language for a long time and have higher proficiency levels tend to spend more time daily and assume more personal responsibility (Orhon, 2018).

With regard to the most frequently used digital tools, social media, online dictionaries, websites for language learning, grammar and spelling checkers, and intelligent tutoring systems were found to be the most popular for both groups, which is consistent with a number of studies (Cai et al., 2017; Kuznetsova & Soomro, 2019). Despite the affordances for language development, tools such as blogs, forums and automatic speech recognition are the least popular. Although blogs and forums serve as social-oriented technological experience for learners, they are the least popular activities in earlier studies (Lai & Gu, 2011; Lai et al., 2018). In addition, there is limited research on the use of automatic speech recognition tools in language learning, as they have only recently gained popularity due to the prevalent IOS and Android applications. With the improvements in accurate speech recognition, automatic speech recognition technology has become ubiquitous and important for fostering learner autonomy (McCrocklin, 2016). In conjunction with the frequency of use of the tools, students in both groups benefited most from social media, websites for language learning and online dictionaries. Learners named language-learning websites like BBC English learning, social media sites such as YouTube and Instagram, and digital games as very helpful tools. It was shown that English major students are more aware of the benefits of the tools and use these effectively for language development. In contrast, Xodabande (2018) found such online websites and computer games to be perceived as less effective tools in enhancing language development. However, Xodabande's results were country-specific, and most social media sites are filtered; these tools do not require much effort to push learners to use them actively. The majority of tools provide receptive activities and entertainment, and information-oriented activities are more common in digital language-learning practices (Jurkovič, 2019; Lai, 2015, 2017; Lai et al., 2015, 2018).

Furthermore, the findings of this study suggest that online digital tools allow learners to practice skills with ease at all times. In parallel to the entertainment- and information-oriented technological experience (Lai et al., 2018), students share or access information useful in daily life while being entertained. In addition, this unintentional process might turn into the incidental acquisition of the language, and naturalistic learning might occur (Sockett, 2014). Online digital tools allow students to practice English in an interactive setting focused on daily language. Most digital tools, especially social media, provide authentic language and increase learners' exposure to target language outside the classroom, especially in EFL settings (Hyland, 2014; Richards, 2015; Xodabande, 2018). Such tools might be used to compensate for the deficiencies of formal education, such as limited course hours and oral practice (Lai et al., 2016; Richards, 2015; Xodabande, 2018). As Lai et al. (2016) emphasized, learning language through digital practice beyond the classroom might serve a compensatory role for limited course time or for practicing lesser known or unclear aspects that are not addressed in the formal education.

The limitations of this study involve the study participants and data collection methodology. First, although two learner profiles emerged, both groups had relatively high means in language learning with technology outside the classroom. This might be related to the study group, as the participants were students in the English major. English major students might have greater needs as well as more self-determined motivation levels than learners who study the language for more external reasons, such as passing an exam or a career promotion (Dincer & Yesilyurt, 2017). In this vein, the other groups of students in different branches might be a strategic new focus of research for further inquiry. Second, this study adopted a survey approach to generalize and understand what transpires outside the classroom in terms of language learning with digital tools. Although this methodology fit the research goals well, it lacked presentation of the causal relationships between the reasons for use and specific tools, and says little about predominant language use in all digital activities. Then, one-on-one interviews are needed for in-depth analysis and understanding of how these digital tools helped learners to learn English beyond the classroom. It might also be interesting to adopt a mixed-method or longitudinal design to understand the relationship and activities, including language use beyond the classroom (Jurkovič, 2019). As Reinders and Benson (2017) suggested, asking learners to keep diaries or reflective journals to track their engagement and individual strategy use in-depth on a daily basis might illuminate the specific tools used in this lesser known terrain of applied linguistics.

Conclusion

The study findings provide further understanding of the nature of language learners' out-of-class language learning experiences with digital tools. The research provided findings in which tools are used by more autonomously engaged and less autonomously engaged learners. The findings reveal that learners are highly engaged with digital tools, and that these digital tools afford for learners to individualize and monitor their language development. Additionally, the study highlights the necessity for language teachers to homogenize students' out-of-class experiences and in-class language learning. With the divergence of digital tools and the use of smartphones in daily life, the boundaries between in-class and out-of-class have gradually blurred (Ma, 2017). Therefore, it seems imperative for teachers to guide their students' learning outside the classroom and link in-class teaching to their students' out-of-class activities by understanding their students' engagement with digital tools (Reinders & Benson, 2017). Research on what transpires beyond the classroom with digital tools for language learning remains a raw area, and there are many questions waiting to be answered. Any research attempt to understand language learners' practices outside the classroom in the digital era would assist in developing thorough understanding of the language-learning process.

Acknowledgements

The author thanks Hakan Demiroz (PhD) and Tuba Isik (PhD Student) for their data collection assistance.

References

Benson, P. (2011). Language learning and teaching beyond the classroom: An introduction. In P. Benson & H. Reinders (Eds.), *Language learning and teaching beyond the classroom: Theoretical and practical perspectives* (pp. 7–16). Palgrave Macmillan.

Cai, Z., Fan, X., & Du, J. (2017). Gender and attitudes toward technology use: A meta-analysis. *Computers & Education, 105*, 1–13. https://doi.org/10.1016/j.compedu.2016.11.003

Chan, H. W. (2016). Popular culture, English out-of-class activities, and learner autonomy among highly proficient secondary students in Hong Kong. *Universal Journal of Educational Research 4*(8), 1918–1923. https://doi.org/10.13189/ujer.2016.040823

Chik, A. (2018). Learner autonomy and digital practices. In A. Chik, N. Aoki, & R. Smith (Eds.), *Autonomy in language learning and teaching: New research agenda* (pp. 73–92). Palgrave Pivot. https://doi.org/10.1057/978-1-137-52998-5-5

Chik, A., & Ho, J. (2017). Learn a language free: Recreational learning among adults. *System, 69,* 162–171. https://doi.org/10.1016/j.system.2017.07.017

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Pearson Education.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior.* Plenum Press.

Dincer, A., & Dariyemez, T. (2020). Proficient speakers of English as a foreign language: A focus-group study. *IAFOR Journal of Education: Language Learning in Education, 8*(1), 83–99. https://doi.org/10.22492/ije.8.1.05

Dincer, A., & Yesilyurt, S. (2017). Motivation to speak English: A self-determination theory perspective. *PASAA: Journal of Language Teaching and Learning in Thailand, 53*(1), 1–25. https://doi.org/10.14456/pasaa.2017.1

Eksi, G., & Aydin, H. (2013). What are the students doing out there? An investigation of out-of-classs language learning activities. *Abant Izzet Baysal University Journal of Social Sciences, 13*(2), 191–210.

Ethnologue, (2019). *What are the top 200 most spoken languages?* Retrieved from https://www.ethnologue.com/statistics/size

Gonulal, T. (2019). The use of Instagram as a mobile-assisted language learning tool. *Contemporary Educational Technology, 10*(3), 309–323. https://doi.org/10.30935/cet.590108

Haidari, S. M., Yanpar Yelken, T., & Akay, C. (2019). Technology-enhanced self-directed language learning behaviors of EFL student teachers. *Contemporary Educational Technology*, *10*(3), 229–245. https://doi.org/10.30935/cet.590003

Hall, J. (2008). Cross-sectional survey design. In P. J. Lavrakas (Ed.), *Encyclopedia of survey research methods* (pp.172–173). Sage. https://doi.org/10.4135/9781412963947

Hyland, F. (2004). Learning autonomously: Contextualizing out-of-class English language learning. *Language Awareness, 13*(3), 180–202. https://doi.org/10.1080/09658410408667094

Inozu, J., Sahinkarakas, S., & Yumru, H. (2010). The nature of language learning experiences beyond the classroom and its learning outcomes. *US-China Foreign Language, 8*(1), 14–19.

Jurkovič, V. (2019). Online informal learning of English through smartphones in Slovenia. *System*, *80*, 27–37. https://doi.org/10.1016/j.system.2018.10.007

Kemp, S. (2020). *Digital in 2020.* Retrieved from https://wearesocial.com/digital-2020

Kuznetsova, N., & Soomro, K. A. (2019). Students' out-of-class Web 2.0 practices in foreign language learning. *Journal of Education and Educational Development*, *6*(1), 78–94. https://doi.org/10.22555/joeed.v6i1.2713

Lai, C. (2015). Modeling teachers' influence on learners' self-directed use of technology for language learning outside of the classroom. *Computer & Education, 82*(1), 74–83. https://doi.org/10.1016/j.compedu.2014.11.005

Lai, C. (2017). *Autonomous language learning with technology: Beyond the classroom.* Bloomsbury.

Lai, C., & Gu, M. (2011). Self-regulated out-of-class language learning with technology. *Computer Assisted Language Learning, 24*(4), 317–335. https://doi.org/10.1080/ 09588221.2011.568417

Lai, C., Hu, X., & Lyu, B. (2018). Understanding the nature of learners' out-of-class language learning experience with technology. *Computer Assisted Language Learning, 31*(1–2), 114–143. https://doi.org/10.1080/09588221.2017.1391293

Lai, C., Yeung, Y., & Hu, J. (2016). University student and teacher perceptions of teacher roles in promoting autonomous language learning with technology outside the classroom. *Computer Assisted Language Learning*, *29*(4), 703–723. https://doi.org/10.1080/09588221.2015.1016441

Lai, C., Zhu, W., & Gong, G. (2015). Understanding the quality of out-of-class English learning. *TESOL Quarterly, 49*(2), 278–308. https://doi.org/10.1002/tesq.171

Larsen-Freeman, D., & Anderson, M. (2013). *Techniques and principles in language teaching* (3rd ed.). Oxford University.

Lou, N. M., Chaffee, K. E., Vargas Lascano, D. I., Dincer, A. & Noels, K. A. (2018). Complementary perspectives on autonomy in self-determination theory (SDT) and language learner autonomy (LLA). *TESOL Quarterly, 52*(1), 210–220. https://doi.org/10.1002/tesq.403

Ma, Q. (2017). A multi-case study of university students' language-learning experience mediated by mobile technologies: *A socio-cultural perspective. Computer Assisted Language Learning, 30*(3–4), 183–203. https://doi.org/10.1080/09588221.2017.1301957

Mazer, J. P., Murphy, R. E., & Simonds, C. J. (2007). I'll see you on "Facebook": The effects of computer-mediated teacher self-disclosure on student motivation, affective learning, and classroom climate. *Communication Education*, *56*(1), 1–17. https://doi.org/ 10.1080/03634520601009710

McCrocklin, S. M. (2016). Pronunciation learner autonomy: The potential of automatic speech recognition. *System, 57,* 25–42. https://doi.org/10.1016/j.system.2015.12.013

Moshin, M. (2020). *10 social media statistics you need to know in 2020*. Retrieved from https://www.oberlo.com/blog/social-media-marketing-statistics

Murray, G., & Kojima, M. (2007). Out-of-class language learning: One learner's story. In P. Benson (Ed.), *Learner autonomy 8: Insider perspectives on autonomy in language learning and teaching* (pp. 25–40). Authentik.

Nakata, Y. (2011). Teachers' readiness for promoting learner autonomy: A study of Japanese EFL high school teachers. *Teaching and Teacher Education, 27*(5), 900–910. https://doi.org/10.1016/j.tate.2011.03.001

Noels, K. A., Lou, N. M., Vargas Lascano, D. I., Chaffee, K. E., Dincer, A., Zhang, Y. S. D., & Zhang, X. (2019). Self-determination and motivated engagement in language learning. In M. Lamb, K. Csizér, A. Henry, & S. Ryan (Eds.), *The Palgrave handbook of motivation for language learning* (pp. 95–115). Palgrave Macmillan.

Nunan, D., & J. C. Richards (Eds.) (2015). *Language learning beyond the classroom.* Routledge.

Orhon, Y. (2018). An investigation of out-of-class language activities of tertiary-level EFL learners. *Education Reform Journal, 3*(1), 1–14. https://doi.org/10.22596/erj2018.0301.1.14

Reinders, H., & Benson, P. (2017). Research agenda: Language learning beyond the classroom. *Language Teaching, 50*(04), 561–578. https://doi.org/10.1017/S0261444817000192

Reinders, H., & White, C. (2016). 20 years of autonomy and technology: How far have we come and where to next? *Language Learning & Technology*, *20*(2), 143–154. https://doi.org/10125/44466

Richards, J. C. (2015). The changing face of language learning: Learning beyond the classroom. *RELC Journal, 46*(1), 5–22. https://doi.org/10.1177/0033688214561621

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness.* The Guilford Press.

Sockett, G. (2014). *The online informal learning of English.* Palgrave Macmillan.

Staples, S., & Biber, D. (2015). Cluster analysis. In L. Plonsky (Ed.), *Advancing quantitative methods in second language research* (pp. 243–274). Routledge.

Xodabande, I. (2018). Iranian EFL learners' preferences of different digital technologies for language learning beyond the classroom. *International Journal of Education & Literacy Studies, 6*(3), 20–31. https://doi.org/10.7575/aiac.ijels.v.6n.3p.20

Corresponding author: Ali Dincer
Contact email: adincer@erzincan.edu.tr

Beyond the Basics: Adapting an Open Textbook to Accommodate a Flipped Class

Ariana Eichelberger
University of Hawaii at Manoa,
USA

Hong Ngo
University of Hawaii at Manoa
USA

Abstract

Through a collaborative effort between an instructional design team and the Biology Department at the University of Hawai‘i at Mānoa, the OpenStax Biology 2e open, online textbook was modified with new features to improve student engagement and learning outcomes. This study investigated students' perceptions of the customized textbook. A survey of 22 questions was completed by 446 students using the textbook as a part of an introductory Biology course. Changes made to the textbook were well received by the majority of students and suggestions were made for improvements. Current and future revisions to the textbook are discussed.

Keywords: OER**,** OpenStax, biology, flipped classroom

Assigning university students readings to complete outside of class is not new. Outside readings are an important way for students to learn, as undergraduate courses typically have limited in-class time (Bergmann & Sams, 2012; Ryan, 2006). Students who complete readings prior to class tend to understand instructional material better and are more prepared for class (Gurung, 2003; Narloch et al., 2006). Completing work outside of class may also contribute to student satisfaction and sense of self-determination (Sergis et al., 2018).

Completing work outside of class is a significant component of the flipped classroom model. In a flipped classroom, "students gain first exposure to new material outside of class, usually via reading or lecture videos, and then use class time to do the harder work of assimilating that knowledge, perhaps through problem-solving, discussion, or debates" (Brame, 2013, p. 1). The flipped model has been shown to improve learning performance (Bhagat et al., 2016), increase student satisfaction (Bösner et al., 2015), engage students (Khanova et al., 2015), improve critical thinking (van Vliet et al., 2015) and enhance application skills (Liou et al., 2016).

However, there are also challenges, including students not completing out-of-class work (Al-Zahrani, 2015), and instructors' inability to know if students have completed work (Fautch, 2015). Students commonly fail to spend adequate amounts of time studying outside of class (Akçayır & Akçayır, 2018; Lai & Hwang, 2016) and those students may not succeed in a flipped class (Sayeski et al., 2015). It has been suggested that engaging students during out-of-class work and keeping them accountable are key factors for student success in the flipped model (Hwang et al., 2015).

While the flipped model's effectiveness in increasing student outcomes has been well established, less attention has been paid to its impact on students' internal dispositions or intrinsic motivation to remain engaged in the learning process (Sergis et al., 2018). A student's engagement and learning are influenced by their motivation (Elliot, 2019). Student motivation to engage with the out-of-class content becomes critical in a flipped environment as students who fail to do so are not able to fully participate in class (Aidinopoulou & Sampson, 2017) and increasingly fall behind as a flipped course progresses (Chen et al., 2014).

Inspired by the possibilities, and aware of the challenges, the University of Hawai‘i at Mānoa's (UHM) Biology department partnered with the College of Education's Distance Course Design and Consulting Group (DCDC) to redesign its introductory Biology course, BIOL 171, to incorporate the flipped classroom model. Biology team members included the course professor and lab coordinator serving as subject matter experts. DCDC team members included a project manager, instructional designer, web developer, programmer, and graphic designer. From fall 2017 to summer 2018, the OpenStax Biology 2e textbook was customized, then piloted in fall 2018 with 463 students. This study examined students' perceptions of using the customized textbook. The questions guiding the study were:

1. How did BIOL 171 students perceive the design features added to the OpenStax Biology 2e textbook?
2. Did the new design features influence students' motivation and satisfaction when participating in the course?
3. What improvements to the textbook did students suggest?

Customizing the OpenStax Biology 2e Textbook

The OpenStax Biology 2e textbook is an Open Educational Resource (OER), as it resides in the public domain and is released under an intellectual property license allowing for free use or re-purposing (Atkins et al., 2007). Educator reported benefits of OER include knowing that all students have access to course materials (Weller et al., 2015), an increased sense of control over curriculum, better ability to serve the needs of diverse learners, and positive changes in pedagogy (Pitt, 2015).

Students report favoring online OER textbooks over traditional print texts, finding them more up-to-date and useful (Feldstein et al., 2012). Students have also reported satisfaction with the quality of OER materials (Gil et al., 2013; Pitt et al., 2013), and their accessibility (Weller et al., 2015). In addition, students also report that OER textbooks support their course work, and would recommend OER to their classmates (Hilton et al., 2013). Another common reason for students preferring OER textbooks is low cost (Lindshield & Adhikari, 2013; Petrides et al., 2011). High prices for traditional textbooks have resulted in students choosing to not take courses (Donaldson et al., 2012), not purchase materials while enrolled in a course (Allen, 2011) and to be more concerned about book costs than tuition (Bonner, 2014 as cited in Pitt, 2015).

The textbook was redesigned to support a flipped classroom. A fundamental aspect of the flipped model is students interacting with content out-of-class before engaging in learning activities face-to face. This pre-class work provides students with a sense of ownership of their learning (O'Flaherty & Phillips, 2015) and has been attributed in part to the overall success of the flipped model (Gross, 2015). The textbook was specifically focused on to enhance students' out-of-class experience and accountability.

Conceptual Framework

The redesign of the textbook was conceptually guided by Gagne's Conditions of Learning and Theory of Instruction (1985) and Deci and Ryan's (2012) Self-Determination Theory. Considering the flipped model from an instructional design perspective, the primary function of the textbook is to present content. However, according to the Conditions of Learning and Theory of Instruction (1985), presenting content is not enough. To effectively learn, students must move through a series of learning events. Providing learner guidance and opportunities for practice with feedback after content presentation are key learning events. In the absence of sufficient learner guidance, practice, and feedback students in flipped learning environments often lack the self-regulation to be successful with the out-of-class content (Sun et al., 2017). A number of the features added to the textbook were designed to support Gagne's learning events relevant to out-of-class work including providing learner guidance, eliciting performance and providing feedback on performance. To enhance learner guidance, organization and navigational features were added. Additional chapters were added explaining navigation of the textbook and providing tips on being a successful online learner. Text and figure rollovers were included to reinforce concepts introduced. To provide opportunities for practice, interactive flashcards and text and video quizzes were added. Immediate feedback was provided and quizzes could be taken an unlimited number of times. Feedback on overall progress was provided via the redesigned table of contents displaying the student's status on each of the quizzes.

The additional features of the redesigned textbook were also influenced by Self-Determination Theory. Through the lens of Self-Determination Theory (Deci & Ryan, 2012), a learner's intrinsic motivation is strengthened when their actions feel autonomous and they feel

competent or able to master an activity. Intrinsically motivated learners tend to persist at learning tasks, making them more likely to achieve (Vansteenkiste et al., 2006). Therefore, learning materials used as a part of a flipped class should enhance perceptions of autonomy and competence to foster motivation. A number of features were added to increase feelings of autonomy. First, the textbook was designed to be easily accessed via mobile devices allowing access from any location at any time. Second, quiz status icons were added to give students continual feedback on their progress. Third, the table of contents was redesigned based on due dates rather than topics. Each of these features was designed to enhance students' sense of autonomy as they completed out-of-class work. To increase students' sense of competence with the content, practice flashcards and text and video quizzes were added to each chapter.

Text and Video Quizzes

The number of undergraduate students who do not complete textbook readings or postpone them until immediately before an exam is increasing (Clump et al., 2004; Johnson & Kiviniemi, 2009; Sappington et al., 2002). Failure to complete reading assignments is detrimental to learning (Johnson & Kiviniemi, 2009), and negatively impacts in-class performance (Gurung, 2003; Narloch et al., 2006). Regularly scheduled quizzes have been associated with increased exam scores and course performance (Johnson & Kiviniemi, 2009). Flipped students need formative assessment opportunities to understand what they know and do not know (Rotellar & Cain, 2016; Slomanson, 2014) and benefit from incentives to prepare for class (Kim et al., 2014). Additionally, flipped instructors need methods for assessing students' understanding of material (Kim et al., 2014).

To enhance student performance, engagement and accountability, quizzes were embedded in each chapter. A portion of final grades were based on overall quiz completion. Two types of quizzes were added, text and video. Both types used a multiple-choice format and were created using the H5P plugin. Figure 1 shows a text quiz.

Figure 1: Screenshot of a text quiz

Eight additional videos were added to the text. Quizzes were embedded in these videos using the H5P interactive video feature. As seen in Figure 2, quizzes paused the video with questions for students to answer before they could continue watching.

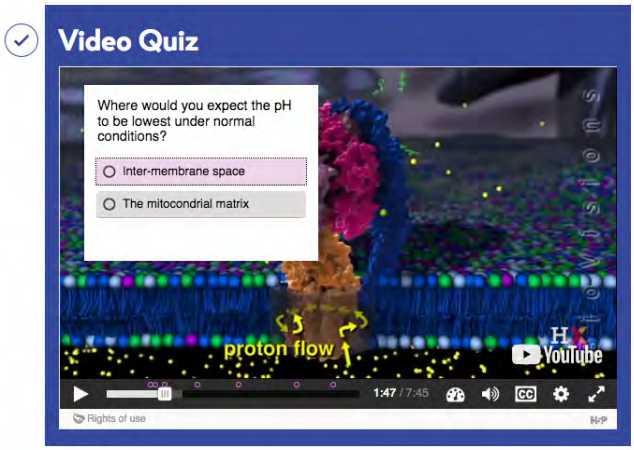


Figure 2: Screenshot of a video quiz

Glossary Term Practice Flashcards

Flashcards are known to increase vocabulary comprehension and retention (Fitzpatrick et al., 2008), are more likely to be used when provided by an instructor (Burgess & Murray, 2014), and are most effective when used over time (Cepeda et al., 2006). The customized textbook embedded interactive glossary term flashcards in each chapter using the original textbook's terms. Flashcards were built with Quizlet, a free, online, effective (Wright, 2016) flashcard application. Flashcard use was optional, and not recorded.

Chapter Due Dates

Consistent pre-class assignments prepare students for a flipped class (Baepler et al., 2014) and contribute to increased outcomes (Gross et al., 2015). Flipped classes should incorporate preferred features of online classes including clear structure, easy navigation and scheduling milestones (Bergstrand & Savage, 2013; Crews & Butterfield, 2014; Rabbany et al., 2011; Wanner & Palmer, 2015). It is important for flipped students to know what they need to do prior to class (Rotellar & Cain, 2016), as self-regulation is often a challenge for students in technology mediated environments (Shyr & Chen, 2018). This can be communicated to flipped class students by providing a study schedule (Mason et al., 2013).

As displayed in Figure 3, the redesigned textbook used a calendar-like format that organized chapters by their due dates rather than topic. This Due Dates page was shown upon logging into the text.

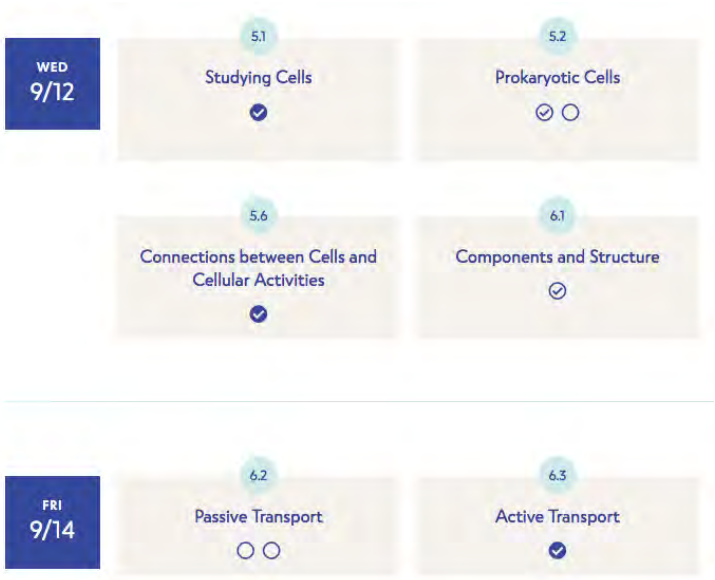


Figure 3: Chapters organized by due dates with quiz status icons

Each chapter was displayed as a single webpage. Groups of chapters due on the same date were displayed as circular icons at the top and bottom of each chapter page. As displayed in Figure 4, rolling over a chapter icon displayed the chapter's title and quiz status. Clicking on a chapter icon would take a student to that chapter.

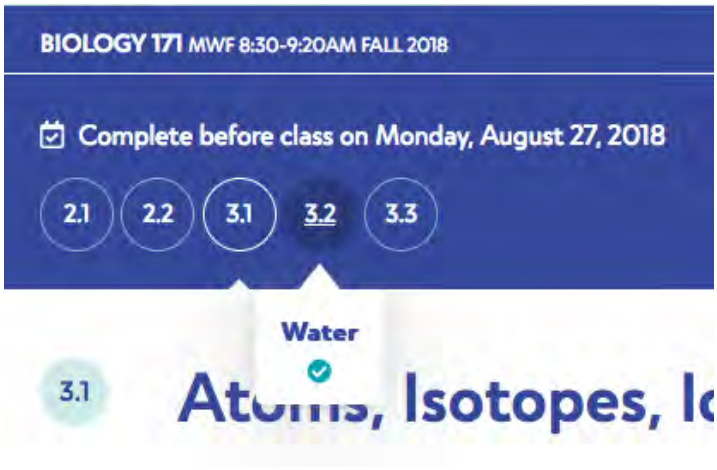


Figure 4: Rollover feature displaying chapter title and individual student's quiz status

Quiz Status Icons

Students are often not aware of how they are doing in a course until it is too late (Pistilli & Arnold, 2010). An online student dashboard "provides a visual display of the important information needed to achieve one or more goals, consolidated and arranged on a single screen so the information can be monitored at a glance" (Teasley, 2017, p. 378). Quiz status icons were displayed with each chapter depicting student progress. As seen in Figures 3 and 4, each quiz was represented by a circle. At a glance, a student could see their quiz status.

Figure and Text Rollovers

In the original textbook, when clicking on a figure reference would take readers back to the original figure's location. To reduce clicks and keep readers in their location, the redesigned

textbook added a rollover feature that popped a figure up in place any time it was referred to in the text. The figure rollover feature is seen in Figure 5.

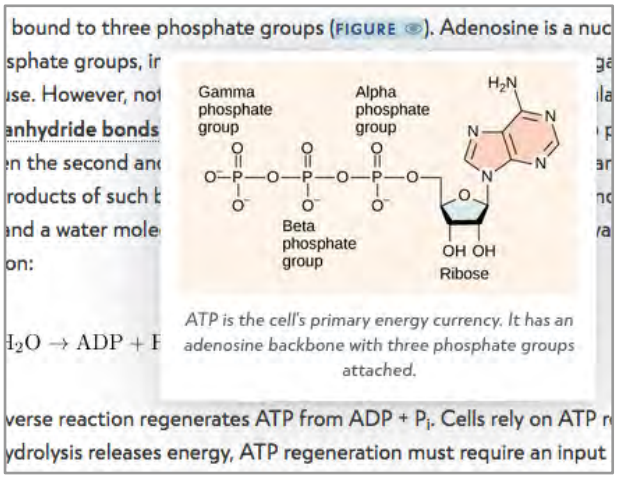


Figure 5: Figure rollover feature

As seen in Figure 6, a glossary term in-text rollover feature was also added. Terms appeared as underlined text, indicating that they could be rolled over to display their definition.

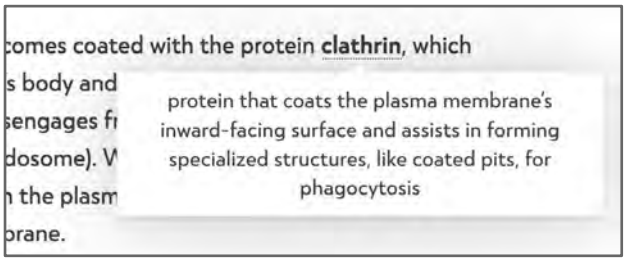


Figure 6: Text rollover feature

Chapter Feedback

At the end of every chapter, students were able to provide comments and ratings on a 1 to 5 "star" scale, see Figure 7. Feedback could be given a descriptive tag to identify it as a compliment, fix or recommendation. The feedback was then displayed to instructors in their dashboard.

Figure 7: Student feedback feature

Additional Chapters

A comprehensive course orientation may help reduce confusion for online students regarding course layout and expectations (Morris & Finnegan, 2008). For flipped students it may additionally reduce fear or resistance to a new method (Lee et al., 2017). To orient students and provide tips on being a successful online learner, two additional chapters, Start Here and Online Learning Success, were added. Start Here included a video detailing logging in, taking quizzes and monitoring progress. Online Learning Success provided online learning tips.

Method

The purpose of this study was to examine students' perceptions of the customized textbook. All methods and instruments were approved by the University's institutional review board on human subjects research. Data were collected using an anonymous, online survey consisting of 16 Likert scale, three open-ended, and three demographic questions. As the textbook's redesign had been conceptually guided Gagne's Theory of Instruction and the Self-Determination Theory, the survey asked students to rate the features added to provide learner guidance, practice with content, and feedback as well as questions about satisfaction and motivation with the text. The survey was distributed in week 14 of the 16-week fall 2018 semester. Quantitative data were analyzed using SPSS 25.0. Qualitative data were quantified for frequency of favored features and improvement suggestions.

Findings

Participants

The majority, 96.3% (n = 446) of the 463 fall 2018 BIOL 171 students invited to participate completed the survey. Students ranged from 17 to 38 years old, 70% (n = 312) were female, 29% (n = 131) were male and 3 opted to not identify gender.

Students' Perceptions of the Design Features

Text and video quizzes. Students were positive about the text and video quizzes. As summarized in Table 1, the overall mean score (*M*) for quizzes was 3.8, above the midpoint on a scale of 1 (strongly disagree) to 5 (strongly agree) with a standard deviation of .870. Specifically, 59% found the quizzes engaging, 62.3% agreed that the questions in the videos helped them learn the content in the video, and 68.6% agreed that the text quizzes reinforced the chapter content. In addition, 16.6% listed the embedded quizzes as the feature they liked best about the customized textbook. Student 327 explained, "the quizzes encouraged me to review and study the information being taught." Student 345 said, "the textbook had...video quizzes so that I could be engaged in my homework."

Table 1: Text and video quizzes

Text and Video Quizzes (*M* = 3.8, *SD* = .870)	**1-2 (%)**	**3 (%)**	**4-5 (%)**	***M (SD)***
1. The text and video quizzes in the online textbook were engaging.	10.7	30.3	59	3.72 (1.008)
2. The questions embedded in the videos helped me learn the video content.	11.5	26.2	62.3	3.78 (1.042)
3. The text quizzes reinforced the chapter content.	8.1	23.3	68.6	3.94 (0.980)

(1-2: strongly disagree - disagree; 3: neutral; 4-5: agree - strongly agree)

The results also revealed students with neutral or negative perceptions toward the quizzes. As seen in Table 1, 23.3% to 30.3% of the students indicated neutrality about the benefits of the text and video quizzes to their learning, and 8.1% to 11.5% indicated negative perceptions of the quizzes. Some students suggested adding more questions to the text and video quizzes. For example, Student 372 wrote, "More content on the quizzes that better reflect exams questions i.e actual questions from the exams." Student 137 said, "the quizzes more in depth because they were very easy and i feel quite a few of them didn't cover main ideas of certain sections." Student 159 suggested fixing the questions saying, "Some of the quizzes had answers that did not make sense."

Glossary term practice flashcards. As displayed in Figure 8, slightly over half (52.9%) of the students reported using the flashcards in most, or every chapter while 28.1% of the students did not use them in any, or in very few chapters.

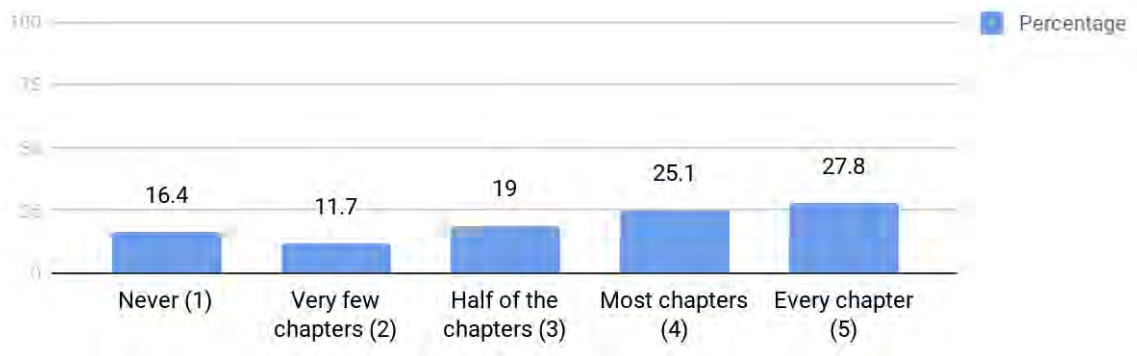


Figure 8. Reported frequency of use of glossary term practice flashcards.

Additional design features. The majority of students were positive about the additional design features. The overall mean score for these 5 questions was 4.2 with an *SD* of .653. As shown

in Table 2, the quiz status icons (item 6) were rated most highly (approximately 90%) with a mean value of 4.59 and an *SD* of .781. Organization of the textbook (item 5) was second, with 82.5% (M = 4.35, *SD* = .894). The remaining questions regarding redesign elements (rollovers, chapter due dates, and feedback option) received a smaller number of positive responses. In order of highest to lowest, 78.7% of the students liked the rollover feature (*M* = 4.27, *SD* = .880), 76.2% preferred the text organized by chapter due dates (*M* = 4.26, *SD* = 1.062) and the feedback option scored lowest with 33.6% of the students neutral and 13.5% negative on this item (*M* = 3.64, *SD* = 1.112).

Table 2: Additional design features of the customized OpenStax Biology textbook

Additional Design Features (*M* = 4.2, *SD* = .653)	**1-2 (%)**	**3 (%)**	**4-5 (%)**	***M (SD)***
5. The organization of the online textbook was logical and easy to follow.	3.2	14.3	82.5	4.35 (0.894)
6. The online textbook quiz status icons (checkmarks in circles representing each quiz in a chapter) helped me track my progress.	2.7	7.6	89.8	4.59 (0.781)
7. I liked the rollover feature that allowed me to see the figures in a chapter.	2.7	18.6	78.7	4.27 (0.880)
8. Given the choice, I would rather have the online textbook chapters organized by when chapters need to be read versus a traditional table of contents.	6.1	17.7	76.2	4.26 (1.062)
9. Having the option to	13.5	33.6	52.9	3.64 (1.112)

provide feedback at the end of each book chapter made me feel more involved in my learning process.				

(1-2: strongly disagree - disagree; 3: neutral; 4-5: agree - strongly agree)

Additional chapters. The Start Here and Online Learning Success chapters added to the textbook were rated positively by approximately 60% of students. The overall mean for the two chapters was 3.8 with an *SD* of 1. As displayed in Table 3, 63.2% of students agreed that the Start Here chapter helped them navigate the textbook, and 61.2% found the Online Learning Success chapter helpful.

Table 3: Additional chapters

Additional Chapters (*M* = 3.8, *SD* = 1.000)	**1-2 (%)**	**3 (%)**	**4-5 (%)**	***M (SD)***
10. The Start Here: Textbook Orientation chapter helped navigate the textbook.	10.8	26	63.2	3.84 (1.111)
11. I found the information in the Online Learning Success chapter helpful and would advocate keeping it in the online textbook.	11	27.8	61.2	3.78 (1.112)

(1-2: strongly disagree - disagree; 3: neutral; 4-5: agree - strongly agree)

Format. As displayed in Table 4, 90.8% of students reported that they preferred an online, free version of the text over a hard copy for purchase (M = 4.7, *SD* of .918). Fewer than 10% of students indicated otherwise.

When asked specifically about the customized textbook (item 13), a smaller number of students (70.4%) indicated their preference for the online version (*M* = 4.09, *SD* = 1.253). More students (15.9%) indicated their neutrality on item 13 and 13.7% reported not preferring the online textbook over a hard copy. Agreement dropped 20.4% between item 12 and 13 when students were asked about a general preference for a free online textbook and this textbook in particular.

Table 4: Free online vs hard copy format

Format (*M* = 4.4, *SD* = .918)	**1-2 (%)**	**3 (%)**	**4-5 (%)**	***M (SD)***
12. I preferred having a free online textbook over a hard copy book I have to purchase.	3.6	5.7	90.8	4.7 (0.805)
13. I preferred having this online textbook over a hard copy textbook.	13.7	15.9	70.4	4.09 (1.253)

(1-2: strongly disagree - disagree; 3: neutral; 4-5: agree - strongly agree)

Favorite features. To the optional, open-ended question, "What did you like best about the textbook?", "No cost" and "Online" were the two most frequently given answers, mentioned by 31.6% and 24.9% students respectively. Student 298 said "It was easy to access anywhere I was because I found myself forgetting to do my reading but I could still do it in my spare time when I was out just on my phone!" Student 430 commented:

> Having easy access to this textbook was amazing. I could complete readings and hw on the bus which helped me stay on top of my work. Also, the interface was intuitive and very organized. Not having to pay and carry around a textbook was very nice. I wish all my classes adopted this system. Having the hw integrated into the textbook made my life much easier.

Student 250 reported:

> I love this book! It is the best bio book I have ever read! I really like how easy it is to keep track of assignments and to know if I turned them in or not. I also like how at the start of every assignment, there was a learning objective center for me to know what to focus on. Above all else, I LOVED the flashcards, quizzes and matching game. I wish all my classes used books like this. BEST BOOK EVER!

In referring to no cost, student 345 said, *"*I like that this textbook was free especially because biology textbooks are very expensive.*"* Student 154 stated that a no cost textbook "lowers the cost of going to school for the student" and Student 353 said "even students like me who struggle financially could still have the opportunity to use it.*"*

Other favorite aspects cited included organization (21.7%) ease of access (10.1%), practice flashcards (4.5%), chapter due dates (3.4%), glossary (2.9%), and chapter summaries (1.1%). A few students, 2.7%, mentioned the search feature with Student 181 saying "There is also a "search" button, where I could look-up topics whenever I don't know what chapter they belong to."

Motivation and Satisfaction

As shown in Table 5, the mean value for the textbook motivating students to study was 3.38 (SD = 1.213), slightly above the midpoint.

Table 5: Influence of the textbook on student motivation

	1-2 (%)	3 (%)	4-5 (%)	*M (SD)*
14. The online textbook motivated me to study for this course.	21.7	32.7	45.6	3.38 (1.213)
16. Other courses should adopt similar online textbooks.	6.7	11	82.3	4.27 (1.016)

(1-2: strongly disagree - disagree; 3: neutral; 4-5: agree - strongly agree)

Item 16 asked students to respond to the statement: "Other courses should adopt similar online textbooks." The majority of students (82.3%) agreed or strongly agreed with this statement (*M* = 4.27, *SD* = 1.016).

Suggested Improvements

Sixty three percent of students made suggestions for improvements, summarized in Figure 10. Frequencies are based on the number of times a suggestion was made, one student often had more than one suggestion.

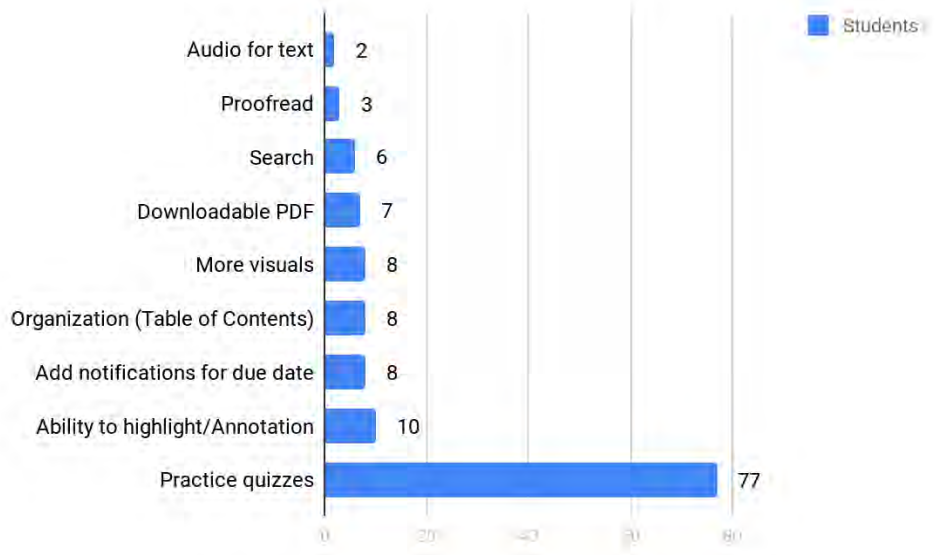


Figure 10. Student suggestions for improvement.

Eight students recommended having more visuals and the same number suggested having a traditional table of contents. Student 371 stated that "More pictures would be helpful." Student

366 preferred to "have a table of contents available for the chapters for easy navigation while studying, looking back over content, etc." Six students made suggestions about the search feature.

Students also suggested four features to add to the textbook: 1) audio in addition to text (2 students), 2) a PDF download for the textbook (7 students), 3) due date notifications sent via email (8 students), and 4) adding a highlight/annotation feature (10 students).

Discussion and Recommendations

The elements added to the textbook intended to provide learner guidance, practice with content and feedback on performance were all well received by students. The textbook appears to have addressed students' need for autonomy and competence as evidenced by their overall satisfaction with the book and their motivation to use it to study for the course.

The two most favored aspects of the text were no cost and the affordances of it being online. Others have also found no cost and online to lead to student satisfaction with OER (Feldstein et al., 2012; Hilton et al., 2013; Petrides et al., 2011). The majority, (90.8%) agreed with the statement: "I preferred having a free online textbook over a hard copy book I have to purchase." This aligns with previous studies in which students reported preferring OER texts due to low or no costs (Lindshield & Adhikari, 2013; Petrides et al., 2011). Students may not purchase costly textbooks when enrolled in a course, despite decreased learning outcomes (Allen, 2011). No cost textbooks address equitability and students may feel more competent when they can equally access learning materials. Online access may also have contributed to feelings of autonomy given that students appreciated anywhere, any time access.

While using unmodified OER resources has proven successful, customized OER has also been shown to increase student learning outcomes (Mathew & Kashyap, 2019). The redesigned textbook customizations were cited as favorite aspects of the text. Students were positive when rating features incorporated to enhance learner guidance including the chapters viewed by due dates, glossary term practice flashcards and the new rollover feature. The majority of students (89.8%) felt the quiz status icons helped them monitor their progress. The ability to monitor progress is an important part of self-regulated learning (Zimmerman, 2002) and students have been shown to be more self-regulated when they feel more autonomous in their learning (Sierens et al., 2009).

The text and video quizzes in particular were the third most favored aspect of the text. This is encouraging as ungraded test-enhanced learning has been shown to have learning benefits. In particular, completing ungraded tests prior to an exam can increase active information retrieval on exams (Karpicke & Roediger, 2008; McDaniel & Masson, 1985) which has been associated with higher final exam scores (Khanna, 2015).

Students also had suggestions for improving the quizzes. These included more quizzes, more questions, and better alignment with the exams. That students highly rated the quizzes and wanted more may have been due to them supporting feelings of competence with the course content, perhaps because quizzes have been found to be more beneficial to students in content-focused courses versus skills-focused courses (Khanna & Cortese, 2016). Aligning quizzes more closely to exams may also improve student confidence with the content.

Requests for additional and more comprehensive quizzes suggests that students are willing to engage even further with the textbook. This is significant as out-of-class work is a key factor in students' success in flipped classes (Hwang et al., 2015) and students typically do not spend enough time on out-of-class work (Akçayır & Akçayır, 2018; Lai & Hwang, 2016).

The two new chapters were less well received by students. Over a third of students, 36.8%, disagreed or were neutral that the Start Here chapter was helpful. Additionally, 38.8% were neutral or disagreed that the Online Learning Success chapter was helpful. Specific features of these chapters may have led to students' attitudes toward them. First, neither were directly related to the course content. Second, while encouraged, they were not required and did not have quizzes that impacted students' grades.

Student response to the chapter feedback feature was also mixed. Only half agreed that "Having the option to provide feedback at the end of each book chapter made me feel more involved in my learning process." This may have been due to instructors not reading or responding to student feedback. It may also have been due to lack of student use of the feature. Despite the opportunity, students often do not provide feedback. Common reasons include skepticism about the possibility for change or a lack of skill in how to provide meaningful feedback (Svinicki, 2001). If receiving feedback is a goal, it should be more thoroughly incorporated into the teaching and learning process because "giving feedback is a skill that can be learned" (Svinicki, 2001, p. 1). The design team suggests that future instructors emphasize feedback's importance and respond to it more regularly. Enhanced communication with the instructor may also increase students' intrinsic motivation to use the textbook. When looked at through the lens of SDT, in addition to competence and autonomy, learners also have a need for relatedness or the feeling of being connected to others (Deci & Ryan, 2012). Students that engage in more dialog with their instructor may feel more connected to them.

Other suggestions for improvement included the ability to download an offline copy of the text to reduce eye strain and enable highlighting and annotation. This result is not surprising as the lack of annotation ability and eye strain associated online texts were complaints in a study using the original OpenStax Biology textbook (Watson et al., 2017) and "computer vision syndrome" (Akinbinu & Mashalla, 2014) is a known effect of increased screen time. In fact, almost a third (29.6%) of the students in this study disagreed with or were neutral on this statement: "I preferred having this online textbook over a hard copy textbook." The complaints regarding eye strain and lack of ability to highlight and annotate may be associated with this result. In response, students are now provided with a PDF file of the textbook upon request but are still encouraged to use the online version in order to have their quiz results recorded.

In conclusion, implementing the new features to the textbook enhanced students' experience and supported the efforts to incorporate the flipped learning model into the course. Students appreciated the customized text, specifically cost reduction, online availability, and the embedded quizzes. However, the new features added complexity to the implementation process, which in turn led to additional development time and increased need for technical support. Institutions considering similar endeavors should be prepared to provide ongoing support to students and instructors, and to be responsive to technical and performance issues that may arise.

Viewing future textbook developments through the lens of motivation theory may also prove beneficial to retain focus on student engagement, especially if part of a flipped classroom design. While this textbook development and study focused primarily on students' need for

competence and autonomy, future textbook developments might benefit from also incorporating features that foster students' need for relatedness. Features to enhance relatedness might include increased student-to-student or student-to-instructor communication directly in the textbook platform or leveraging the inherent social affordances of mobile devices to encourage collaborative learning through student sharing, peer assessment, and intentional community building activities.

Limitations

The scope of this study presents limitations to transferability of the results. Only one textbook in the specific field of Biology was redesigned and tested with students enrolled in a single semester. Additional textbooks in various fields, tested with a larger pool of students would result in more transferable results. In addition, a goal of the textbook was to motivate students to engage in out-of-class content. However, only one survey question specifically asked if the redesigned textbook motivated them to study. Future research by the authors on redesigned textbooks will address student motivation and satisfaction on a more comprehensive level.

Conclusion

In conclusion, implementing the new features to the textbook enhanced students' experience and supported the flipped learning model in the course. Students appreciated many aspects of the customized text, specifically cost reduction, online availability, and the embedded quizzes. However, the new features added complexity to the implementation process, which in turn led to additional development time and increased need for technical support. Institutions considering similar endeavors should be prepared to provide ongoing support to students and instructors, and to be responsive to technical and performance issues that may arise.

Viewing future textbook developments through the lens of motivation theory may also prove beneficial to retain focus on student engagement, especially if part of a flipped classroom design. While this textbook and study focused on students' need for competence and autonomy, future textbook developments might benefit from incorporating features that foster students' need for relatedness. Features to enhance relatedness might include increased student-to-student or student-to-instructor communication directly in the textbook or leveraging the inherent social affordances of mobile devices to encourage collaborative learning through student sharing, peer assessment, and intentional community building activities.

References

Akçayır, G., & Akçayır, M. (2018). The flipped classroom: A review of its advantages and challenges. *Computers & Education*, *126*, 334–345. https://doi.org/10.1016/j.compedu.2018.07.021

Al-Zahrani, A. M. (2015). From passive to active: The impact of the flipped classroom through social learning platforms on higher education students' creative thinking. *British Journal of Educational Technology*, *46*(6), 1133–1148. https://doi.org/10.1111/bjet.12353

Baepler, P., Walker, J. D., & Driessen, M. (2014). It's not about seat time: Blending, flipping, and efficiency in active learning classrooms. *Computers & Education*, *78*, 227–236. https://doi.org/10.1016/j.compedu.2014.06.006

Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day*. International Society for Technology in Education.

Bergstrand, K., & Savage, S. V. (2013). The chalkboard versus the avatar: Comparing the effectiveness of online and in-class courses. *Teaching Sociology*, *41*(3), 294–306. https://doi.org/10.1177/0092055X13479949

Bhagat, K. K., Chang, C.-N., & Chang, C.-Y. (2016). The impact of the flipped classroom on mathematics concept learning in high school. *Journal of Educational Technology & Society*, *19*(3), 134–142. https://www.jstor.org/stable/jeductechsoci.19.3.134

Bösner, S., Pickert, J., & Stibane, T. (2015). Teaching differential diagnosis in primary care using an inverted classroom approach: Student satisfaction and gain in skills and knowledge. *BMC Medical Education*, *15*(1), 1–7. https://doi.org/10.1186/s12909-015-0346-x

Brame, C. (2013, January 31). Flipping the classroom. Vanderbilt University website. https://wp0.vanderbilt.edu/cft/guides-sub-pages/flipping-the-classroom/

Burgess, S. R., & Murray, A. B. (2014). Use of traditional and smartphone app flashcards in an introductory psychology class. *Journal of Instructional Pedagogies*, *13,* 1–7. http://search.proquest.com/docview/1697499938

Cepeda, N. J., Pashler, H., Vul, E., Wixted, J. T., & Rohrer, D. (2006). Distributed practice in verbal recall tasks: A review and quantitative synthesis. *Psychological Bulletin*, *132*(3), 354–380. https://doi.org/10.1037/0033-2909.132.3.354

Chen, Y., Wang, Y., Kinshuk, & Chen, N.-S. (2014). Is FLIP enough? Or should we use the FLIPPED model instead? *Computers & Education*, *79*, 16–27. https://doi.org/10.1016/j.compedu.2014.07.004

Clump, M., Bauer, H., & Bradley, C. (2004). The extent to which psychology students read textbooks: A multiple class analysis of reading across the psychology curriculum. *Journal of Instructional Psychology*, *3*(31), 228–232.

Crews, T., & Butterfield, J. (2014). Data for flipped classroom design: Using student feedback to identify the best components from online and face-to-face classes. *Higher Education Studies*, *4*(3), 38–47. https://doi.org/10.5539/hes.v4n3p38

Deci, E. L., & Ryan, R. M. (2012). Self-determination theory. In *Handbook of Theories of Social Psychology* (Vol. 1, pp. 416–436). Sage Publications Ltd. https://doi.org/10.4135/9781446249215.n21

Fautch, J. (2015). The flipped classroom for teaching organic chemistry in small classes: Is it effective? *Chemistry Education Research and Practice*, *16*(1), 179–186. https://doi.org/10.1039/C4RP00230J

Feldstein, A., Martin, M., Hudson, A., Warren, K., Iii, J. H., & Wiley, D. (2012). Open textbooks and increased student access and outcomes. *European Journal of Open, Distance and E-Learning*, *15*(2), 1–9. http://search.proquest.com/docview/1314327088

Fitzpatrick, T., Al-Qarni, I., & Meara, P. (2008). Intensive vocabulary learning: A case study. *The Language Learning Journal*, *36*(2), 239–248. https://doi.org/10.1080/09571730802390759

Gagne, R. M. (1985). *The conditions of learning and theory of instruction* (4th ed.). Wadsworth Publishing Company.

Gross, D., Pietri, E. S., Anderson, G., Moyano-Camihort, K., & Graham, M. J. (2015). Increased preclass preparation underlies student outcome improvement in the flipped classroom. *CBE—Life Sciences Education*, *14*(4), 1–8. https://doi.org/10.1187/cbe.15-02-0040

Gurung, R. A. R. (2003). Pedagogical aids and student performance. *Teaching of Psychology*, *30*(2), 92–95. https://doi.org/10.1207/S15328023TOP3002_01

Hilton, J., Gaudet, D., Clark, P., Robinson, J., & Wiley, D. (2013). The adoption of open educational resources by one community college math department. *The International Review of Research in Open and Distributed Learning*, *14*(4), 37–50. https://doi.org/10.19173/irrodl.v14i4.1523

Hwang, G.-J., Lai, C.-L., & Wang, S.-Y. (2015). Seamless flipped learning: A mobile technology-enhanced flipped classroom with effective learning strategies. *Journal of Computers in Education*, *2*(4), 449–473. https://doi.org/10.1007/s40692-015-0043-0

Johnson, B. C., & Kiviniemi, M. T. (2009). The effect of online chapter quizzes on exam performance in an undergraduate social psychology course. *Teaching of Psychology*, *36*(1), 33–37. https://doi.org/10.1080/00986280802528972

Karpicke, J., & Roediger, H. (2008). The critical importance of retrieval for learning. *Science*, *319*(5865), 966–968. https://doi.org/10.1126/science.1152408

Khanna, M. (2015). Ungraded pop quizzes: Test-enhanced learning without all the anxiety. *The Teaching of Psychology*, *42*(2), 174–178. https://doi.org/10.1177/0098628315573144

Khanna, M. M., & Cortese, M. J. (2016). The benefits of quizzing in content-focused versus skills-focused courses. *Scholarship of Teaching and Learning in Psychology*, *2*(1), 87–97. https://doi.org/10.1037/stl0000051

Khanova, J., Roth, M. T., Rodgers, J. E., & McLaughlin, J. E. (2015). Student experiences across multiple flipped courses in a single curriculum. *Medical Education*, *49*(10), 1038–1048. https://doi.org/10.1111/medu.12807

Kim, M. K., Kim, S. M., Khera, O., & Getman, J. (2014). The experience of three flipped classrooms in an urban university: An exploration of design principles. *The Internet and Higher Education*, *22*, 37–50. https://doi.org/10.1016/j.iheduc.2014.04.003

Lai, C.-L., & Hwang, G.-J. (2016). A self-regulated flipped classroom approach to improving students' learning performance in a mathematics course. *Computers & Education*, *100*, 126–140. https://doi.org/10.1016/j.compedu.2016.05.006

Lee, J., Lim, C., & Kim, H. (2017). Development of an instructional design model for flipped learning in higher education. *Educational Technology Research and Development*, *65*(2), 427–453. https://doi.org/10.1007/s11423-016-9502-1

Lindshield, B. L., & Adhikari, K. (2013). Online and campus college students like using an open educational resource instead of a traditional textbook. *Journal of Online Learning and Teaching*, *9*(1), 26–38. Retrieved from http://krex.k-state.edu/dspace/handle/2097/16660

Liou, W.-K., Bhagat, K. K., & Chang, C.-Y. (2016). Beyond the flipped classroom: A highly interactive cloud-classroom (HIC) embedded into basic materials science courses. *Journal of Science Education and Technology*, *25*(3), 460–473. https://doi.org/10.1007/s10956-016-9606-8

Mason, G. S., Shuman, T. R., & Cook, K. E. (2013). Comparing the effectiveness of an inverted classroom to a traditional classroom in an upper-division engineering course. *IEEE Transactions on Education*, *56*(4), 430–435. https://doi.org/10.1109/TE.2013.2249066

Mathew, S., & Kashyap, U. (2019). Impact of OER Materials on Students' Academic Performance in Undergraduate Astronomy Course. *Journal of STEM Education: Innovations and Research*, *20*(1), 46–49.

McDaniel, M. A., & Masson, M. E. (1985). Altering memory representations through retrieval. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *11*(2), 371–385. https://doi.org/10.1037/0278-7393.11.2.371

Morris, L., & Finnegan, C. (2008). Best practices in predicting and encouraging student persistence and achievement online. *Journal of College Student Retention: Research, Theory & Practice*, *10*(1), 55–64. https://doi.org/10.2190/CS.10.1.e

Narloch, R., Garbin, C. P., & Turnage, K. D. (2006). Benefits of prelecture quizzes. *Teaching of Psychology*, *33*(2), 109–112. https://doi.org/10.1207/s15328023top3302_6

O'Flaherty, J., & Phillips, C. (2015). The use of flipped classrooms in higher education: A scoping review. *The Internet and Higher Education*, *25*, 85–95. https://doi.org/10.1016/j.iheduc.2015.02.002

Petrides, L., Jimes, C., Middleton-Detzner, C., Walling, J., & Weiss, S. (2011). Open textbook adoption and use: Implications for teachers and learners. *Open Learning: The Journal of Open, Distance and e-Learning*, *26*(1), 39–49. https://doi.org/10.1080/02680513.2011.538563

Pistilli, M. D., & Arnold, K. E. (2010). Purdue signals: Mining real-time academic data to enhance student success. *About Campus*, *15*(3), 22–24. https://doi.org/10.1002/abc.20025

Porcaro, P. A., Jackson, D. E., McLaughlin, P. M., & O'Malley, C. J. (2016). Curriculum design of a flipped classroom to enhance haematology learning. *Journal of Science Education and Technology*, *25*(3), 345–357. https://doi.org/10.1007/s10956-015-9599-8

Rabbany, R., Takaffoli, M., & Zaïane, O. R. (2011). Analyzing participation of students in online courses using social network analysis techniques. *Proceedings of Educational Data Mining*, 21–30.

Rotellar, C., & Cain, J. (2016). Research, perspectives, and recommendations on implementing the flipped classroom. *American Journal of Pharmaceutical Education*, *80*(2), 1–9. https://doi.org/10.5688/ajpe80234

Ryan, T. E. (2006). Motivating novice students to read their textbooks. *Journal of Instructional Psychology*, *33*(2), 136–140. Retrieved from http://eres.library.manoa.hawaii.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=21597697&site=ehost-live

Sappington, J., Kinsey, K., & Munsayac, K. (2002). Two Studies of Reading Compliance Among College Students. *Teaching of Psychology*, *29*(4), 272–274. https://doi.org/10.1207/S15328023TOP2904_02

Sayeski, K. L., Hamilton-Jones, B., & Oh, S. (2015). The efficacy of IRIS STAR legacy modules under different instructional conditions. *Teacher Education and Special Education*, *38*(4), 291–305. https://doi.org/10.1177/0888406415600770

Sergis, S., Sampson, D. G., & Pelliccione, L. (2018). Investigating the impact of flipped classroom on students' learning experiences: A self-determination theory approach. *Computers in Human Behavior*, *78*, 368–378. https://doi.org/10.1016/j.chb.2017.08.011

Shyr, W.-J., & Chen, C.-H. (2018). Designing a technology-enhanced flipped learning system to facilitate students' self-regulation and performance. *Journal of Computer Assisted Learning*, *34*(1), 53–62. https://doi.org/10.1111/jcal.12213

Sierens, E., Vansteenkiste, M., Goossens, L., Soenens, B., & Dochy, F. (2009). The synergistic relationship of perceived autonomy support and structure in the prediction of self-regulated learning. *British Journal of Educational Psychology*, *79*(1), 57–68. https://doi.org/10.1348/000709908X304398

Slomanson, W. R. (2014). Blended learning: A flipped classroom experiment. *Journal of Legal Education*, *64*(1), 93–102. Retrieved from https://www.jstor.org/stable/24716075

Sun, J. C.-Y., Wu, Y.-T., & Lee, W.-I. (2017). The effect of the flipped classroom approach to OpenCourseWare instruction on students' self-regulation. *British Journal of Educational Technology*, *48*(3), 713–729. https://doi.org/10.1111/bjet.12444

Svinicki, M. D. (2001). Encouraging your students to give feedback. *New Directions for Teaching and Learning*, *2001*(87), 17–24. https://doi.org/10.1002/tl.24

Teasley, S. D. (2017). Student facing dashboards: One size fits all? *Technology, Knowledge and Learning*, *22*(3), 377–384. https://doi.org/10.1007/s10758-017-9314-3

van Vliet, E. A., Winnips, J. C., & Brouwer, N. (2015). Flipped-class pedagogy enhances student metacognition and collaborative-learning strategies in higher education but effect does not persist. *CBE—Life Sciences Education*, *14*(3), 1–10. https://doi.org/10.1187/cbe.14-09-0141

Vansteenkiste, M., Lens, W., & Deci, E. L. (2006). Intrinsic versus extrinsic goal contents in self-determination theory: Another look at the quality of academic motivation. *Educational Psychologist*, *41*(1), 19–31. https://doi.org/10.1207/s15326985ep4101_4

Wanner, T., & Palmer, E. (2015). Personalising learning: Exploring student and teacher perceptions about flexible learning and assessment in a flipped university course. *Computers & Education*, *88*, 354–369. https://doi.org/10.1016/j.compedu.2015.07.008

Watson, C. E., Domizi, D. P., & Clouser, S. A. (2017). Student and faculty perceptions of openstax in high enrollment courses. *The International Review of Research in Open and Distributed Learning*, *18*(5), 288–304. https://doi.org/10.19173/irrodl.v18i5.2462

Wright, B. A. (2016). Transforming vocabulary learning with Quizlet. In *P. Clements, A. Krause, & H. Brown (Eds.) Transformation in Language Education*. JALT.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice*, *41*(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2

Corresponding author: Ariana Eichelberger
Contact email: ariana@hawaii.edu

Learning Management System Adoption in Higher Education Using the Extended Technology Acceptance Model

Marissa R. Fearnley
De La Salle-College of Saint Benilde Manila
Philippines

Johnny T. Amora
De La Salle-College of Saint Benilde Manila
Philippines

Abstract

A learning management system is capable of enriching instruction and acceptance of this learning technology by users is crucial to its successful application in higher education. This study investigated factors that influenced adoption of a learning management system by higher education teachers using the technology acceptance model which incorporates three external constructs: system quality, perceived self-efficacy and facilitating conditions. Data collected from faculty respondents (n=127) through an online survey were examined by employing partial least squares-structural equation modeling. While several relationships were confirmed, others were not supported by this research. Results showed that both system quality and perceived self-efficacy strongly influenced perceived usefulness, which in turn indirectly affected attitudes towards the technology and behavioral intention. Additionally, system quality directly affected perceived ease of use and attitudes toward technology use. The strong and direct influence of perceived self-efficacy on perceived usefulness and perceived ease of use suggests that faculty with positive beliefs about their ability to use the learning management system will regard it as both useful and easy to use. Facilitating conditions, on the other hand, affected neither perceived ease of use nor attitudes. Implications for practice, policy and potential research directions are likewise presented.

Keywords: higher education, learning management system, technology acceptance model, facilitating conditions, perceived self-efficacy, system quality

Emerging technologies in education are driving colleges and universities to progressively infuse their use in higher education (Rodriguez & Anicete, 2010; Alharbi & Drew, 2014; Bermúdez-Hernández et al., 2017). Given their incontestable importance (Revythi & Tselios, 2019), instructors are challenged to incorporate them as a means to complement conventional learning environments (Lee et al., 2009; Rhode et al., 2017), enhance learners' experiences, and improve academic outcomes (Parkman et al., 2018).

A learning management system (LMS) is a web-based application capable of transforming face-to-face sessions by offering students a space for online learning (Wichadee, 2015). Using a LMS is an effective way of delivering instruction to students by offering 24/7 access to course content, while enabling convenient course creation and management for teachers (Bousbahi & Alrazgan, 2015). Despite the perceived benefits of using LMSs, many faculty members remain hesitant to adopt them as a teaching tool (Wichadee, 2015; Zanjani et al., 2016). Moreover, teachers tend to underutilize this educational technology despite its widespread availability in higher education settings (Fathema & Sutton, 2013; Bousbahi & Alrazgan, 2015). The variables that affect faculty adoption of the technology include teachers' perceptions, self-efficacy beliefs and instructional goals, as well as the availability of resources, support services, and time (Baturay et al., 2017; Siyam, 2019).

Teachers play an important role in carrying out any innovation in the classroom (Alharbi & Drew, 2014). This is why determining the variables that motivate teachers to provide a technology-supported learning environment to their students is essential (Teo et al., 2012). This paper aims to assess the factors that affect how teachers accept and adopt a learning management system. Additionally, it seeks to confirm whether the technology acceptance model (TAM) in its extended version is applicable in a local higher education context.

Literature Review

Learning Management Systems

Learning management systems are platforms that offer a variety of integrated tools for delivering and managing online instruction. Whether open source (e.g., Moodle, Sakai) or commercial (e.g., Blackboard, Brightspace D2L), most LMSs are flexible, easy to use, accessible and user-friendly (Kasim & Khalid, 2016).

With a LMS, an instructor can create online course content and subsequently manage that course to enhance critical thinking abilities and promote collaboration among university students (Zanjani et al., 2016). LMSs offer many tools such as online group chats, discussion threads, video conferencing, lecture materials, learning modules, grading and course evaluations, all of which may be customized to suit specific instructional needs (Fathema et al., 2015; Walker et al., 2016). According to Anshari et al. (2017), non-traditional forms of learning supported by online approaches to instruction positively affect both teachers and learners. Some of the benefits provided by a LMS include organized course content, enhanced student engagement, improved autonomy among learners, convenient submission of requirements and immediate feedback (Adzharuddin et al., 2013; Cavus, 2015; Alenezi, 2018).

The utilization of LMSs to aid in educational initiatives has become widespread among colleges and universities over the years (Walker et al., 2016). Higher education institutions use them to supplement face-to-face learning sessions, as well as support blended instruction and distance learning (Klobas & McGill, 2010). Their significant contribution to instructional delivery notwithstanding, financial investment and technical demands are critical factors in the

selection of a particular LMS (Kasim & Khalid, 2016). In addition, hindrances to LMS utilization reported by teachers include: (1) deficient computer units and inadequate computer competence; (2) problematic integration of technology into the curriculum; and (3) a lack of supervisory and technical personnel (Li, 2007; Baturay et al., 2017). Other concerns that impede the delivery of technology-supported instruction in higher education are system infrastructure, effort from faculty, and satisfaction with the system (Surry et al., 2005).

Technology Acceptance Model

Before an innovation, such as a new LMS, can be implemented, it has to be accepted (Rogers, 2003). Investigating technology acceptance helps determine the purpose of teachers' technology use (Scherer et al., 2019). Of the many theories and models that attempt to describe how users accept and adopt a given technology (Ahmad et al., 2010; Shih-Chih et al., 2011), one of the most prominent is the Technology Acceptance Model (TAM) (Park, 2009; Scherer et al., 2019). Introduced by Davis (1989), the TAM has been implemented in different domains of information technology and information systems (Shih-Chih et al., 2011), and has become a useful model in exploring adoption behavior of a particular technology in various contexts (Fathema & Sutton, 2013).

The model (Figure 1) shows how perceived usefulness and perceived ease of use are strong determinants of attitudes towards technology use (Siyam, 2019). Perceived usefulness represents users' views on the degree to which a technology facilitates improvement in job performance, while perceived ease of use indicates users' expectations that use of a technology is easy and effortless (Davis, 1989; Lai & Savage, 2013). Both determinants influence users' attitudes toward technology use (Baturay et al., 2017), and are themselves influenced by external variables (Shih-Chih et al., 2011). These external variables include subjective norm, job relevance, output quality, and result demonstrability (Venkatesh & Davis, 2000), among others. Users' attitudes configure their behavioral intention, which in turn defines actual technology use (Alharbi & Drew, 2014; Revythi & Tselios, 2019).

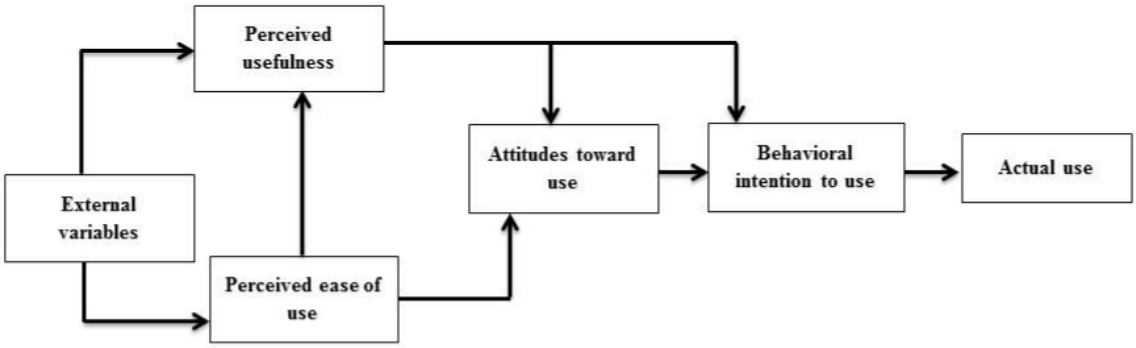


Figure 1: Original technology acceptance model by Davis et al. (1989)

Over the years, different versions of the TAM have been employed in many empirical studies (Scherer et al., 2019). Other parameters that have been linked to the TAM are system quality, computer self-efficacy and facilitating conditions (Fathema et al., 2015; Salloum et al., 2019), as well as personal innovativeness (Mazman Akar, 2019) and access to technology and planning time (Siyam, 2019).

The model proposed by Siyam (2019) consisted of the following external variables: job relevance, access to technology, self-efficacy and planning time. Of the four factors studied,

only self-efficacy and planning time were found to be significant and positive determinants of technology acceptance among special education teachers. A related study conducted by Parkman et al. (2018) in the United Arab Emirates sought to determine how 82 female pre-service teachers accepted environments that were adequately supported by technology. This investigation utilized the original TAM constructs and two external variables, namely perceived user resources and computer self-efficacy, as predictors of behavioral intention. Results showed that behavioral intention was strongly correlated with perceived usefulness, perceived ease of use and computer self-efficacy. Between the two variables used to extend the TAM, computer self-efficacy was found to have a greater predictive power than perceived user resources. In Turkey, 476 pre-service university teachers were surveyed by Baturay et al. (2017) to investigate the relationship among competence in computer use, attitude towards computer-assisted instruction and intention to use technology, and whether these external constructs may be determined by four factors: gender; computer ownership; access to the Internet; and daily computer usage. Findings revealed that the correlations among three of the constructs were statistically significant. Of the four factors examined, however, only daily computer use was found to positively affect computer competence. The studies described above highlight the importance of competence in computer use or computer self-efficacy in the adoption of a particular technology. In the context of this paper, the same construct is expressed as perceived self-efficacy.

In Serbia, knowledge of mathematics, subjective norm and facilitating conditions were used by Teo and Milutinovic (2015) in their version of the TAM to assess factors that affect technology use in mathematics teaching among 313 pre-service teachers. Their findings revealed that attitude towards technology use was the only variable with a direct effect on behavioral intention. The TAM was also used by Fathema et al. (2015) to explore the determinants of technology acceptance among 560 university teachers and teaching assistants in the United States whose LMS use was non-mandatory. Structural equation modeling revealed that system quality, perceived self-efficacy and facilitating conditions were useful determinants of attitudes toward use. Another study among 487 Turkish pre-service teachers revealed that perceived usefulness, attitudes toward use and computer self-efficacy directly affect behavioral intention.Perceived ease of use, facilitating conditions and technological complexity indirectly influence technology acceptance and perceived usefulness is a powerful determinant of intention to use a particular technology (Teo et al., 2012).

While previous studies conducted by Teo and Milutinovic (2015), Fathema, et al. (2015), and Teo et al. (2012), incorporated facilitating conditions as an external variable of the TAM, only the work of Fathema et al. (2015) explained how system quality affects technology acceptance. A more recent study by Salloum et al. (2019) revealed that among university students, system quality is a significant predictor of perceived ease of use but not perceived usefulness. Thus, the inclusion of system quality as an external variable was deemed an important factor in the context of using a commercial LMS.

Research Framework and Hypotheses

The current study adopted the extended technology acceptance model proposed by Fathema et al. (2015) which integrated system quality, perceived self-efficacy, and facilitating conditions as factors that influence adoption and implementation of a LMS by faculty. Additionally, the effect of system quality on perceived ease of use was included in this investigation. A total of fourteen (14) hypotheses were formulated to test this study's model (Figure 2).

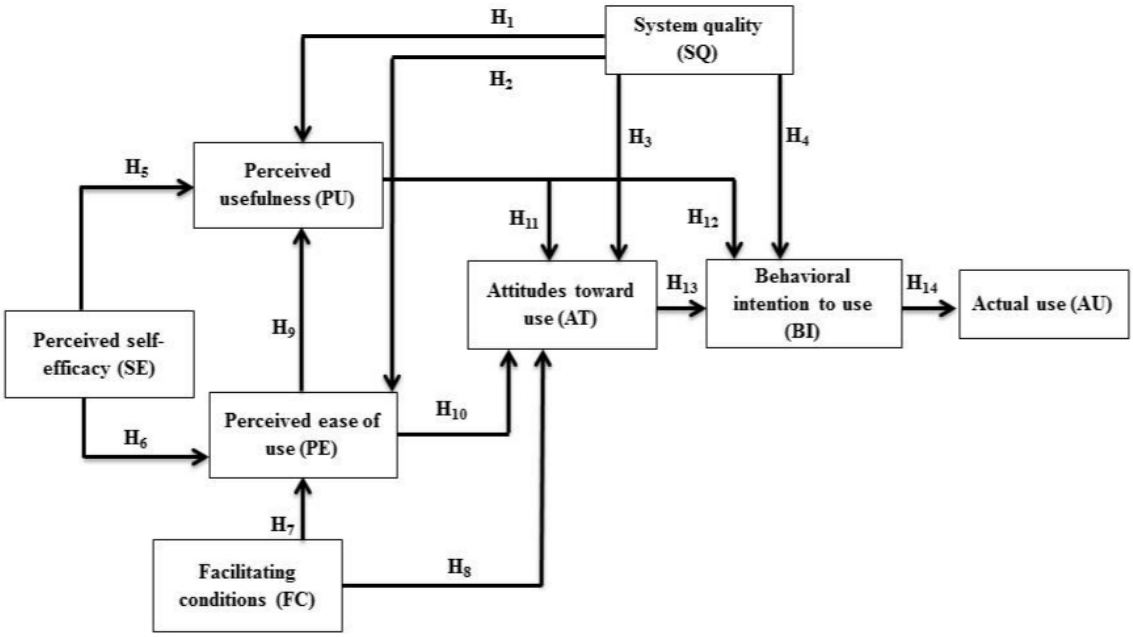


Figure 2: Extended technology acceptance model for learning management systems by Fathema et al. (2015)

System quality (SQ) characterizes desirability of the system (i.e., the LMS) in terms of functions, speed, features, content, and interaction capability (Delone & Mclean, 2003; Fathema et al., 2015). If the LMS is desirable, teachers will find it useful, view it positively, and use it intentionally. Another significant factor in adopting an information system is perceived self-efficacy (SE), or self-assessment of one's capability to carry out the tasks needed to accomplish a set of outcomes (Bandura, 1993; Gong et al., 2004; Nikou & Economides, 2019). In this study, SE indicates how confident a faculty member is in his or her ability to operate, navigate, and work with the LMS. Lastly, facilitating conditions (FC) are factors that can positively or negatively affect how easy or difficult it is for an individual to accomplish a particular job (Teo, 2010). In terms of LMS use, FC is measured by the availability of technical support, capacity building opportunities, and related resources. If FC are present, faculty members are expected to show high perceived ease of use and positive attitudes towards LMS use.

The first eight (8) hypotheses address the effects of the external variables SQ, SE and FC on the original TAM constructs. These are:

H_1: System quality directly affects PU.
H_2: System quality directly affects PE.
H_3: System quality directly affects AT.
H_4: System quality directly affects BI.
H_5: Perceived self-efficacy directly affects PU.
H_6: Perceived self-efficacy directly affects PE.
H_7: Facilitating conditions directly affect PE.
H_8: Facilitating conditions directly affect AT.

The other six (6) hypotheses examine the relationships among the original TAM variables namely, PE, PU, AT and BI.

H_9: Perceived ease of use directly affects PU.
H_{10}: Perceived ease of use directly affects AT.
H_{11}: Perceived usefulness directly affects AT.
H_{12}: Perceived usefulness directly affects BI.
H_{13}: Attitude toward LMS use directly affects BI.
H_{14}: Behavioral intention directly affects AU.

As educational technologies are being integrated into teaching and learning practices, the examination of factors that are vital to user adoption becomes increasingly important (Rhode et al., 2017). This investigation is aimed at confirming the applicability of the extended TAM (Fathema et al., 2015), with a focus on the effects of system quality, perceived self-efficacy and facilitating conditions.

Methods

Participants of the Study

This research explored the acceptance and adoption of Brightspace, a learning management system being utilized by faculty members at a private college in Manila, Philippines. Brightspace is a commercial LMS designed by the Desire2Learn (D2L) Corporation (Moseley & Ajani, 2015). It is a cloud-based platform with a suite of tools for delivering flexible instruction and facilitating engaged learning.

A total of 127 out of 250 (51%) served as the study sample. These teachers had experience using the LMS for at least one academic term (i.e., 14 weeks) for purposes beyond downloading class lists and uploading course syllabi. Hair et al. (2012) recommended that the minimum sample for a partial least squares-path model be equal to the number of structural paths for the construct with the greatest complexity multiplied by 10, which, in this case, would require a minimum sample of 40 participants. Thus, the study's actual sample of 127, which is more than three times the minimum requirement, is deemed adequate for the purposes of this investigation. Table 1 presents demographic data related to the sample group.

The respondents in this study comprised of 51% male and 49% female teachers who use some, or all, of the available features of the LMS. A majority (75%) of the respondents were part-time faculty, and 98% (125 out of 127) were current users of the LMS at the time the data were collected. Three of the respondents were teachers with administrative positions (i.e., other faculty) who were given teaching loads. A great majority (73%) of the faculty had completed graduate education, and about 44% (56 out of 127) had a minimum of four years of teaching experience in the institution.

Table 1: Demographic profile of respondents (n = 127)

Variables	**n**	**%**
Sex		
Female	62	48.82
Male	65	51.18
Education		
BA/BS	34	26.77
Doctorate/Post-doctorate	18	14.17
Master's	75	59.06
Classification		
Full-Time Teaching Faculty	29	22.83
Part-Time Teaching Faculty	95	74.80
Other Faculty	3	2.36
Current LMS users		
Yes	125	98.43
No	2	1.57
No. of years of teaching in the institution		
Below 5	56	44.09
5 to 9	24	18.90
10 to 14	24	18.90
15 to 19	19	14.96
20 & above	4	3.15
Total	127	100.00

Research Instrument

The research instrument used for data collection was an online survey that consisted of three parts: the first part described the objectives of the study and sought informed consent from the respondents; the second part asked about the respondents' gender, education, faculty classification, current LMS use, and number of years of teaching at the institution; the third part consisted of survey items related to LMS adoption. The TAM-related survey items were adopted from Fathema et al. (2015) and were re-worded to align with the context of this research. A total of 28 statements were used to assess the eight constructs: SQ (4 items), SE (3 items), FC (3 items), PE (4 items), PU (4 items), AT (4 items), BI (3 items), and AU (3 items). All items were measured on a four-point Likert scale with 1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree.

Data Gathering Procedure

A web-based survey created using Google Forms was sent to faculty members through their official email addresses in the College. Data collection was done in the middle of the academic year, approximately one year after the college shifted to Brightspace from an open source LMS.

Conducting this study was supported and monitored by the institutional research office. Compliance with prescribed ethical guidelines was ensured through informed consent from the respondents by requiring them to signify understanding of the nature and purposes of the study, offering no rewards for participation, and providing an option to be excluded from the study in case they change their mind. Personal identifiable information of the respondents (i.e., email address) were accessible only to the researcher who analyzed the data.

Data Analysis

This is a quantitative study that applied partial least squares-structural equation modeling (PLS-SEM) to determine the association among eight constructs related to TAM (PU, PE, AT, BI, AU, SQ, FC, and SE). This technique enables estimation of complex models with several constructs (Revythi & Tselios, 2019) but requires less stringent assumptions on sample size, distribution and normality (Hair et al., 2019).

Findings

This section follows the stages of PLS-SEM model analysis and interpretation suggested by Hulland (1999). The first part presents the results generated from the tests of reliability and validity, and the second part shows the tests of hypotheses related to the structural model.

Reliability and Validity

Construct reliability evaluates the degree of consistency between the reflective item and the intended measure (Roldan & Sanchez-Franco, 2012; Kock, 2015; Amora et al., 2016). Construct reliability is deemed adequate when composite reliability (CR) and Cronbach's alpha (CA) are at least 0.70 (Fornell & Larcker, 1981; Nunnaly & Bernstein, 1994; Kock, 2015). Convergent validity assesses whether the level of understanding by the respondents on the items associated with each variable matches the intention of the designer of the instrument. In PLS-SEM, there are two methods used to test convergent validity. First, item loadings related to the variable should be at least 0.50 in value, and statistically significant ($p < 0.5$). Item loading indicates the correlation between the item and the variable. Next, average variance extracted (AVE) should be at least 0.50 (Hair et al., 2012; Kock, 2015; Amora et al., 2016). AVE measures the overall dispersion attributed to the construct against that of observational error (Fornell & Larcker, 1981).

The values in Table 2 indicate that all eight constructs were above the recommended 0.70 guideline for construct validity. Likewise, convergent validity of the constructs in the structural model were deemed sufficient with item loadings and AVE values recorded well above 0.50.

Table 2: Item loadings, AVE, and reliability of the constructs

Constructs	No. of items	Item loadings***	AVE	CA	CR
1. Actual Use (AU)	3	.77-.96	.78	.86	.92
2. Behavioral Intention (BI)	3	.91-94	.85	.91	.95
3. Perceived Usefulness (PU)	4	.91-.95	.88	.95	.97
4. Perceived Ease of Use (PE)	4	.81-.91	.73	.88	.92
5. Attitude Towards Using (AT)	4	.87-.91	.81	.92	.95
6. Facilitating Conditions (FC)	3	.86-.92	.81	.88	.93
7. Perceived Self-Efficacy (SE)	3	.90-.94	.85	.91	.95
8. System Quality (SQ)	4	.73-.85	.68	.84	.90

***p < .001.

Discriminant validity is present when respondents do not confuse the items of a particular variable with those of other variables in the instrument, particularly in terms of meaning (Kock, 2015). If the $\sqrt{\text{AVE}}$ of a variable (i.e., any of the diagonal values) is greater than the coefficients (i.e., off-diagonal values) for any combination of this variable with another, then the items in that variable have a strong correlation (Teo, 2010). In this case, all diagonal values are higher than the related off-diagonal values which shows acceptable discriminant validity for all constructs (see Table 3).

Table 3: Correlation coefficients and AVE of the constructs

Constructs	1	2	3	4	5	6	7	8
1. Actual Use (AU)	**0.89**							
2. Behavioral Intention (BI)	0.62	**0.92**						
3. Perceived Usefulness (PU)	0.60	0.79	**0.94**					
4. Perceived Ease of Use (PE)	0.49	0.64	0.72	**0.86**				
5. Attitude Towards Using (AT)	0.61	0.87	0.84	0.72	**0.90**			
6. Facilitating Conditions (FC)	0.30	0.55	0.57	0.65	0.56	**0.90**		
7. Perceived Self-Efficacy (SE)	0.55	0.67	0.68	0.81	0.72	0.64	**0.92**	
8. System Quality (SQ)	0.39	0.66	0.72	0.79	0.74	0.69	0.73	**0.83**

Note. Diagonal values represent the square root of AVE of constructs ($\sqrt{\text{AVE}}$), while the off-diagonal values are the correlation among the constructs.

Tests of convergent validity, discriminant validity and reliability satisfied the conditions for estimating the structural model: average path coefficient (APC) = 0.304 ($p < .001$), average R-squared (ARS) = 0.656, $p < .001$; average adjusted R-squared (AARS) = 0.649, $p < .001$; average block VIF (AVIF) = 3.073 (acceptable if ≤5, ideally ≤ 3.3); average full collinearity VIF (AFVIF) = 3.773 (acceptable if ≤ 5, ideally ≤ 3.3); and Tenenhaus goodness of fit (GoF) = 0.726 (large ≥ 0.36) (Kock, 2015). Overall, the fit and quality indices of the structural model in the present study fell within acceptable limits.

Test of Structural Model

Table 4 presents the parameter estimates and outcomes for proposed relationships in the extended TAM. Of the fourteen (14) hypotheses, only 10 were supported by the data.

Table 4: Parameter estimates of the extended technology acceptance model for LMS

Hypotheses	Path	β	p-value	f^2	Results
H_1	SQ →PU	.340	.000	.082	Supported**
H_2	SQ → PE	.390	.000	.081	Supported**
H_3	SQ → AT	.237	.003	.084	Supported*
H_4	SQ → BI	.016	.428	.088	Not supported
H_5	SE → PU	.226	.004	.159	Supported*
H_6	SE → PE	.470	.000	.380	Supported**
H_7	FC → PE	.081	.177	.053	Not supported
H_8	FC → AT	.005	.476	.003	Not supported
H_9	PE → PU	.278	.000	.205	Supported**
H_{10}	PE→ AT	.108	.108	.080	Not supported
H_{11}	PU → AT	.590	.000	.499	Supported**
H_{12}	PU → BI	.219	.005	.173	Supported*
H_{13}	AT → BI	.666	.000	.574	Supported**
H_{14}	BI → AU	.633	.000	.401	Supported**

Note. f^2 is Cohen's effect size: .02=small, .15=moderate, .35=large; β=path coefficient
*$p < .05$, **$p < .01$

In terms of system quality, results of the structural model revealed that SQ directly affected PU, PE, and AT. Positive β values (i.e., path coefficients) indicated that high SQ led to high PU, PE and AT. Additionally, SQ significantly affected BI. For perceived self-efficacy, it can be noted that SE significantly affected PU and PE. Moreover, the extent of the effect of SE can be described as large on perceived ease of use ($f^2 = .380$) and moderate on perceived usefulness ($f^2 = .159$). FC did not have a significant effect on PE and AT.

PE had a positive and significant effect on PU, but no statistically significant effect on AT. The positive β value of PE on PU suggested that when teachers reported ease of LMS usage, they also perceived the LMS to be useful. Moreover, PU had a more dominant effect on AT ($f^2 = .499$) than BI ($f^2 = .173$). The data also offered evidence that faculty who found the LMS useful would have positive attitudes and strong intentions to use the LMS.

AT positively and significantly affected BI, and in turn, BI directly affected AU. This means that teachers with favorable attitudes toward LMS usage were likely to have stronger behavioral intentions which led to actual technology use. Similar to the effect of AT on BI ($f^2 = .574$), behavioral intention influenced AU to a large extent ($f^2 = .401$).

Discussion

This research sought to confirm the applicability of the extended TAM (Fathema et al., 2015) in a local higher education context. While it confirmed several relationships from the model, four hypotheses were not supported by this research. More specifically, the effects of SQ on BI, FC on PE and AT, and PE on AT were all not statistically significant. Findings from this study expand the existing body of knowledge on TAM by reinforcing a new dimension to the relationships that exist between SQ and PE.

Effects of External Variables

System quality is a significant external variable that affects users' attitudes towards technology usage (Fathema & Sutton, 2013). Aligned with the work of Fathema et al. (2015) and Salloum et al. (2019), this study revealed that SQ positively and significantly affects PU and PE. This means that a high-performing LMS in terms of quality will be perceived by teachers as both useful and easy to use. Consistent with the finding of Fathema et al. (2015), SQ has a significant effect on AT but not BI. This means that the characteristics of a LMS, although desirable, do not assure its consequent utilization by faculty.

Teachers' perceived self-efficacy has a significant influence on PU and PE, which confirms previous findings that self-efficacy is a critical factor in assessing whether technology use will be successful or not (Ahmad et al., 2010; Teo et al., 2012; Fathema et al., 2015). This result suggests that teachers with high SE also have high levels of comfort and confidence that using the LMS will help them achieve their goals at work. Based on previous research, high SE among teachers translates to improved perceptions and stronger intentions to use the LMS (Baturay et al., 2017; Parkman et al., 2018).

The provision of technical support for technology use is rated by faculty as an enabler (Siyam, 2019), and its absence is a barrier to technology integration in the classroom (Lim & Khine, 2006). According to Fathema et al. (2015), teachers are likely to develop more approving attitudes toward the technology when facilitating conditions (i.e., training, tutorials, support, etc.) are present. In terms of FC, the results of this study were not in agreement with earlier work by Teo (2010) and Fathema et al. (2015) which reported FC to have a significant effect on PE. It could be possible that adequate facilitating conditions were not fully in place at the time of data collection, which made the effects of FC on PE weak and insignificant. Alternatively, SQ and SE may be quite high such that teachers do not feel the need for FC, and the lack of facilitating conditions presented no significant effect on PE. Consistent with one of the findings of this research, however, are related studies that found no significant association between FC and AT (Teo et al., 2012; Teo & Milutinovic, 2015).

Effects of Original TAM Constructs

The findings of this research are generally consistent with previous TAM-related work that reported strong relationships between PE and PU, and PU and AT (Teo, 2010; Teo et al., 2012; Fathema et al., 2015, Teo & Milutinovic, 2015; Stockless, 2018; Siyam, 2019). Between PU and PE, PU is a stronger predictor of AT compared to PE. Contrary to the researchers' expectation, this investigation showed that PE does not significantly predict AT. This suggests that faculty who perceive the LMS to be easy to use do not necessarily possess positive attitudes towards the LMS. This may be explained by the high perceived self-efficacy reported by teachers which could strongly affect how easy it is for them to work with the LMS. When teachers feel confident in their abilities to use a technology and find no difficulty in its utilization, their attitudes towards it may likely be unaffected. Thus, PE had no significant effect on AT. As noted earlier, SE has the largest influence on PE compared to SQ and FC, thus, lending further support to the above explanation. The positive effect of AT on behavioral intention, and the similar effect of BI on actual use are all in agreement with previous work by Fathema et al. (2015), Teo (2010), and Ahmad et al. (2010).

Conclusion and Recommendation

The technology acceptance model has been modified numerous times based on emerging technologies (Benbasat & Barki, 2007), and these various modifications may provide some

explanation as to why there is no single model that is unanimously accepted by the research community (Stockless, 2018). This may be attributed to differences in educational context, characteristics of respondents, and emphasis as regards to the external variables utilized in the investigation (Wu & Liu, 2015). While the study results provide an acceptable level of support for the TAM and its extended version, the relationships among constructs that were not confirmed by this research (i.e., the effects of SQ on BI, FC on PE and AT, and PE on AT) merit further examination.

Among the three external variables included in this investigation, perceived self-efficacy has the strongest influence on PU and PE. As such, there is further evidence that teachers with positive beliefs about their capacity for technology will find a LMS both useful and easy to use. This research also confirms the desirability of the learning management system being utilized in the college, because system quality positively and significantly affects PU, PE and AT.

The current study provides an empirical validation of the extended TAM proposed by Fathema et al. (2015). It offers practical implications in terms of practice, policy and future related work. For practitioners, self-confidence in their ability (i.e., perceived self-efficacy) to use a technology is an essential element of acceptance and adoption. Moreover, faculty with high SE may be recruited as partners in promoting LMS use or engaged as mentors for other teachers who are at the early stages of LMS integration. For policy makers who make decisions on the procurement of educational technologies by their respective institutions, system quality should be considered as an important selection criterion. By assessing system quality, administrators can prioritize the kind of institutional support to be put in place for users of the technology (Rhode et al., 2017). For researchers, succeeding studies on the TAM may seek to further explore the effects of other external variables including personal innovativeness and technology access (Mazman Akar, 2019), job relevance and planning time (Siyam, 2019), management support (Ayele & Birhanie, 2018), subjective norm (Teo, 2010) and computer anxiety (Venkatesh & Bala, 2008), among others. While the single method of data collection used in this study limits generalizing the findings to other populations, this research provides a better understanding of how higher education teachers accept, adopt, and use technology in the Philippine context. Replication studies may also consider a mixed-method approach to generate qualitative data that can enrich the explanatory power of the different TAM constructs.

References

Adzharuddin, N.A., & Ling, L. H. Ling. (2013). Learning management systems (LMS) among university students: Does it work? *International Journal of e-Education, e-Business, e-Management and e-Learning*, *3*(3), 248–252. https://doi.org/10.7763/IJEEEE.2013.V3.233

Ahmad, T., Madarsha, K., Zainuddin, A., Ismail, N., & Nordin, M. (2010). Faculty's acceptance of computer based technology: Cross-validation of an extended model. *Australasian Journal of Educational Technology*, *26*(2), 268–279. https://doi.org/10.14742/ajet.1095

Alenezi, A. (2018). Barriers to participation in learning management systems in Saudi Arabian universities. *Hindawi Education Research International*. https://doi.org/10.1155/2018/9085914

Alharbi S., & Drew, S. (2014). Using the technology acceptance model in understanding academics' behavioural intention to use learning management systems. *International Journal of Advanced Computer Science and Applications*, *5*(1), 143–155. https://doi.org/10.14569/IJACSA.2014.050120

Amora, J., Ochoco, M. S., & Anicete, R. C. (2016). Student engagement and college experience as mediators of the relationship between institutional support and academic performance. *Digital Journal of Lasallian Research*, *12*, 15–30.

Anshari, A., Almunawar, M. N., Shahrill, M., Wicaksono, D. K., & Huda, M. (2017). Smartphones usage in the classrooms: Learning aid or interference? *Education and Information Technologies*, *22*(6), 3063–3079. https://doi.org/10.1007/s10639-017-9572-7

Ayele, A. A., & Birhanie, B. K. (2018). Acceptance and use of e-learning systems: the case of teachers in technology institutes of Ethiopian universities. *Applied Informatics*, *5*(1). https://doi.org/10.1186/s40535-018-0048-7

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational* Psychologist, 28(2), 117–148. https://doi.org/10.1207/s15326985ep2802_3

Baturay, M. H., Gökçearslan, Ş., & Ke, F. (2017). The relationship among pre-service teachers' computer competence, attitude towards computer-assisted education, and intention of technology acceptance. *International Journal of Technology Enhanced Learning*, *9*(1), 1–13. https://doi.org/10.1504/IJTEL.2017.084084

Benbasat, I., & Barki, H. (2007). Quo vadis TAM? Journal of the Association for Information Systems, 8(4), 211–218. https://doi.org/10.17705/1jais.00126

Bermúdez -Hernández, J., Chalela, S., Valencia Arias, J., & Valencia Arias, A. (2017). Research trends in the study of ICT based learning communities: A bibliometric analysis. *EURASIA Journal of Mathematics Science and Technology Education*, *13*(5), 1539–1562. https://doi.org/10.1515/mjss-2017-0016

Bousbahi, F., & Alrazgan, M. S. (2015). Investigating IT faculty resistance to learning management system adoption using latent variables in an acceptance technology model. *The Scientific World Journal*, *2015*, 1–11. https://doi.org/10.1155/2015/375651

Cavus, N. (2015). Distance learning and learning management systems. *Procedia - Social and Behavioral Sciences*, *191*, 872–877. https://doi.org/10.1016/j.sbspro.2015.04.611

Davis, F. (1989). Perceived usefulness, perceived ease of use and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319–340. https://doi.org/10.2307/249008

Delone, W. H., & Mclean, E. R. (2003). The Delone and Mclean information system success: A ten-year update. *Journal of Management Information Systems, 19*(4), 30–36. https://doi.org/10.1080/07421222.2003.11045748

Fathema, N., Shannon, D., & Ross, M. (2015). Expanding the technology acceptance model (TAM) to examine faculty use of learning management systems (LMSs) in higher education institutions. *MERLOT Journal of Online Learning and Teaching*, *11*(2), 210–232.

Fathema, N., & Sutton, K. L. (2013). Factors influencing faculty members' learning management systems adoption behavior: An analysis using the technology acceptance model. *International Journal of Trends in Economics Management & Technology, 2*(6), 20–28.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 48*, 39–50.

Groves, M. M., & Zemel, P. C. (2000). Instructional technology adoption in higher education: An action research case study. *International Journal of Instructional Media, 27*(1), 57–65.

Hair, J., Risher, J., Sarstedt, M., & Ringle, C. (2019). When to use and how to report the results of PLS-SEM, *European Business Review*, *31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Hair, J., Sarstedt, M., Ringle, C., & Mena, J. A. (2012). As assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science*, *40*, 414–433. https://doi.org/10.1007/s11747-011-0261-6

Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four recent studies. *Strategic Management Journal, 20*(2), 195–204. https://doi.org/10.1002/(SICI)1097-0266(199902)20:2<195::AID-SMJ13>3.0.CO;2-7

Kasim, N. M. M., & Khalid, F. (2016). Choosing the right learning management system (LMS) for higher education institution context: A systematic review. *International Journal of Emerging Technologies in Learning*, *11*(6), 55–61. https://doi.org/10.3991/ijet.v11i06.5644

Klobas, J. E. & McGill, T. J. (2010). The role of involvement in learning management system success. *Journal of Computing in Higher Education, 22*(2), 114–134. http://doi.org/10.1007/s12528-010-9032-5

Kock, N. (2015). WarpPLS 5.0 user manual. Script Warp Systems.

Lai, A., & Savage, P. (2013). Learning management systems and principles of good teaching: Instructor and student perspectives. *Canadian Journal of Learning & Technology*, *39*(3), 1–21. https://doi.org/10.21432/T24S39

Lee, B. C., Yoon, J. O., & Lee, I. (2009). Learners' acceptance of e-learning in South Korea: Theories and results. *Computers & Education*, *53*(4), 1320–1329. https://doi.org/10.1016/j.compedu.2009.06.014

Li, Q. (2007). Student and teacher views about technology: A tale of two cities. *Journal of Research on Technology in Education*, *39*(4), 377–397. https://doi.org/10.1080/15391523.2007.10782488

Lim, C. P., & Khine, M. S. (2006). Managing teachers' barriers to ICT integration in Singapore schools. *Journal of Technology and Teacher Education*, *14*(1), 97–125.

Mazman Akar, S. G. (2019). Does it matter being innovative: Teachers' technology acceptance. Education and Information Technologies, *24*, 3415–3432. https://doi.org/10.1007/s10639-019-09933-z

Moseley, S., & Ajani, T. (2015). Users' perceptions on the Brightspace learning management system. *Issues in Information Systems*, *16*(4), 10–19.

Nikou, S. A., & Economides, A. A. (2019). Factors that influence behavioral intention to use mobile-based assessment: A STEM teachers' perspective. *British Journal of Educational Technology*, *50*(2), 587–600. https://doi.org/10.1111/bjet.12609

Nunnaly, J. C., & Bernstein, I. H. (1994). *Psychometric theory*. Mc-Graw Hill.

Park, S. Y. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-Learning. *Journal of Educational Technology & Society*, *12*(3), 150–162.

Parkman, S., Litz, D., & Gromik, N. (2018). Examining pre-service teachers' acceptance of technology-rich learning environments: A case study. *Education and Information Technologies*, *23*, 1253–1275. https://doi.org/10.1007/s10639-017-9665-3

Revythi, A., & Tselios, N. (2019). Extension of technology acceptance model by using system usability scale to assess behavioral intention to use e-learning. *Education and Information Technologies*, *24*(4), 2342–2355. https://doi:10.1007/s10639-019-09869-4

Rhode, J., Richter, S., Gowen, P., Miller, T., & Wills, C. (2017). Understanding faculty use of the learning management system. *Online Learning*, *21*(3), 68–86. https://doi:10.24059/olj.v%vi%i.1217

Rodriguez, M., & Anicete, R. (2010). Students' views of a mixed hybrid Ecology course. *MERLOT Journal of Online Learning and Teaching*, *6*(4), 791–798.

Rogers, E.M. (2003). *Diffusion of innovations* (5th ed.). Free Press.

Roldan, J. L., & Sanchez-Franco, M. J. (2012). Variance-based structural equation modeling: Guidelines for using partial least squares in information systems research. In M. Mora, O. Gelman, A. Steencamp, & M. Raisinghani (Eds.), *Research methodologies in engineering of software systems and information systems: Philosophies, methods and innovations* (pp. 193–221). Information Science Reference.

Salloum, S. A, Alhamad, A. Q. M., Al-Emran, M., Monem, A. A., & Shaalan, K. (2019). Exploring students' acceptance of e-learning through the development of a comprehensive technology acceptance model. *IEEE Access*, *7*, 128445–128462. https://doi.org/10.1109/ACCESS.2019.2939467

Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education. *Computers & Education*, *128*, 13–35. https://doi.org/10.1016/j.compedu.2018.09.009

Shih-Chih, C., Shing-Han, L., & Chien-Yi, L. (2011). Recent related research in technology acceptance model: A literature review. *Australian Journal of Business & Management Research*, *1*(9), 124–127.

Siyam, N. (2019). Factors impacting special education teachers' acceptance and actual use of technology. *Education and Information Technologies*, *24*(3), 2035–2057. https://doi.org/10.1007/s10639-018-09859-y

Stockless, A. (2018). Acceptance of learning management system: The case of secondary school teachers. *Education and Information Technologies*, *23*(3), 1101–1121. https://doi.org/10.1007/s10639-017-9654-6

Surry, D. W., Ensminger, D. C., and Haab, M. (2005). A model for integrating instructional technology into higher education. *British Journal of Educational Technology, 36*(2), 327–329. https://doi.org/10.1111/j.1467-8535.2005.00461.x

Teo, T. (2010). Examining the influence of subjective norm and facilitating conditions on the intention to use technology among pre-service teachers: A structural equation modeling of an extended technology acceptance model. *Asia Pacific Education Review, 11*(2), 253–262. https://doi.org/10.1080/10494821003714632

Teo, T., & Milutinovic, V. (2015). Modelling the intention to use technology for teaching mathematics among pre-service teachers in Serbia. *Australasian Journal of Educational Technology, 31*(4), 363–380. https://doi.org/10.14742/ajet.1668

Teo, T. & Ursavas, O., & Bahcekapili, E. (2012). An assessment of pre-service teachers' technology acceptance in Turkey: A structural equation modeling approach. *The Asia-Pacific Education Researcher*, *21*(1), 191–202.

Wu, C., & Liu, C. F. (2015). Acceptance of ICT-mediated teaching/learning systems for elementary school teachers: Moderating effect of cognitive styles. *Education and Information Technologies*, *20*(2), 381–401. https://doi.org/10.1007/s10639-013-9290-8

Venkatesh, V., & Bala, H. (2008). Technology Acceptance Model 3 and a research agenda on interventions. *Journal of Information Technology*, *39*, 273–315. https://doi.org/10.1111/j.1540-5915.2008.00192.x

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186–204. https://doi.org/10.1287/mnsc.46.2.186.11926

Walker, D., Lindner, J., Murphrey, T., & Dooley, K. (2016). Learning management system usage: Perspectives from university instructors. *Quarterly Review of Distance Education, 17*(2), 41–50.

Wichadee, S. (2105). Factors related to faculty members' attitude and adoption of a learning management system. *The Turkish Online Journal of Educational Technology*, *14*(4), 53–61.

Zanjani, N., Edwards, S., Nykvist, S., & Geva, S. (2016). LMS acceptance: The instructor role. *The Asia-Pacific Education Researcher*, *25*(4), 519–526. https://doi.org/10.1007/s40299-016-0277-2

Corresponding author: Marissa R. Fearnley
Contact email: marissa.fearnley@benilde.edu.ph

Digital Skills at Divine Word University, Papua New Guinea

Iwona Kolodziejczyk
Divine Word University
Papua New Guinea

Philip Gibbs
Divine Word University
Papua New Guinea

Cecilia Nembou
Divine Word University
Papua New Guinea

Maria Rodina Sagrista
Divine Word University
Papua New Guinea

Abstract

The purpose of the study was to investigate the level of digital skills within a group of university students in Papua New Guinea and their ability to meaningfully engage within the digital world. The study also aimed to explore whether the traditionally recognized digital divide continues between genders and place of origin, and between years of study and faculties. This study utilizes the framework defined by Van Deursen and Van Dijk who identify operational, formal, information and strategic skills. The study measured the internet skills of students by asking 289 participants to complete sixteen assignments on the internet. The results indicate that, on average, the tasks were completed as follows: 38% of operational skills, 13% of formal internet skills, 30% of information skills and 28% of strategic internet skills. Age and gender were not significant; however, performances were significantly different for students from the capital city as compared to those coming from a rural town or village environment, and performance improved as students moved through the four years of university training. Differences in groups from specific faculties are significant but require further study to explain. If operational and formal skills are a necessary (but not sufficient) condition for performance of higher-level information and strategic skills, then tertiary institutions, particularly those facing the effects of the digital divide, will need to ensure that those necessary skills are provided for. Having ensured digital competency at that level, further efforts can be made to develop information and strategic skills to ensure a meaningful and creative use of digital technologies.

Keywords: digital skills, digital literacy framework, university, developing country, Papua New Guinea

The internet provides an endless source of information and entertainment, and also has the potential to empower individuals to realize their educational and professional development. However, just having access to Information Communication Technologies (ICTs) does not mean people are making use of them. Many people have access to these technologies, but they lack the skills to use them properly or the motivation to engage with them. Realising the importance of the internet involves not simply monitoring the number of citizens subscribed to an internet plan, but also assessing the patterns behind usage and skills such as production of meaningful content, and engagement with technology or the benefits obtained from it (Fuchs & Horak, 2008; Godhe, 2019; Spante et al., 2018). Hence, digital skills are not simply functional technological skills, but also the ability to find and select digital information, and the knowledge essential for people to become "critical consumers" (Ameen & Gorman, 2009, p. 99) of that information.

Research for this paper began as a study of the so-called "digital divide" whereby new technologies open a gap between those who can access these technologies and those who cannot. Societal digital divides are those between citizens with and without formal education and between rural and urban populations in their relation to technology. However, physical access alone, without proper skills and adequate policies, is not enough to achieve the full benefits of ICTs (Acilar, 2011; Chetty, Qigui, et al., 2018; Halford & Savage, 2010; Jin & Cheong, 2008). For this reason, nowadays many researchers expand the initial area of research, based on access and hardware, and introduce the so-called "second divide", referring to the different level of skills that allow users not only to access technology, but to make a fruitful and effective use of it (Chetty, Qigui, et al., 2018; Lesame, 2013; Selvyn, 2004; van Deursen et al., 2014).

The second divide, goes hand in hand with the term "digital literacy", a new indispensable set of skills that allows users to take profit of and perform efficiently in digital environments (Eshet-Alkalai, 2004). It can be said that digital literacy is "as important as reading and writing were in earlier centuries" (Katz, 2007, p. 4). In 2009, the ICT Development Index was established with the intention that it become a tool to measure the level of ICT adoption and advancement of a country and to contribute to adequate policy-making (Ayanso et al., 2011). However, it has not been used uniformly and, for the purpose of our study, it does not provide data for the country of Papua New Guinea. In order to start developing a base of reliable data on the specific characteristics of the digital literacy in Papua New Guinea, our team decided to undertake a practical study to assess the digital skills of university students at the Madang campus of Divine Word University.

Measuring Digital Skills

Given the importance of the digital skills for success in higher education as well as future participation in the digitized world, substantial efforts have been made by researchers to develop methods of measuring what has been termed "digital literacy". Researchers approach the issue from various perspectives. Reynolds (2016) observes that digital literacy often relates to the extent of technology usage and thus measuring of digital literacy focuses on practical skills. However, with the fast-changing technology, as well as with more exposure of the young generation to technology and its practical application in everyday activities, measuring digital skills has evolved in new directions to capture more complex functions and uses of technology. The changing landscape of research done on digital skills is presented in Table 1, which gives the example of four different approaches to measuring digital skills.

Table 1: Four approaches to measuring digital skills

Four steps in digital inclusions (Livingstone & Helsper, 2007, p. 10)	**Six-skills of digital literacy model (Eshet-Alkalai, 2004, 2012)**	**Four types of digital literacy skills (van Deursen & van Dijk, 2008, p. 4)**	**Digital competencies framework (Alvarez-Flores, et al., 2017, p. 545)**
Information seeking: using the internet for information finding purposes	Photo-visual digital skill: ability to use graphical user interface	Operational skills – the skills to operate digital media	Information – competency in browsing and filtering data, evaluating and storing data and feedback
Games and emails: using the internet for information, entertainment and communication	Reproduction digital skill – ability to use, edit and manipulate different forms of files to produce new ones	Formal skills – the skills to handle the structures of digital media	Communication – competency in interaction and sharing through digital technologies, participation and collaboration through digital media and managing digital identities
Instant messaging and downloading music: using the internet for the purposes described in steps 1 and 2, and expanding use for peer-to-peer engagement	Branching digital skill – ability to navigate through hyperspace in both non-orderly and non-linear ways.	Information skills – the skills to locate information in digital media	Content creation – competency in developing, integrating and re-elaborating digital content, copyrights and licenses and in programming
Using the internet for all previous steps activities and for a wide range of interactive and creative uses.	Information digital skill – ability to critically evaluate online information	Strategic skills – the skills to employ the information contained in digital media towards personal (and professional) development	Safety – competency is protecting devises and data, protecting health, well-being and environment
	Socio-emotional digital skill - ability to communicate effectively to create and share knowledge online		Problem solving – competency in solving technical problems, creatively using digital technologies and identifying digital competence needs
	Real-time digital skill (added by Eshet in 2012) – ability to effectively execute different tasks simultaneously		

Although authors identified different stages in the process of engagement with technology, they all point out the gradual evolution of the skills from the simple use of graphical user interface and searching for information, to critical analysis of the information found, to more complex tasks of using this information in order to create new digital artefacts and share them with other online users.

While researching the digital divide among young people, Livingston and Helsper (2007) identified four steps in digital inclusions which led them to categorizing young online users into four categories: "basic users", "moderate users", "broad users" and "all-rounders" (p. 10). These categories of users reflect a staged process of going online: from simple information seeking (basic users), to using the internet for information, entertainment, and communication, to expanding online activities to peer-to-peer engagement. The final stage includes a broad variety of interactive and creative uses. The authors support the widespread assumption that "basic use makes for a narrow, unadventurous, even frustrating use of the internet, while more sophisticated use permits a broad-ranging and confident use of the internet that embraces new opportunities and meets individual and social goals" (p. 14).

Based on the notion that engagement with technology involves more than mere ability to use a digital device, Eshet-Alkalai (2004) proposes to evaluate digital skills through five-skills of a digital literacy model. To function effectively in the digital world, he observes, it requires a "variety of complex cognitive, motor, sociological, and emotional skills" (p. 93). Thus, he proposes a five-skills digital literacy framework, later (in 2012) extended into a six-skills literacy framework. The proposed list of skills (photo-visual; reproduction; branching; information; socio-emotional; and real-time) are claimed to be "survival skills" in a digitalized world (Eshet-Alkalai, 2012, pp. 268–272) including in the context of today's higher education (Komlayut & Srivatanakul, 2017).

In relation to measuring digital skills, Ilomäki, et al. (2016) observe that in policy related papers, the term "skills" has been replaced by the term "competencies" (p. 655). Various papers make an attempt to propose the digital competencies that are required from those who enter and function in the digital world (Gašová et al., 2018; Iordache et al., 2017). Included in Table 1 is a digital competencies framework developed by (Álvarez-Flores et al., 2017).

Van Deursen and Van Dijk (2008) observed that the models and framework available to measure digital skills were more on a conceptual level, which may contribute to a lack of consistency among researchers in their approaches to measuring digital skills. Thus, the authors have made an attempt to move from the conceptual to the operational level. In their description of the four types of digital skills they provided "operational definitions for operational, formal, information and strategic skills, the measurements, and sample procedures" (p. 5). For each of the type of skills, Van Deursen and Van Dijk provide measurement indicators. The first three types of skills are related to an effective use of the internet. The indicators for operational skills include skills in operating an internet browser, operating an online search engine and completing online forms. To measure formal skills, the indicators include skills in navigating the internet through hyperlinks, and maintaining a sense of location while navigating the internet. The information skills are measured by locating required information by choosing an appropriate search system, or website, ability to define search queries, selecting information from search results, and evaluating information for accuracy of data and the reliability of the sources. The strategic skills are related to the purpose of the internet use and therefore involve the skills to use the networks' sources to achieve a specific goal as well as improve one's status in the society. To measure the strategic skills, the set indicators are: Taking advantage of the

internet by setting a particular goal, making the decision and taking the appropriate action to achieve the goal, and gaining the benefits belonging to this goal (pp. 5–9).

The framework used by Van Deursen and Van Dijk was to measure the internet skills of Dutch citizens. The results show that although the Dutch population has a high level of operational and formal internet skills, the level of information and strategic skills is much lower. The authors concluded that surveys measuring only operational and formal skills may not reflect actual digital skills of the researched population.

Our study adopted Van Deursen and Van Dijk's framework. The main factors influencing our selection of the framework were the specificity and detailed indicators developed for each of the type of digital skills, and the practicality of the proposed research setup.

Digital Skills in the Papua New Guinea Context

For decades, the Papua New Guinea (PNG) Government has understood that command and control of ICT is one of the keys to successful participation in the global digitalized world. Thus, to ensure that the entire nation benefits from access to services provided through ICT, the government established a Department of Information and Communication in mid-1992. Since then, although a number of policies and regulations were put in place, many attempts to implement them were unsuccessful. Various barriers were identified, including the ad hoc way of mounting projects resulting in incompatible systems being installed (Vaa, 2003), the diversity of the cultural and linguistic landscape, and the difficult geographical terrain (Henao, 2004). However, the government remains committed to strengthening the capacity and accessibility of ICT across the entire country (Department of National Planning and Monitoring, 2010). In its vision, the government expects the higher education sector to be able to prepare a skilful workforce prepared for the 21st-century work market. In line with the PNG Development Strategic Plan 2010-2030, the Department of Education (2016) plans to provide ICT training for all school teachers and for teaching ICT skills in primary and secondary schools. The new curriculum for upper secondary schools (Department of Education, 2008) introduces a Computer Studies program. In addition, the Department envisions establishing and maintaining successful e-learning infrastructure. However, despite ambitious plans, a majority of the student population, especially in rural areas, has no or little access to ICT (Department of Education, 2019; Leh & Kennedy, 2004; Ravinder, 2011; Trucano, 2014).

The higher education sector in PNG has a longer history of technology presence. Already in 1990, when there were only 250 internet users in the country, the internet was accessed at the University of Technology in Lae (Kolodziejczyk, 2012). Since then, the application of ICT in higher education institutions varied with generally much higher exposure to technology at universities than at colleges. However, as found by Kolodziejczyk, staff and students at all institutions of higher education recognize technology as an important factor contributing to success in teaching and learning as well as for a future professional career. In the same line, the recent assessment of the PNG graduate labour market (Salonda et al., 2017) shows that digital competency is recognized as one of the most important skills of university graduates.

Understanding the importance of digital skills for successful learning at the tertiary level (Gazi, 2016; Jiménez-Cortés et al., 2017; Komlayut & Srivatanakul, 2017) as well as the demand for graduates equipped with digital skills (Chetty, Aneja, et al., 2018; Gašová et al., 2018; Ilomäki et al., 2016), this research focuses on measuring the current digital skills of students at one of the universities in PNG. Better understanding of the level of student digital competency may

advise teaching and learning strategies towards strengthening and developing skills that will prepare students to function in digitalized environments.

Research Design

The research was inspired by the study of Van Deursen and Van Dijk (2008) on internet skills and the digital divide of the Dutch population. The objective was to investigate the level of digital skills within a group of university students in PNG and their ability to meaningfully engage within the online world. The study also aimed to explore whether the traditionally recognized digital divide continues between genders and place of origin, and between years of study and faculties. For these reasons, the study was guided by two main research questions:

> Q1: What are the levels of operational, formal, information and strategic digital skills of undergraduate students at the Madang Campus of Divine Word University?
> Q2: Are there statistically significant differences among the categories of gender, age, faculty of study, year of study, and residency (capital city, town or village)?

For comparability reasons, our study employed a similar approach to Van Deursen and Van Dijk and used the quantitative method. Prior to the completion of internet-based assignments, the participants were required to fill in a short questionnaire which collected socio-demographic information such as gender, age, faculty, year of study, and former place of residence before joining the university. Residence was considered significant because PNG has only one city, the capital Port Moresby, with a population approaching half a million. There are provincial towns, varying in size. However, the majority of the population live in small villages, many of which are isolated, without electricity or modern amenities.

The tasks to be completed on the internet were prepared following the description of four types of digital skills as defined in the original study:

- Operational skills – the skills to operate digital media
- Formal skills – the skills to handle the structures of digital media
- Information skills – the skills to locate information in digital media
- Strategic skills – the skills to employ the information contained in digital media towards personal (and professional) development (van Deursen & van Dijk, 2008, p. 4).

A total number of 16 assignments were devised to measure various digital skills. Time was allocated to complete each of the assessments. It required a total of 88 minutes to complete all tasks. All activities done on the internet were screen recorded for coding and analysis using Active Presenter software.

For the purpose of the study a special computer lab was set up with 30 brand new laptops with the same setup to ensure that all students were given the same tools. All computers were connected to the university's network. To complete their tasks, students could choose from the three popular web browsers (Mozilla Firefox, Internet Explorer and Chrome). After each group completed the session, temporary files, browser history, favourites, cookies, and computer storage and passwords were deleted to ensure that the next group work was not affected by previous participants' actions.

In line with the quantitative nature of the study, appropriate sampling was used. To achieve a representative sample of the student population, the researchers randomly selected 12 groups from among three faculties. For randomization, all group names were written on a piece of paper and a lottery done in each of the faculties at different levels: year one, two, three, and four. Two departments from within the Faculty of Business Studies and Informatics were excluded from the selection process, Information Systems and Maths and Computing, as their extensive experience with technology compared to others may have affected the results. All selected groups were approached and invited to take part in the study. All were informed about the voluntary nature of participation; a few students declined participation and left the lab during a session. A total of 289 students took part in the study which is considered an adequate number for a population of approximately 1400 to ensure valid results for quantitative analysis.[1] More detailed socio-demographic information about participants is presented in Table 2.

Table 2: Socio-demographic profile of the study participants

Gender	Female	159 (55%)
	Male	129 (45%)
Faculty	Arts and Social Sciences	125 (43%)
	Business and Informatics	66 (23%)
	Health and Medical Sciences	97 (34%)
Year of study	First year	73 (25%)
	Second year	78 (27%)
	Third year	86 (30%)
	Fourth Year	51 (18%)
Place of origin	Capital city	67 (23%)
	Town	158 (55%)
	Village	63 (22%)

The study obtained ethical clearance on April 4, 2017 from the Faculty of Arts and Social Sciences Ethics Committee (ID# FASS/FS/3/2017).

Study results

As indicated earlier, the purpose of the study was twofold: to create a profile of digital skills level among tertiary students and at the same time to explore possible digital divides along five variables: gender, age, faculty, year of study, and residency. After the general overview of completion of tasks in each of the digital skills category, the following sections present more detailed analysis of each of the four categories measured.

General Overview

Different types of digital skills were measured in four categories: Operational skills (9 tasks completed); Formal skills (2 assignments); Information skills (3 assignments); and Strategic skills (2 assignments). The completion of tasks was recorded as: 1 = not completed; 2= partially completed; 3= completed. As expected, the highest percentage of task completion was in the lowest category – operational skills (38%). However, the most difficult for students to complete were tasks in the formal skills category with only 13% of all tasks completed (Table 3).

[1] We note the issues with the internet connection in the time students were involved in completing research tasks and periodic unavailability of one of the government websites. In such cases, the affected results were not included in statistical analysis.

Table 3: General summary of completion of tasks in four categories of digital skills

	Completion of tasks		
	Mean (M)	Standard Deviation (SD)	% of tasks completed
Operational tasks (9)	2.04	.814	38
Formal tasks (2)	1.64	.661	13
Information tasks (3)	1.68	.816	30
Strategic tasks (2)	1.64	.886	28

Operational Tasks

The results of a linear regression test indicate that faculty and year of study are the main predictors of the level of operational skills.

Table 4: Linear regression of results of the number of operational tasks completed

	Number of tasks completed		
	Beta	t	Sig.
Gender	.087	1.562	.120
Age	-.088	-1.537	.126
Faculty	.136	2.441	.015
Year of study	.386	6.783	.000
Place of residency	-.075	-1.341	.181
R^2 F		.154 11.449	p<.001

The ANOVA test[2] shows that among three faculties, students from the Faculty of Medical Sciences score highest in completion of operational tasks ($F(2)=4.66$, $p=.01$).

Table 5: ANOVA results for the operational skills category as completed by students in three faculties

	Number of tasks completed		
	M	SD	% of all tasks
Arts and Social Sciences	3.33	2.74	37
Business and Informatics	3.10	2.87	34
Health and Medical Sciences	4.22	2.18	47

When analysed by year of study, the ANOVA results (Table 6) show that students in the fourth year score highest on completion of operational skills with the lowest results for students in the first year of study ($F(3)=15.391$, $p<.001$).

[2] ANOVA test (or analysis of variance test) is used to decide whether the differences between means of observations is due to chance or whether there are systematic effects that have caused scores of observations in one or more groups to be statistically significantly different.

Table 6: ANOVA results for number of operational skills tasks completed by students at different levels of university study

	Number of tasks completed		
	M	SD	% of all tasks
First Year	2.34	2.40	26
Second Year	2.96	2.69	33
Third Year	4.52	2.27	50
Fourth Year	4.67	2.45	52

Formal Skills

The results of linear regression test indicate that three main predictors of the level of formal skills among participating students are year of study, place of residence and faculty.

Table 7: Linear regression of results of the number of formal tasks completed

	Number of tasks completed		
	Beta	t	Sig.
Gender	-.038	-.663	.508
Age	-.080	-1.380	.169
Faculty	-.163	-2.861	.005
Year of study	.239	4.110	.000
Place of residency	-.187	-3.275	.001
R^2		.133	
F		8.642	.000

The ANOVA test shows that among students at different years of study, students in the fourth year score the highest in completion of formal skills ($F(3)=7.905$, $p<.001$). The significance effect is caused by the group of first year students whose results significantly differ from the other three groups (Table 8).

Table 8: ANOVA results for number of formal skills tasks completed by students at different levels of university study

	Number of tasks completed		
	M	SD	% of all tasks
First Year	.05	.23	2.5
Second Year	.35	.53	17.5
Third Year	.27	.45	13.5
Fourth Year	.39	.49	19.5

The ANOVA test shows that among students who came from a different residential background (lived either in capital city, town or village prior to their study at university), students who lived in the capital city score the highest in completion of formal skills ($F(2)=8,614$, $p<.001$). The significance effect is caused by the group of students who lived in the village whose results significantly differ from the other two groups (Table 9).

Table 9: ANOVA results for number of formal skills tasks completed by students coming from different residential backgrounds

	Number of tasks completed		
	M	SD	% of all tasks
Capital city	.45	.530	22.5
Town	.23	.436	11.5
Village	.14	.353	7

The ANOVA test (Table 10) shows that among students in different faculties, students from the Faculty of Business and Informatics score significantly higher in completion of formal skills that from other faculties ($F(2)=14.038$, $p<.001$). The significantly lower scores were recorded among students in the Faculty of Health and Medical Sciences.

Table 10: ANOVA results for number of formal skills tasks completed by students in different faculties

	Number of tasks completed		
	M	SD	% of all tasks
Arts and Social Sciences	.26	.442	13
Business and Informatics	.47	.561	23.5
Health and Medical Sciences	.10	.306	5.1

Information Skills

The results of linear regression test (Table 11) indicate that the two main predictors of the level of information skills among participating students are year of study and place of residence.

Table 11: Linear regression of results of the number of information tasks completed

	Number of tasks completed		
	Beta	t	Sig.
Gender	-.017	-.299	.765
Age	-.044	-.734	.463
Faculty	-.016	-.275	.783
Year of study	.182	3.036	.003
Place of residency	-.193	-3.258	.001
R^2		.075	
F		4.564	.001

The ANOVA test (Table 12) shows that scores of information tasks completion differ significantly ($F(3)=4.727$, $p<.003$) among students at different levels of study with students from first year scoring significantly lower than other groups.

Table 12: ANOVA results for number of information skills tasks completed by students at different levels of university study

	Number of tasks completed		
	M	SD	% of all tasks
First Year	.59	.683	19.7
Second Year	.97	.772	32.3
Third Year	1.0	.826	33.3
Fourth Year	.98	.836	32.7

The ANOVA test shows that among students who came from different residential backgrounds (lived either in the capital city, town, or village prior to their study at university), students who lived in the capital city score the highest in completion of information skills ($F(2)=7.277$, $p<.001$). This effect is caused by the group of students who lived in the village whose results significantly differ from the other two groups (Table 13).

Table 13: ANOVA results for number of information skills tasks completed by students from different residential backgrounds

	Number of tasks completed		
	M	SD	% of all tasks
Capital city	1.0597	.73610	35.3
Town	.9430	.82357	31.3
Village	.5714	.68895	19

Strategic Skills

The results of linear regression test (Table 14) indicate that faculty is the only predictor of the level of strategic skills among participating students.

Table 14: Linear regression of results of the number of strategic tasks completed

	Number of tasks completed		
	Beta	t	Sig.
Gender	-.107	-1.814	.071
Age	-.042	-.687	.492
Faculty	-.135	-2.266	.024
Year of study	.069	1.135	.257
Place of residency	-.109	-1.820	.070
R^2		.057	
F		3.404	.005

The ANOVA test (Table 15) shows that students in the Faculty of Business and Informatics scored significantly higher in completion of strategic skills than from other faculties ($F(2)=9.234$, $p<.001$). This effect is caused by the group of students in the Faculty of Health and Medical Sciences whose results significantly differ from the other two groups.

Table 15: ANOVA results for number of strategic skills tasks completed by students in different faculties

	Number of tasks completed		
	M	SD	% of all tasks
Arts and Social Sciences	.57	.639	28.5
Business and Informatics	.80	.706	40
Health and Medical Sciences	.38	.509	19

Discussion

The study objective was twofold; firstly, to investigate the levels of operational, formal, information and strategic digital skills of undergraduate students at the Divine Word University in Madang Campus; secondly, to explore any statistically significant differences among the categories of gender, age, faculty of study, year of study, and residency.

As mentioned earlier, the study used the framework from a previous research study in The Netherlands (van Deursen & van Dijk, 2008). We note the completion rate in our PNG study of tasks across all four categories, operational, formal, information and strategic is 39, 13, 29 and 28 percent as compared with 80, 72, 62, 22 percent respectively in The Netherlands study.

As reported, the highest percentage of completed tasks was in the lowest category – operational skills (38%). In this category students were expected to navigate an internet browser, operate an online search engine and complete an online form. Most of the students were able to complete successfully the two initial tasks while the latter task proved the most difficult with only 3% completing it. Van Deursen and Van Dijk (2008) pointed to a positive correlation between internet experience and operational skills. This may explain why students in PNG found it difficult to complete tasks in this category. Comprehensive study of e-government services in PNG conducted by Daniel (2020) concluded that the majority of the government websites operate on an emerging level with only basic one-way communication available to those who use their service; only one-third (about 34%) of the services provided were improved one-way (e.g. forms for manual completion) and simple two-way communication (e.g. contact forms and search facilities). Consequently, Daniel observed that the majority of citizens use services at an emerging level. The demonstrated pattern of internet skills reflects Daniel's observation: students were able to navigate websites successfully but only few were able to engage in some form of communication with the service provider.

In the formal skills category, the students were expected to navigate through internet websites by recognizing and using tabs and hyperlinks without getting disoriented and locating similar information in different website layouts. Unexpectedly, students did not perform well with only 13% completion across all tasks in this category. The most difficult task involved identifying physical addresses of four organizations in the capital city. It should be noted that there is no postal service to physical addresses in PNG. This may help explain why only students from the capital city, who knew the physical location of the organizations, were able to complete the task. None of the students from a rural village background completed the task successfully indicating that life experience could be a significant factor in their ability to complete the digital task.

The information skills category required students to choose appropriate websites to seek information. One-third (30%) of students were able to complete all the tasks successfully. The strategic skills category required students to define search queries and select proper resources. Almost one-third (28%) of students completed successfully all tasks in this category. We note that the results in these two categories were almost as high as in operational skills and much higher than in formal skills. The results in our study in these two categories show a different trend from The Netherlands study where higher level of skills showed a lower level of completion. The observed converse trend of successful completion of tasks in the two studies indicates that long exposure to the internet as in The Netherlands, may well contribute to the operational and formal skills but is insufficient for successful completion of information and strategic skills. In PNG, where the exposure to the internet is much shorter, students in the university setting were better able to complete tasks that require intellectual skills. Our observation remains in line with other studies, which found that the time spent on the internet has a weak relation with the level of internet skills and influences only operational and formal skills (van Deursen et al., 2011) while educational level shows a relevant impact on the ability to solve complex information and strategic tasks on the internet (Godhe, 2019; Gui & Argentin, 2011; Kim, 2019; Passey et al., 2018).

Considering the second objectives, whether there are statistically significant differences among the categories of gender, age, faculty of study, year of study, and residency, in both places The Netherlands and PNG there is no significant gender difference. Age did not feature in the significance tests for PNG, possibly because all the participants were between 18 and 29 years of age.

Considering the year of study, the results demonstrate that the year of study positively correlates with successful completion of tasks in three categories (Tables 4, 7, and 11). It was particularly obvious with only 2% of year one students completing formal skills tasks.

Turning now to the two remaining categories of residency and faculty we note how the PNG study distinguished between those who came from the capital city, Port Moresby, those who came from provincial or rural towns, and those from rural villages. This appears to be a significant predictor, at least for formal and informational skills. It follows that those from more isolated environments will have less exposure to the digital world and be on the disadvantaged side of the digital divide.

Similarly, of interest is the significance of Faculty as a predictor in three of four skills for the PNG students. It may be expected that students in the Faculty of Business Studies and Informatics might have better developed digital skills, but this was apparent only in formal and strategic skills (Tables 10 and 15). Further study may shed light on why Faculty of Health and Medical Sciences students should score so well in operational skills and so poorly on strategic skills.

Conclusion

Digital literacy is important in education, particularly tertiary education. Duncan-Howell (2012) has researched the nature of the digital competency exhibited by undergraduate students in an Australian University. She found that they had a high level of "digital comfort" but that did not necessarily translate from consuming content to creating content. She concluded that there is a strong need in higher education "for meaningful use of digital technologies as learning

tools and the development of digital professional skills within programs that is beyond the current practice of being limited to LMS use and email" (p. 838).

At a polytechnic tertiary institution in Singapore, students were found to be not well acquainted with a range of information search strategies and techniques that would enable them to search effectively for information (Laxman, 2009). Laxman proposes school programs that would enable students to become information literate and more able to fully utilize the educational computing potential of the internet in developing vibrant, independent learning environments.

The four levels of digital literacy skills from Van Deursen and Van Dijk (2008), provide ways of refining our understanding of digital competency so that we can identify and focus on skills that need attention. With only 38% of operational tasks and 13% of formal tasks completed in the PNG study, we cannot conclude as in The Netherlands that such skills will be learned simply by practice. Effects of the first digital divide mean that many first year students come to university with limited practice and consequently face a steep learning curve.[3] Our research points to the need for training and formal schooling right from the first year of tertiary education in PNG, since a good number of students will come with little prior experience. Divine Word University meets a felt need by giving a laptop to every new fully registered student and providing formal coursework in use of computers and the internet in their first semester at the university. The effect of such training may be seen in the relative improvement between first and second years shown in Table 8. If, as Van Deursen and Van Dijk (2008) conclude, that "operational and formal skills are a necessary (but not sufficient) condition for performance of information and strategic skills" (p. 19), then tertiary institutions, particularly those facing the effects of the digital divide, will need to ensure that those necessary skills are provided for. Having ensured digital competency at that level, further efforts can be made to develop information and strategic skills so as to make a meaningful and creative use of digital technologies.

[3] Since 2003, Divine Word University offers to all year one students a compulsory unit *Introduction to End-User-Computing and Word* that introduces students to the concept of the internet and usage of WWW, issues in end-user-computing, and basic and intermediate level skills in MS Word.

References

Acilar, A. (2011). Exploring the aspects of digital divide in a developing country. *Issues in Informing Science and Information Technology*, *8*, 231–244. https://doi.org/10.28945/1415

Álvarez-Flores, E. P., Nunez-Gomez, P., & Crespo, C. R. (2017). E-skills acquisition and deficiencies at the university in the context of the digital economy. *Revista Latina de Comunicacion Social*, *72*, 540–559. https://doi.org/10.4185/RLCS

Ameen, K., & Gorman, G. E. (2009). Information and digital literacy: A stumbling block to development? A Pakistan perspective. *Library Management*, *30*(1–2), 99–112. https://doi.org/10.1108/01435120910927565

Ayanso, A., Cho, D. I., & Letrwachara, K. (2011). ICT development index and the digital divide. *International Conference on Information Resources Management*. https://pdfs.semanticscholar.org/2e3e/63fee1a5ab69508954c79d6e077e8e9a19e7.pdf

Chetty, K., Aneja, U., Mishra, V., Gcora, N., & Josie, J. (2018). Bridging the digital divide in the G20: Skills for the new age. *Economics: Open-Assessment E-Journal*, *12*. https://doi.org/10.5018/economics-ejournal.ja.2018-24

Chetty, K., Qigui, L., Gcora, N., Josie, J., Wenwei, L., & Fang, C. (2018). Bridging the digital divide: Measuring digital literacy. *Economics: Open-Assessment E-Journal*, *12*. https://doi.org/http://dx.doi.org/10.5018/economics-ejournal.ja.2018-23

Daniel, M. (2020). *Adoption of e-government in Papua New Guinea [unpublished PhD dissertation]*. Divine Word University.

Department of Education. (2008). *Computer studies: Upper secondary syllabus*. Department of Education.

Department of Education. (2016). *National education plan 2015-2019: Quality learning for all*. Department of Education. https://doi.org/10.1016/j.jqsrt.2014.08.009

Department of Education. (2019). *Boosting education standards together in PNG: Education sector plan implementation grant & multiplier*. https://www.globalpartnership.org/sites/default/files/2019-04-gpe-png-program-document.pdf

Department of National Planning and Monitoring. (2010). *Papua New Guinea medium term development plan 2011-2015: Building the foundations for prosperity*. Department of National Planning and Development.

Duncan-Howell, J. (2012). Digital mismatch: Expectations and realities of digital competency amongst pre-service education students. *Australasian Journal of Educational Technology*, *28*(5), 827–840. https://doi.org/10.14742/ajet.819

Eshet-Alkalai, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia*, *13*(1), 93–106.

Eshet-Alkalai, Y. (2012). Thinking in the digital era: A revised model for digital literacy. *Issues in Informing Science and Information Technology*, *9*, 267–276. https://doi.org/https://doi.org/10.28945/1621

Fuchs, C., & Horak, E. (2008). Informational capitalism and the digital divide in Africa. *Masaryk University Journal of Law and Technology*, *1*(2), 11–32. https://journals.muni.cz/mujlt/article/viewFile/2504/2068

Gašová, K., Mišík, T., & Štofková, Z. (2018). Employers demands on e-skills of university students in conditions of digital economy. *CBU International Conference on Innovations in Science and Education*, 146–152. https://doi.org/10.12955/cbup.v6.1147

Gazi, Z. A. (2016). Internalization of digital citizenship for the future of all levels of education. *Education and Science*, *186*, 137–148. https://doi.org/10.15390/EB.2016.4533

Godhe, A. L. (2019). Digital literacies or digital competence: Conceptualizations in Nordic curricula. *Media and Communication*, *7*(2), 25–35. https://doi.org/10.17645/mac.v7i2.1888

Gui, M., & Argentin, G. (2011). The digital skills of internet-natives: The role of ascriptive differences in the possession of different forms of digital literacy in a random sample of northern Italian high school students. *New Media & Society*, *13*(6), 963–980. https://doi.org/https://doi.org/10.1177/1461444810389751

Halford, S., & Savage, M. (2010). Reconceptualizing digital social inequality. *Journal of Information, Communication & Society*, *13*(7), 937–955. https://doi.org/https://doi.org/10.1080/1369118X.2010.499956

Henao, I. (2004). Country report in Papua New Guinea. *Pacific Island Forum Secretariat Sub-Regional Conference on ICT for Development in Pacific Island Developing Countries, December 6-9*.

Ilomäki, L., Paavola, S., Lakkala, M., & Kantosalo, A. (2016). Digital competence: An emergent boundary concept for policy and educational research. *Education and Information Technologies*, *21*, 655–679. https://doi.org/10.1007/s10639-014-9346-4

Iordache, C., Mariën, I., & Baelden, D. (2017). Developing digital skills and competences: A quick-scan analysis of 13 digital literacy models. *Italian Journal of Sociology of Education*, *9*(1), 6–30. https://doi.org/10.14658/pupj-ijse-2017-1-2

Jiménez-Cortés, R., Vico-Bosch, A., & Rebollo-Catalán, A. (2017). Female university student's ICT learning strategies and their influence on digital competence. *International Journal of Educational Technology in Higher Education*, *14*. https://doi.org/10.1186/s41239-017-0040-7

Jin, J., & Cheong, A. W. H. (2008). Measuring digital divide: The exploration in Macao. *Observatorio*, *6*, 259–272. https://doi.org/https://doi.org/10.15847/obsOBS232008186

Katz, I. R. (2007). Testing information literacy in digital environments: ETS's iskills assessment. *Information Technology and Libraries*, *September*, 1–10. https://ejournals.bc.edu/index.php/ital/article/view/3271/2884

Kim, K. T. (2019). The structural relationship among digital literacy, learning strategies, and core competencies among South Korean college students. *Educational Sciences: Theory & Practice*, *19*(2), 3–21. https://doi.org/10.12738/estp.2019.2.001

Kolodziejczyk, I. (2012). *Gender issues in access, application and attitudes toward information communication technology in higher education institutions in Papua New Guinea [unpublished PhD dissertation]*. Divine Word University.

Komlayut, S., & Srivatanakul, T. (2017). Assessing digital literacy skills using a self-administered questionnaire. *Review of Integrative Business & Economics Research*, *6*(3), 74–85. http://buscompress.com/uploads/3/4/9/8/34980536/riber_6-3_a17-026_74-85.pdf

Laxman, K. (2009). A baseline study on the internet information search proficiencies of polytechnic students in Singapore. *International Journal of Education and Development Using Information and Communication Technology*, *5*(3). http://ijedict.dec.uwi.edu/viewarticle.php?id=936&layout=html

Leh, A. S. C., & Kennedy, R. (2004). Instructional and information technology in Papua New Guinea. *Educational Technology Research and Development*, *52*(1), 96–101. https://doi.org/https://doi.org/10.1007/BF02504778

Lesame, N. (2013). Vision and practice: The South African Information Society experience. *Journal of Multidisciplinary Research*, *5*(1), 73–90.

Livingstone, S., & Helsper, E. J. (2007). Gradations in digital inclusion: Children, young people and the digital divide. *New Media & Society*, *9*(4), 671–696. https://doi.org/10.1177/1461444807080335

Passey, D., Shonfeld, M., Appleby, L., Judge, M., Saito, T., & Smits, A. (2018). Digital agency: Empowering equity in and through education. *Technology, Knowledge and Learning*, *23*(3), 425–439. https://doi.org/10.1007/s10758-018-9384-x

Ravinder, R. (2011). Challenges for quality primary education in Papua New Guinea: A case study. *Education Research International*, *2011*, 1–11. https://doi.org/10.1155/2011/485634

Reynolds, R. (2016). Defining, designing for, and measuring 'social constructivist digital literacy' development in learners: A proposed framework. *Educational Technology Research and Development*, *64*, 735–762. https://doi.org/10.1007/s11423-015-9423-4

Salonda, L., Siaguru, P., Yoko, J., & Oliver, W. (2017). *A rapid assessment of the Papua New Guinean graduate labour market to inform the development of Western Pacific University's academic programs*. https://www.wpu.ac.pg/images/downloads/Assessment_of_PNG_Labour_Market.pdf

Selvyn, N. (2004). Reconsidering political and popular understandings of the digital divide. *Media & Society*, *6*(3), 341–362. https://doi.org/https://doi.org/10.1177/1461444804042519

Spante, M., Hashemi, S. S., Lundin, M., & Algers, A. (2018). Digital competence and digital literacy in higher education research: Systematic review of concept use. *Cogent Education*, *5*(1), 1–21. https://doi.org/10.1080/2331186X.2018.1519143

Trucano, M. (2014). *Promoting literacy with mobile phones in Papua New Guinea*. Blog Post. https://blogs.worldbank.org/edutech/promoting-literacy-mobile-phones-rural-papua-new-guinea

Vaa, R. (2003). *Papua New Guinea ICT use in education*. http://www.unesco.org/fileadmin/user_upload/ict/Metasurvey/papuanewguinea.pdg

van Deursen, A. J. A. M., Courtois, C., & van Dijk, J. A. G. (2014). Internet skills, sources of support, and benefiting from internet use. *International Journal of Human-Computer Interaction*, *30*(4), 278–290. https://doi.org/10.1080/10447318.2013.858458

van Deursen, A. J. A. M., & van Dijk, J. A. G. (2008). Measuring digital skills: Performance tests of operational, formal, information and strategic internet skills among Dutch population. *ICA Conference*, 1–25.

van Deursen, A. J. A. M., van Dijk, J. A. G., & Peters, O. (2011). Rethinking internet skills: The contribution of gender, age, education, internet experience, and hours online to medium- and content-related internet skills. *Poetics*, *39*(2), 125–144. https://doi.org/10.1016/j.poetic.2011.02.001

Corresponding author: Iwona Kolodziejczyk
Contact email: ikolodziejczyk@dwu.ac.pg

Teacher Candidate Reflection and Development Through Virtual Exchange

Chesla Ann Lenkaitis
Binghamton University, State University of New York
United States

Shannon M. Hilliker
Binghamton University, State University of New York
United States

Kayla Roumeliotis
Teachers College at Columbia University
United States

Abstract

This study examines the effects of a virtual exchange on twelve teacher candidates of a Teaching English to Speakers of Other Languages program. The teacher candidates participated in a 4-week virtual exchange with English as a Foreign Language learners from a university in Mexico. Throughout the exchange, the teacher candidates participated in conversational exchanges and subsequently analyzed and reflected on the errors produced by the English as a Foreign Language students and also the corrective feedback strategies they used during the sessions. The goal of the analysis and reflection activities was to help the teacher candidates develop their ability to identify such errors and apply appropriate corrective feedback strategies. The results indicated the teacher candidates' ability to identify errors increased throughout the exchange, suggesting changes to their development and perception of corrective feedback. These results add to the growing body of research about the value of using virtual exchanges in teacher preparation programs, a tool that may be particularly relevant during the current coronavirus global crisis.

Keywords: virtual exchange; learner autonomy; teacher preparation; corrective feedback; adult learners; language learning

Virtual exchange, a practice that partners students from two geographical locations through the means of technological tools, is an innovative instructional approach being used in higher education (Bohinski & Leventhal, 2015; Dorner, 2016). The term "virtual exchange" is synonymous with telecollaboration, online intercultural exchanges, and teletandem (O'Dowd, 2018). Sadler and Dooly (2016) discussed the increasing use of virtual exchange in language learning, and how it facilitates communication and promotes learner autonomy. However, the research on integrating virtual exchanges in teacher preparation programs is still growing (Lenkaitis, 2020; Dooly & Sadler, 2013; Jauregi & Bañados, 2008).

The current study focuses on teacher candidates in a Teaching English to Speakers of Other Languages (TESOL) program. In a 4-week virtual exchange, TESOL teacher candidates were partnered with English as a Foreign Language (EFL) learners. The weekly virtual exchange sessions gave the EFL learners access to a TESOL teacher candidate with whom they were able to communicate in English, while providing the teacher candidates opportunities to develop their pedagogy. The ability to work with an international partner to develop language and pedagogical skills via virtual exchange is a promising tool that can be valuable as the educational landscape changes and can address challenges such as the current coronavirus (COVID-19) global crisis. More specifically, this study examines how virtual exchange sessions created opportunities for TESOL teacher candidates to develop learner autonomy while learning to recognize and reflect upon EFL student errors and the corresponding corrective feedback (CF).

Literature Review

Virtual Exchange

Communication is a significant part of learning, especially in the language classroom. Holley and King (1971) discussed the importance of practicing communication in order to promote a "natural language learning context" (Cohen, 1975, p. 416), where learners are encouraged to speak and are only corrected for errors that impede communication. Communication and collaboration can be promoted through the use of technology such as videoconferencing (Fetterman, 1996) and other Web 2.0 tools (Greenhow, Robelia, & Hughes, 2009). Technology can also facilitate the formation of international partnerships amongst students (Spante et al., 2014) via a virtual exchange. In virtual exchange, a practice that pairs students in other contexts via technology, students can interact using the target language, and it can be used as an effective method for improving students' linguistic development (Ware & O'Dowd, 2008).

Virtual exchange projects have been carried out in English language learning (Austin et al., 2017; Rafieyan et al., 2014; Sevilla-Pavón, 2016) and there is a growing body of research on how to integrate virtual exchanges in teacher preparation programs (Lenkaitis, 2020; Dooly & Sadler, 2013; Jauregi & Bañados, 2008; The EVALUATE Group, 2019). In Lenkaitis (2020), participants in a teaching program from a university in the USA were partnered with second language (L2) learners in a 4-week virtual exchange via videoconferencing. TESOL teacher candidates explored the language that their L2 partners produced and utilized learned teaching techniques to interact with course content by watching their recorded sessions. Results revealed that teacher candidates developed their reflective practices and were able to bridge theory into practice. In Dooly and Sadler's (2013) study, student teachers from the USA were partnered with student teachers from Spain for two years via synchronous (real-time) and asynchronous (non-real-time) means. Results from these collaborations showed that student teachers recognized the possibilities that exist for L2 learning and teaching through technology, as well as the benefits of creating materials with other student teachers. In Jauregi and Bañados (2008),

teacher candidates of Spanish from a Chilean university partnered with L2 Spanish learners from a university in the Netherlands to participate in synchronous video sessions and asynchronous blogs. Analysis of the exchange and questionnaire data indicated that the exchange was beneficial. Not only did teacher candidates and students make connections to cultural topics, but it also allowed them to achieve course outcomes. The EVALUATE Group (2019) was the largest study of teacher candidates that were partnered in virtual exchanges to date. Over 1,000 teacher candidates from over thirty countries formed twenty-five partnerships with the goal of completing tasks that included developing curriculum and educational materials. Qualitative and quantitative results revealed that competences, such as digital-pedagogical, language, and intercultural, developed as a result of the collaboration.

In their review of virtual exchange studies, Akiyama and Cunningham (2018) expressed that only 13% of all studies have focused on partnerships between foreign language (FL) learners and native speaker (NS) teachers in training. Furthermore, only 20% of studies have centred around FL learners and non-native speakers (NNS). In this type of exchange known as an apprenticeship exchange, one group utilizes teaching strategies while the other group learns a foreign language. Therefore, the exchange is typically in the target language of the FL learners (Chaudhuri, 2011; Jauregi & Bañados, 2008). While Akiyama and Cunningham (2018) mentioned apprenticeship exchange as a typical configuration for a virtual exchange, this article focuses on a study whose participants consisted of teacher candidates that were both NS and NNSs of English.

Learner Autonomy

Because learner autonomy is encouraged by virtual exchange (Sadler & Dooly, 2016) and is a central concept of language teaching and learning (Benson, 2013; Holec, 1981; Little, 1998), this study focused on the learner autonomy of TESOL teacher candidates. Autonomous learners, such as the TESOL teacher candidates in this study, are fully responsible for the learning process including reflection and analysis to plan, monitor and evaluate learning (Little, 1998). Little (1998) discussed the importance of learner autonomy in language learning. According to Little (1998), there are three basic pedagogical principles to learner autonomy: learners must be involved in the learning process; learners must reflect and evaluate their learning; and learners must use the appropriate target language.

Self-assessment and reflection play a significant role in learner autonomy. Through reflection, learners can recognize the methods and strategies they use and, as a result, evaluate their learning, identify any problems and suggest solutions (Çakici, 2015). A teacher's role in a learner autonomous language classroom is different from a traditional teacher's role, in that teachers can be described as a facilitator of learning (Little, 1995). Teachers and students are partners working towards a common goal. Teachers teach their students how to learn by offering different methods of learning and involving students in decision making processes (Çakici, 2015). Little (1995) stated that successful teachers are autonomous in that they practice continuous reflection and analysis of the teaching process. This practice is useful in the language classroom when teachers keep a record of learners' errors and the feedback given to students. This log of information can help teachers understand what errors are commonly made by students and what feedback has the most beneficial effect. When reflecting on corrective feedback (CF) strategies, teachers can gain a greater understanding of the effectiveness of a strategy and even change their practices as a result (Ellis, 2009).

Although learner autonomy encompasses activities done individually, another component of autonomous learning is group work. Çakici (2015) discussed the importance of cooperative

learning in an autonomous classroom where "its aim is to establish a community of learners in which students are able to generate questions and discuss ideas freely with the teacher and each other" (p. 36). Cooperative learning has also been proven to result in higher self-esteem, confidence and rapid achievement (Çakici, 2015). Virtual exchange may foster this cooperative learning because student pairs are working together towards a common goal. Collaboration between students, teachers and schools has always been an essential part of education, and now with the use of technology and the increase of internet connections, it is easier to connect and work with others (Dooly, 2017) and learn beyond the classroom (Reinders & Benson, 2017).

Corrective Feedback (CF)

Reflecting on CF strategies can be an autonomous activity completed by teachers. There are many factors that can affect whether a CF strategy is effective, so teacher education programs are normally reluctant to tell teacher candidates what strategy to use (Ellis, 2009). Therefore, a common issue in language teaching is the role of error correction (Chenoweth, 1983). Language teachers can facilitate learning by having a greater understanding of the importance of learners' errors and when it is necessary to make a correction. Furthermore, making errors is a significant part of learning and it can be most beneficial to students when errors are followed by CF (Metcalfe, 2017). However, it is crucial that a teacher's method of correction encourages an environment in which students are not afraid to make mistakes, one that promotes "students' active, exploratory, generative engagement" (Metcalf, 2017, p. 61).

Gregersen (2003) stated that although making errors is a necessary part of the learning process, it is also important to realize how learners will react to errors and corrections. Students tend to prefer receiving CF for their errors rather than ignoring them, however, learners' cultural backgrounds, language learning experiences, and proficiency levels play a role in their preferences as well (Lyster et al., 2013). CF is not only a pedagogical tool for teachers, but also a motivational tool for language learners. Language learners can improve their linguistic performance through supportive CF (Ito & Hilliker, 2018). Teachers often express a preference for only correcting errors that impede communication as to not disrupt the flow of communication or discourage students (Jean & Simard, 2011; Lyster et al., 2013).

Ellis (2009) discussed different CF strategies with definitions and examples. Types of CF vary based on the degree of implicitness or explicitness. Explicit CF is when the corrector identifies the error and may also provide a correction. In contrast, implicit CF allows for the student to self-correct. One controversy in error correction is the degree to which a correction should be explicit. Lyster et al. (2013) discussed research suggesting that implicit CF may have a longer lasting effect than explicit CF (Mackey & Goo, 2007; Li, 2010), although explicit CF is more noticeable to learners (Mackey et al., 2007; Nassaji, 2009).

Implicit CF strategies include recasts, repetition, and clarification requests. These methods are similar to when children learn their first language and parents hint at the correct response. Ellis (2009) provided clear definitions for the different CF strategies. Recasting is when the corrector reformulates the student's utterance preceding the error to change or correct in some way. According to Lyster et al. (2013), recasts are common and "well suited in communicative classroom discourse because they tend to not interrupt the flow of communication" (p. 10). Repetition is when the corrector repeats the student's utterance putting an emphasis on the error. A clarification request is when the corrector indicates a misunderstanding. On the other hand, elicitation and paralinguistic signals are examples of explicit CF strategies. With elicitation, the corrector indicates that an error is made by using intonation in the repetition of

the student's utterance. Paralinguistic signals are gestures or facial expressions that indicate an error.

Research Questions

Because reflecting on CF is critical in developing TESOL teacher candidates' pedagogy and virtual exchange can be a vehicle for this autonomous activity, the current study aims to examine how a teacher preparation program's use of virtual exchange promotes learner autonomy and teacher candidates' CF development. Therefore, a study was conducted to answer the following research questions:

1. Upon reflecting on their participation in a virtual exchange, in what ways do TESOL teacher candidates recognize EFL learners' errors during the exchange?
2. Upon reflecting on their participation in a virtual exchange, in what ways do TESOL teacher candidates develop CF strategies during the exchange?

Methods

Participants

In total, twelve TESOL teacher candidates participated in the study. All of these participants were registered for a Linguistics for Teachers course at a university in the USA. The course topics included pragmatics, syntax, semantics, morphology and phonology. As part of required coursework, TESOL teacher candidate participants were partnered with 1-2 EFL learners from a Mexican university. The average age of the TESOL teacher candidates was 29.5 years old (SD = 8.76).

Procedures

Echoing Lenkaitis (2020), participants were given instructions to video conference with their EFL partner(s) for at least 20 minutes for four weeks (Week 1-4). As a way to promote authentic practice, the TESOL teacher candidates implemented strategies they were learning in their Linguistics for Teachers class. These strategies aimed to help develop their partners' English skills during the synchronous sessions, which were done through Zoom (https://zoom.us). There were no weekly topics given to the partnerships, as the weekly synchronous sessions were meant to be authentic conversations between the EFL learners and the TESOL teacher candidates.

After each video conferencing session, the TESOL teacher candidates were asked to watch their recorded synchronous session. While watching these sessions, the teacher candidates identified and recorded the EFLs errors on a weekly chart, along with the time of the occurrence and the CF strategies they implemented during the session. If the TESOL teacher candidates did not implement a CF strategy, they were asked to write an idea of a CF strategy that could have been used at that time. For the two weeks following the video conferencing sessions, the teacher candidates were asked to revisit one of the four sessions, which involved rewatching the video recording and identifying and reflecting on the EFL learners' errors (Week 5 and 6). In addition, the TESOL teacher candidates were required to write a final reflection on their virtual exchange experience and video reflections (Week 7). Table 1 details all seven weeks of the current study.

Table 1: Teacher Candidate Activities and Output by Week

Week(s)	Activity	Output
1 – 4	Video conference with EFL learners for at least 20 minutes each week	Video recordings
5 – 6	Revisit one of the four weekly synchronous sessions to review ELF learners' errors	Chart of ELF errors List of CF strategies
7	Complete final reflection	Written reflection

Data Collection and Analysis

Researchers coded the teacher candidates' reflections in order to see whether their recognition of errors changed or stayed the same throughout the exchange. In order to see when the teacher candidates found it easier to recognize errors, researchers coded reflections into three categories: Difficult, Easy, and Unknown. The Difficult and Easy categories had to do with whether the TESOL teacher candidates' expressed difficulty or ease in recognizing errors. The unknown category was for when participants expressed confusion in recognizing EFL learners' errors. In order to illustrate how teacher candidates' perceptions about CF developed throughout the virtual exchange, researchers coded the TESOL teacher candidates' charts and journal reflections into specific categories using NVivo 11. These categories included Need for Implicit Feedback, Need for Explicit Feedback, No Need for Implicit Feedback, No Need for Implicit Feedback, and Unknown (see Table 2 for a summary). As mentioned in the literature review, both Need and No Need categories were important for data collection and analysis due to the ongoing debate about the role of error correction in language learning. Coding was completed by two researchers with an 89.6% interrater reliability (Kappa = 0.67 with $p < 0.001$). To reconcile differences, both worked together to reach a 100% agreement rate.

Table 2: Name and Description of the Corrective Feedback Categories Coded by Researchers

Need for Implicit Feedback	Teacher candidate talks about needing to … • encourage students to speak freely • give implicit CF (recasts, repetitions, clarification requests and elicitation)
Need for Explicit Feedback	Teacher candidate talks about needing to give EFL learners • explicit CF • lesson ideas for correction
No Need for Implicit Feedback	Teacher candidate does not talk about needing to give EFL learners • encourage students to speak freely • implicit CF (recasts, repetitions, clarification requests and elicitation)
No Need for Explicit Feedback	Teacher candidate does not talk about needing to give EFL learners • explicit CF • lesson ideas for correction
Unknown	Teacher candidate talks about not knowing what kind of CF the ELF learners need

Results

All of the study's participants completed the weekly assignments and final reflection. Each video session averaged 32 minutes and 30 seconds. Figure 1 details the average number of

errors found by the TESOL teacher candidates in the EFL learners' speech during each weekly synchronous session. As shown in Figure 1, the teacher candidates' recognition of errors increased in the first four weeks. In addition, their recognition of errors increased again in weeks 5 and 6, when they reanalyzed the recorded video sessions. For example, from Week 1 to Week 6, the average number of errors increased from 10.56 (*SD* = 8.92) to 19.25 (*SD* = 19.8).

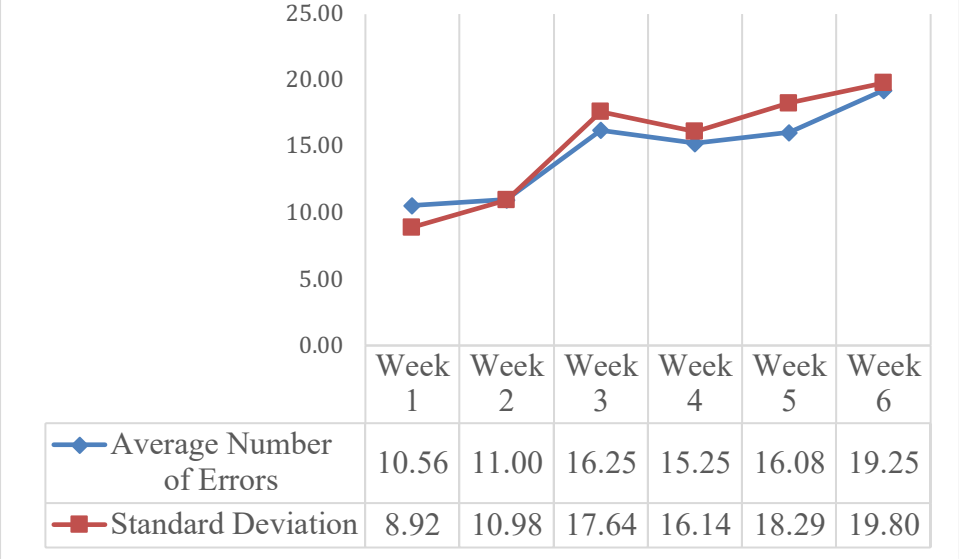


Figure 1: Average EFL Student Errors

In addition to reporting these errors, researchers identified the most frequent words used in the TESOL teacher candidates' weekly and final journals, as well as their weekly and final charts. Many of the common words found in the journal reflections were related to use of language (e.g., word, conversation, understand, sentence). The common words found in the charts reflect linguistic categories, errors and corrections (e.g., syntax, semantics, morphology, error, correct). The bolded words in Table 3 highlight the most common words found across all documents (charts and journals).

Table 3: Ten Most Frequent Words Used by Teacher Candidates by Week Produced

Charts and Journals Produced in Weeks 1–4	**Chart and Journals Produced in Weeks 5–6**	**Charts and Journals Produced in Weeks 1–7**
Like	Syntax	Like
Correct	Errors	Correct
Word	Students	Sentence
Sentence	Zoom	Word
Using	Learning	Using
Question	Session	Students
Students	Language	Question
Semantics	Morphology	Syntax
Times	English	Times
Syntax	Use	Semantics

The teacher candidates expressed ease and difficulty recognizing EFL learners' errors and how it varied throughout the exchange. Researchers found that the total number of coding instances for difficult (11) and easy (10) were around the same as seen in Table 4. However, based on the number of coding instances for each week, one can see that participants spoke about it being more difficult in the beginning than at the end of the exchange.

Table 4: Number of Coded Instances by Week

	Week of Study							
Coding category	1	2	3	4	5	6	7	Total
Difficult	1	2	2	1	0	0	5	11
Easy	1	0	0	0	3	3	5	12
Unknown	1	0	3	2	0	0	3	9

The number of instances for the implicit/explicit categories across the weeks of the exchange are shown in Table 5. Teacher candidates expressed a greater need for implicit feedback than explicit feedback as there were 144 coded instances for explicit feedback versus 28 for implicit feedback. In addition, the no need for explicit feedback category had a greater number of coded instances (53) than the no need for implicit feedback category (37). This further demonstrates the need for implicit feedback.

Table 5: Number of Coded Instances for Need for Implicit and Explicit Feedback

		Need for Explicit	**Need for Implicit**	**No need for Explicit**	**No need for Implicit**	**Unknown**
Week 1	Chart	1	8	2	2	0
	Journal	0	12	11	4	0
Week 2	Chart	0	14	4	2	2
	Journal	2	6	4	3	0
Week 3	Chart	3	17	8	7	1
	Journal	1	2	1	1	1
Week 4	Chart	4	24	6	5	1
	Journal	2	1	3	3	0
Week 5	Chart	7	21	4	4	0
	Journal	2	4	2	1	0
Week 6	Chart	1	18	6	4	0
	Journal	5	5	0	0	1
	Chart	0	10	0	0	0

Week 7	Journal	0	2	2	1	3
Totals	All Charts	16	112	30	24	4
	All Journals	12	32	23	13	5
	All documents	**28**	**144**	**53**	**37**	**9**

Discussion

Recognition of EFL Learners' Errors

During the virtual exchange, recording the video conference sessions allowed teachers to revisit their weekly synchronous meetings in order to reflect on their pedagogy. Just as Kessler and Hubbard (2017) discussed the benefits of technology for observations and monitoring of student behaviour and progress, noting that teachers can also gain insight on the identification of "linguistic and technological challenges students face, the current study's practices can also contribute to the design of more salient feedback" (Kessler & Hubbard, 2017, p. 284). In this virtual exchange study, through practice and acknowledgement of the importance of errors, TESOL teacher candidates began to recognize more errors in their EFL learners' speech.

The number of errors identified weekly as recorded in the charts increased throughout the virtual exchange, and many participants also stated in their reflections that the recognition of errors became easier each week. For instance, participant 2 in Week 6 wrote that, "finding the errors or examples of topics we discussed in class seemed to be more evident than when I analyzed it the first time through". Teacher candidates were both NS and NNS of English and so their difficulties differed in that the NNSs expressed more difficulty in recognizing EFL learners' errors. This could be because English is also not their first language and it was difficult for them to understand what their partner was saying.

The number of coded instances for "difficult" and "easy" had similar totals. However, looking at the distribution of the coded instances throughout the exchange demonstrates that the teacher candidates spoke about their difficulty in recognizing and identifying errors in the beginning of the exchange just as much as they spoke about how they found it easier by the end of the exchange. In his/her final reflection, participant 1 noted, "It was really overwhelming at first to find and classify errors since I didn't understand my conversation partner really well. However, the process became easier over time, and I was able to come up with teaching recommendations more easily". As a result of keeping a record of their students' errors, the virtual exchange allowed teacher candidates to identify recurring errors that their partners made and to recognize the importance of correcting those recurring errors.

Development of Corrective Feedback Strategies

Reflection, being a significant part of autonomous learning (Little, 1995), was implemented into this virtual exchange as teacher candidates were asked to reflect on their weekly videoconferences. Researchers found that participants wrote about the nature of the exchange, EFL learners' progress, the errors they found in their EFL learners' speech, and the use of CF. Throughout this virtual exchange, participants reflected on their weekly meetings and developed methods of CF in an attempt to facilitate communication with their partner and allow for improvement in the EFL learners' speech.

In the first week, teacher candidates were more reluctant to give explicit CF. For example, participant 11 said, "I generally feel like I wouldn't overtly correct a student's errors unless those errors impeded understanding"" This is similar to Jean and Simard's (2011) finding that teachers preferred correcting errors that impede communication. Some possible reasons for reluctance around providing explicit feedback might include that it was their first time meeting their partner and they wanted to encourage their partners' willingness to converse. Another explanation is the teacher candidates were not able to easily identify their partners' errors.

Teacher candidates also wrote about the CF strategies they used in the charts they created. Candidates who did not use any CF strategies during the video exchanges wrote their CF ideas for they might have done. As the weeks progressed, teacher candidates developed more implicit CF strategies and demonstrated a greater need for implicit CF than explicit. Examples of implicit CF include, recasts, repetitions, clarification requests and elicitation. Participant 5 discussed the strategies he/she found to be useful in the exchange, "I adopted several methods for elucidating meaning: reformulating my question/response, adding additional information, using simplified vocabulary and statements, or incorporating known vocabulary".

Perceptions of Corrective Error Feedback

Reflections showed that teacher candidates' views on CF strategies shifted across their weekly exchanges. Similar to Vasquez and Harvey (2010), teacher candidates in this study reflected on their recorded lessons and, as a result, developed a greater understanding of the role and function of CF and the interaction between CF and learner uptake. Overall, most teacher candidates expressed a greater need for implicit CF than explicit. However, some participants' views changed towards the end of the exchange when they expressed a need for explicit CF.

In Weeks 5 and 6 when they revisited and reflected on a session of their choice, it was evident that the teacher candidates began to recognize more errors in their EFL learners' speech. Participants who expressed a need for explicit CF during these weeks, spoke about how it could be a possible solution for correcting recurring errors in their EFL learners' speech. Participant 11 wrote, "the more I pay attention to my conversations with [my partner], the more I notice that his most frequent errors relate to plurals and non-plurals, pronunciation, and tense. Given this information, if I were to continue meeting with [him], I might plan an informal lesson or conversation topic surrounding these areas, so that he could improve".

Participants who did not express a need for explicit CF continued to develop a preference for implicit CF. For example, participant 2 stated, "After learning how to analyze speech and detect errors, I was able to see where my conversation partner needed extra support, though we didn't reach the stage where I felt it was appropriate to correct her errors". These reflections also pointed out that the length of the virtual exchange could have played a role in the use of implicit rather than explicit CF. In a longer exchange, teachers may have felt more comfortable with making explicit corrections and more likely to identify recurring errors.

Limitations

Having a virtual exchange consisting of more than four weeks of synchronous sessions would be helpful for considering the ways in which CF strategies change over time and to examine the role the length the exchange plays in the pedagogical development of teacher candidates. In addition, because the data were self-reported, some participants may have not wanted to fully express their ideas, which in turn could have impacted their reflections. Regardless, coding was completed in order to find commonalities and the two independent coders worked

together to choose the most representative examples from the analysis. Finally, examining similarities and differences between teacher candidates of other content areas could be beneficial to examine the value of virtual exchanges with these other areas.

Conclusion

In this study, a virtual exchange gave TESOL teacher candidates authentic practice with EFL learners and, in turn, a greater sense of responsibility for their learning (Sadler & Dooly, 2016). In this study, teacher candidates were offered different methods of learning in which they were able to participate in decision making processes and take control of their learning (Çakici, 2015). As a result of this learning and the autonomous activities, including self-assessment and reflection, the teacher candidates formed a greater recognition of EFL learners' errors and development of their CF strategies. Overall, this study found that teacher candidates' recognition of errors improved, and their reflections demonstrated how this became easier throughout the exchange. Teacher candidates also demonstrated a greater need for implicit CF for their students and how their perceptions of CF strategies changed depending on their student's recurring errors. Based on the results of this study, which partnered TESOL teacher candidates in a virtual exchange with EFL learners, it seems clear that the following recommendation should be made: Virtual exchange opportunities and subsequent reflection should be integrated into teacher preparation programs. Not only will the utilization of virtual exchange give teacher candidates the opportunity to work with learners in their content area, but also to develop their CF strategies. Furthermore, having the ability to work with an international partner to develop these skills showed that virtual exchange is a tool that can be even more valuable in the era of digital transformation that has been highlighted during the COVID-19 crisis.

Acknowledgments

In carrying out this study, researchers received assistance from the following colleague, who deserves our thanks: Salvador Venegas Escobar.

References

Akiyama, Y. & Cunningham, D.J. (2018). Synthesizing the practice of SCMC-based telecollaboration: A scoping review. *CALICO Journal, 35*(1), 49–76. https://doi.org/:10.1558/cj.33156

Austin, N., Hampel, R. & Kukulska-Hulme, A. (2017). Video conferencing and multimodal expression of voice: Children's conversations using Skype for second language development in a telecollaborative setting. *SYSTEM, 64*, 87–103. https://doi.org/:10.1016/j.system.2016.12.003

Benson, P. (2013). Learner autonomy. *TESOL Quarterly, 47*(4), 839–843. https://doi.org/ 10.1002/tesq.134

Bohinski, C. A. & Leventhal, Y. (2015). Rethinking the ICC framework: Transformation and telecollaboration. *Foreign Language Annals*, *48*(3), 521–534. https://doi.org/10.1111/flan.12149

Çakici, D. (2015). Autonomy in language teaching and learning process. *İnönü Üniversitesi Eğitim Fakültesi Dergisi [Inonu University Journal of the Faculty of Education], 16*(1), 31–42. https://doi.org/doi:10.17679/iuefd.16168538

Chaudhuri, T. (2011). Designing Web 2.0-telecollaborations for university students. The eExchange Giessen–Hong Kong. *German as a Foreign Language, 12*(2), 126–141. Retrieved from http://www.gfl-journal.de/2-2011/chaudhuri.pdf

Cohen, A. D. (1975). Error correction and the training of language teachers. *The Modern Language Journal*, *59*(8), 414–422. https://doi.org/10.1111/j.1540-4781.1975.tb04722.x

Dooly, M. (2017). Telecollaboration. In C.A. Chapelle & S. Sauro (Eds.), *The handbook of technology and second language teaching and learning*. (pp. 169–183). Wiley. https://doi.org/10.1002/9781118914069.ch12

Dooly, M. & Sadler, R. (2013). Filling in the gaps: Linking theory and practice through telecollaboration in teacher education. *ReCALL, 25*(1), 4–29. https://doi.org/10.1017/S0958344012000237

Dorner, H. (2018) Exploring students' conceptions of internationalised learning: Experiences from international online collaborative seminars, *Innovations in Education and Teaching International, 55*(3), 304–313. https://doi.org/10.1080/14703297.2016.1210530

Ellis, R. (2009). Corrective feedback and teacher development. *L2 Journal*, *1*(1), 3–18. https://doi.org/10.5070/l2.v1i1.9054

Fetterman, D. M. (1996). Videoconferencing on-line: Enhancing communication over the Internet. *Educational Researcher, 25*(4), 23–27. https://doi.org/10.3102/0013189X025004023

Greenhow, C., Robelia, B., & Hughes, J. E. (2009). Learning, teaching, and scholarship in a digital age: Web 2.0 and classroom research: What path should we take now?. *Educational Researcher, 38*(4), 246–259. https://doi.org/10.3102/0013189X09336671

Gregersen, T. S. (2003). To err is human: A reminder to teachers of language-anxious students. *Foreign Language Annals*, *36*(1), 25–32. https://doi.org/10.1111/j.1944-9720.2003.tb01929.x

Holec, H. (1981) *Autonomy and foreign language learning*. Pergamon.

Holley, F. M., & King, J. K. (1971). Imitation and Correction in Foreign Language Learning. *The Modern Language Journal*, *55*(8), 494–498. https://doi.org/10.1111/j.1540-4781.1971.tb04612.x

Ito, K. & Hilliker, S. M. (2018). Supporting university students through supportive ESL instruction and corrective feedback. In B. Blummer, J. Kenton and M. Wiatrowski (Eds.), *Promoting ethnic diversity and multiculturalism in higher education* (pp. 40–58). IGI Global.

Jauregi, K. & Bañados, E. (2008). Virtual interaction through video-web communication: A step towards enriching and internationalizing language learning programs. *ReCALL, 20*(2), 183–207. https://doi.org/10.1017/S0958344008000529

Jean, G. & D. Simard (2011). Grammar learning in English and French L2: Students' and teachers' beliefs and perceptions. *Foreign Language Annals 44*(4), 465–492. https://doi.org/10.1111/j.1944-9720.2011.01143.x

Kessler, G. & Hubbard, P. (2017). Language teacher education and technology. In C. A. Chapelle and S. Sauro (Eds.), *The handbook of technology and second language teaching and learning* (pp. 278–292). Wiley. https://doi.org:10.1002/9781118914069.ch19

Lenkaitis, C. A. (2020). Teacher candidate reflection: Benefits of using a synchronous computer-mediated communication-based virtual exchange. *Teaching and Teacher Education*. https://doi.org/10.1016/j.tate.2020.103041

Li, S. (2010). The effectiveness of corrective feedback in SLA: A meta-analysis. *Language Learning,* 60(2), 309–365. https://doi.org/10.1111/j.1467-9922.2010.00561.x

Lyster, R., Saito, K. & Sato, M. (2013). Oral corrective feedback in second language classrooms. *Language Teaching*, *46*(1), 1–40. https://doi.org/10.1017/S0261444812000365

Mackey, A., M. Al-Khalil, G. Atanassova, M. Hama, A. Logan-Terry & K. Nakatsukasa (2007). Teachers' intentions and learners' perceptions about corrective feedback in the L2 classroom. *Innovation in Language Learning and Teaching,* 1(1), 129–152. https://doi.org/10.2167/illt047.0

Mackey, A. & J. Goo (2007). Interaction research in SLA: A meta-analysis and research synthesis. In A. Mackey (Ed.), *Conversational interaction in second language acquisition: A series of empirical* studies (pp. 407–453). Oxford University Press.

Metcalfe, J. (2017). Learning from errors. *Annual Review of Psychology*, *68*, 465–489. https://doi.org/10.1146/annurev-psych-010416-044022

O'Dowd, R. (2018). From telecollaboration to virtual exchange: state-of-the-art and the role of UNICollaboration in moving forward. *Journal of Virtual Exchange*, 1, 1–23. https://doi.org:10.14705/rpnet.2018.jve.1

Rafieyan, V., Sharafi-Nejad, M., Khavari, Z., Siew Eng, L., & Rashid Mohamed, A. (2014). Pragmatic comprehension development through telecollaboration. *English Language Teaching, 7(*2), 11–19. https://doi.org/10.5539/elt.v7n2p11

Reinders, H., & Benson, P. (2017). Research agenda: Language learning beyond the classroom. *Language Teaching, 50*(4), 561–578. https://doi.org/10.1017/S0261444817000192

Sadler, R. & Dooly, M. (2016). Twelve years of telecollaboration: what we have learnt. *ELT Journal*, *70*(4), 401–413. https://doi.org/10.1093/elt/ccw041

Sevilla-Pavón, A. (2016). Affordances of telecollaboration tools for English for Specific Purposes online learning. *World Journal on Educational Technology, 8*(3), 218–223. https://doi.org/10.18844/wjet.v8i3.696

Spante, M., Karlsen, A. V., Nortvig, A.-M., & Christiansen, R. B. (2014). Cross-Border collaboration in history among Nordic students: A case study about creating innovative ICT didactic models. *IAFOR Journal of Education*, 2(2). https://doi.org/10.22492/ije.2.2.02

The EVALUATE Group. (2019). Evaluating the impact of virtual exchange on initial teacher education: A European policy experiment. Research-publishing.net. https://doi.org/10.14705/rpnet.2019.29.9782490057337

Vásquez, C. & Harvey, J. (2010). Raising teachers' awareness about corrective feedback through research replication. *Language Teaching Research*, *14*(4), 421–443. https://doi.org/10.1177/1362168810375365

Ware, P. & O'Dowd, R. (2008). Peer feedback on language form in telecollaboration. *Language Learning & Technology, 12*(1), 43–63. https://doi.org/10125/44130

Corresponding author: Chesla Ann Lenkaitis
Contact email: chesla.ann.lenkaitis@gmail.com

Training Factors as Predictors of Students' Self-Efficacy Beliefs for Online Journalism Practice

Joseph Njuguna
University of Rwanda
Rwanda

Abstract

The advent of Internet technologies has heralded new skill demands in the media industry. Since journalism education mainly takes its cue from industry trends, media training institutions are now forced to adjust their curricula and teaching styles to produce online-ready graduates. Drawing on aspects of self-efficacy theory, this correlation study employs a questionnaire to explore how different training factors influence students' self-efficacy beliefs for online journalism work. A sample of 182 mass communication students from five Rwandan universities participated in the study. Results showed that the training factors explained 29.7% of the variance in the respondents' self-efficacy beliefs for online journalism work, with positive correlations between all the training factors and the students' self-efficacy. In particular, the types of online skills (β =.069) and availability of teaching facilities (β=.076) contributed a larger part of the online self-efficacy beliefs than teaching styles (β=.018). These results showed that training factors have a role in boosting students' beliefs in their capacity to execute online journalism tasks in the industry. Results suggested that journalism educators especially need to enhance different online journalism teaching approaches in order to better develop future professionals who are online-confident for the workplace.

Keywords: online journalism, self-efficacy, training, pedagogy, Rwanda

One defining feature of journalism education is the ability of graduates to demonstrate competence in the changing work environment (Schwalbe, 2009). With Web 2.0 technologies, professional news production has been transformed as news audiences (called "citizen journalists") become active producers and consumers of news, inevitably putting the relevance of journalism education into sharper focus (Oluchi, 2016). Furthermore, the industry's gradual inclination towards multi-skilled and techno-savvy graduates has presented a new reality for media training institutions who are forced to adapt by re-designing their curricula and adopting better ways of teaching these new skills (Robinson, 2013; Quinn, 2010). Short of this, journalism education risks playing the technological catch-up game as stakeholders continue to wonder if the institutions are adequately prepared to develop online-ready graduates (Ehreneich, 2009).

Educating the new generation of media professionals requires breaking from traditional teacher-led approaches by taking cognizance of students' exposure and agility with the digital tools they are expected to use in the industry (Patrão & Figueiredo, 2018; Iordache et al., 2017). With traditional media models almost obsolete, it has been argued that journalism education can only extricate itself from the crisis of relevance by devising new ways of integrating technology in the students' learning experiences. Particularly, the traditional "silo" teaching of TV, radio and print separately has been challenged, with scholars advocating for an integrative use of the technologies to teach these skills for a multimedia environment (Kaul, 2013; Quinn, 2010; Iyer (2015). Harnessing social media tools to co-produce and share story pieces through class blogs and Facebook pages are becoming the teaching norm in a number of institutions (Patrão & Figueiredo, 2018). In contrast with traditional journalism pedagogy, co-creation of stories affords students valuable learning moments, especially through accompanying online comments to their productions. This teaching approach also scaffolds learners with an active community of practice enabling them to authenticate their learning experiences (Cindy, 2015; Ferrucci, 2017).

In online skills training, the nature of content, training approaches and facilities have been considered crucial in shaping the acquisition of skills for the industry (Iordache et al., 2017; Iyer, 2015; Jeanti, 2015). In the journalism context, however, research is needed to explore how students perceive their ability to use these skills at the work place. Some studies have explored students' journalistic writing self-efficacy (e.g. Broaddus, 2012) and efficacy beliefs in social media use (e.g. Patrão & Figueiredo, 2018). Focus on the role of training factors on students' online journalism self-efficacy has not been systematically examined. Although Rwandan journalism schools have integrated the teaching of online journalism skills in their curricula, it remains unclear how the training contributes to students' confidence in the use of such skills when they graduate. Hence, this study hopes to fill this void by exploring the role of content, training approaches and facilities in the students' self-efficacy beliefs for online journalism work.

Literature Review

Digital skills are considered critical for professional survival in an increasingly e-permeated society. Indeed, Ferrari (2012) considers digital competence as one of the critical competences for life-long learning, comprising the "knowledge, skills, attitudes, abilities, …required when using digital media to perform tasks …" (p.11). In light of the fast-evolving technologies, journalism scholars argue that clarity of the variety of online skills required for digital work-readiness among the future professionals is urgently needed (Iyer, 2015; Jeanti, 2015). However, in the absence of a coherent framework for such skills, Gallardo-Echenique et al.

(2015) suggest that a digital competence framework like Ferrari's (2012), which amalgamates other frameworks, can be contextualized to help define the skills expected from media professionals. This framework expects the 21st century professionals to have skills in social media communication, creation and distribution of multimedia content, online ethics, online research and using social media to solve communication problems.

Evidence suggests that skills like online research, multimedia content creation and social media communication are the cornerstone of modern journalism practice (Jeanti, 2015; Cindy, 2015). The ability to produce stories for different formats and share them on social media networks such as blogs, Twitter or news websites has become crucial. Other critical skills gaining currency include the ability to work with web code and data analytics, as well as crowd sourcing stories through artificial intelligence-enabled techniques. In essence, the burgeoning skills call for innovative ways of using the technology to maximize news audience satisfaction (Robinson, 2013; Hirst & Treadwell, 2011).

Journalism educators are urged to tune their training content and techniques by adopting a learning environment that replicates the digital newsroom, which is expected to enhance students' digital production skills (Iyer, 2015; Hirst & Treadwell, 2011). Evidence shows that if social media tools are well appropriated in journalistic training, online story-telling practices of the future professionals can be enhanced (Aifan, 2015; Hirst & Treadwell, 2011; Quinn (2010). Although a connected multimedia environment with unlimited opportunities for practice is the ideal for online production skills, leveraging the near-ubiquitous mobile phones and free online software for editing has sufficed to circumvent the costly equipment in a number of schools (Salaverría, 2011; Kaul, 2013). Indeed, Bethell (2010) argues that journalism students only need a mobile phone and curiosity to produce professional-ready stories. Researchers argue that if students have the necessary environment to develop a skill, they will gradually experience confidence and success with the skill and tasks associated with that skill. Bandura (1986) termed this feeling or belief in their ability to perform a task as one's self-efficacy.

While self-efficacy in the context of journalistic performance has largely focused on writing skills, little attention has been given to new media skills (Broaddus, 2012). Becker et al. (2012) surveyed the journalism work efficacy of 2,195 US graduating students. More than 70% of them attributed the content taught for their self-efficacy for writing and editing for the web, creating blogs, and use of the social media professionally. Wotkyns (2014) explored Australian university students' satisfaction of the training environment in a new convergent journalism major. 88% were extremely-moderately satisfied with the online skills given, indicating that students' learning expectations were being met. A study by Huang et al. (2020) found that students' journalistic writing self-efficacy was positively correlated with their actual writing performance, although the relationship was weak (r =.16), suggesting that their unfamiliarity with the unique requirements of news writing could have been the cause.

Broaddus (2012) explored how learning strategies (among other factors) contributed to US journalism majors' writing self-efficacy. Practical classroom assignments contributed more in students' writing self-efficacy than the students' background experiences and their general writing background. A linear regression analysis on the extent to which learning experiences with such scholastic media associated with writing self-efficacy indicated a statistically significant model ($F4, 445 = 10.075$; $p = .000$; $R^2 = .075$) where newspaper experience ($t = 3.678$; $p = .000$) and journalism classes ($t = 2.671$; $p = .008$) predicted the students' self-efficacy

and therefore possible proficiency in writing. It was evident that exposing journalism students to scholarly media developed their self-efficacy towards producing professional news.

Some studies on technology-focused efficacy indicate a positive relationship between students' technology exposure and usage and their self-efficacy for technology in different academic and professional contexts. Shank and Cotton's (2014) study indicated that students could vicariously acquire technology self-efficacy from their teachers, implying that educator characteristics could inculcate beliefs in students' confident use of technologies. Joo & Choi (2000) explored how students' Internet self-efficacy related to their Internet research performance based on written and practical tests. Students' Internet self-efficacy was related more to the practical research than to the theoretical test. This was not surprising since hands-on skills are considered the best test of readiness for work.

Research Context

In Rwanda, periodic media industry surveys have partly attributed the low quality of news content to poor use of online tools by practitioners. A 2017 Rwanda Governance Board survey considered poor content as the bane of an industry struggling to stay afloat. About 90% of media houses' staff surveyed were confirmed to have inadequate skills for producing professional stories. Although Rwanda's media policy (2014-2020) envisaged a citizenry that is exposed to news through a digitally-empowered media, the 2017 National Media Dialogue echoed a growing stakeholder concern that portrays lackluster use of online tools by media houses (Mwai, 2017). Journalism schools have largely been criticized for inadequate online skills development for the industry (Media High Council, 2016). While media training institutions have increased efforts to train the next generation of "digital journalists", stakeholders are still concerned about the nature of online skills taught and techniques employed (Media High Council, 2016). Although students' efficacy beliefs for technology use have been explored in other countries, the role of Rwanda's journalism training on students' self-efficacy beliefs for professional online skills is not known. Given that employers expect "online-ready" graduates, the role of such training becomes pertinent.

To understand the role of training factors in the students' self-efficacy for online journalism work, the role of content taught, training approaches and training facilities were explored. The study questions were:

1. How efficacious are Rwandan mass communication students in their online journalism skills?
2. How does the content taught, training approaches and facilities influence the students' online journalism self-efficacy beliefs?
3. Are there significant relationships between the training factors and the students' online journalism self-efficacy?

The null hypothesis (H_0) posited no significant positive relationship between each of the training factors and the students' online journalism self-efficacy.

Methods

This study employed a descriptive cross-sectional survey involving a sample of final undergraduate mass communication students (n=182) drawn from journalism schools in five Rwandan universities. Yamane's (1967) formula was used to determine the sample size (i.e.

for populations of 1500). This sample comprised 98 males and 84 females and together constituted 62% of the total student journalism and communication student population (n=293). Recruitment of participants was done through a systematic random sampling from class lists provided by the heads of the selected schools. Out of the 182 respondents, 143 (79%) successfully completed and returned the questionnaires.

The survey instrument was developed through an extensive literature review to identify a scale incorporating components for the training factors and online journalism self-efficacy. Ferrari's (2012) digital competence framework was adapted to test the students' self-efficacy beliefs in their ability to perform the following five online journalism skills: conduct online research; communicate effectively with different social media tools; develop and share multimedia content; integrate ethical practices in online news publishing; and use social media tools to solve organizational problems. The respondents indicated their agreement with statements about training content, teaching style and training facilities and the five online journalism skills. This was indicated on a five-point Likert-type scale where 1 = Strongly Disagree and 5 = Strongly Agree.

To test the quality of the instrument, a pilot survey involving 20 randomly selected students (i.e. four from each journalism school) preceded the main study. The Cronbach Alpha test indicated an overall instrument reliability score of .79, with factor-wise reliability values ranging from .072 to .81. Having met the threshold of .07 as recommended (see Faizan and Zehra, 2016), the instrument was found fit for the main study.

The gathered data was analysed using SPSS version 21. Descriptive analyses of the responses showed the patterns of agreements and disagreements with given statements. Inferential statistics (correlation and regression analyses) were carried out to show the nature and contribution of the training factors (independent variables) on the students' efficacy for online journalism work (dependent variable). Using F-test, the H_0 was tested to confirm or disconfirm the relationship between training factors and students' efficacy for online journalism. The hypothesis was tested at a level of significance of 0.05. Results were then used to draw relevant conclusions of the study.

The research was part of a broader academic study approved by Rwanda's National Council for Science and Technology after ethical clearance by the Directorate of Research of the University of Rwanda. All respondents were informed about their participation rights and their consent obtained before commencement. All responses were kept confidential with no identity required on the questionnaires returned.

Results

Descriptive Analysis of Online Journalism Training Factors

Drawing from empirical research, the training factors considered critical in the development of online journalism skills included the nature of online skills taught, training style and training facilities. Mean aggregate responses regarding these factors are summarized in Table 1.

Results showed that having learnt multimedia content production and sharing skills had the highest mean score (mean=4.11), followed by learning of social media skills (mean=3.99). The fact that most of the journalism modules taught integrated notions of online skills (e.g. research) attracted a mean score of 3.69. Furthermore, respondents indicated that content that related to the industry (e.g. case studies) were well employed in the online journalism classes

(mean=3.67). These results implied that the respondents had been taught a broad range of industry-focused online skills. From the aggregate mean agreement score of 3.87 and standard deviation of 1.09, respondents generally agreed with the training content despite some slight variances in their responses.

Table 1: Means and STDVs of training factor responses

Construct	**Indicator**	**Mean**	**STDV**
Training content	We learnt some online skills in most of the modules	3.69	1.077
	We learnt how to use different social media tools	3.99	1.051
	We learnt how to produce and share multimedia content online	4.11	1.035
	We learnt real online case studies from the industry	3.67	1.179
Sub-variable Aggregate score		3.87	1.09
Training approach	Teaching online skills was more practical than theoretical	4.10	1.115
	Online resources like tutorials were sometimes used in teaching	3.92	1.015
	Some students volunteered to teach complex online skills like web design	3.73	1.181
	Lecturers used online tools to professionally interact with students	4.22	0.958
	Lecturers demonstrated adequate online journalism skills	3.92	1.101
Sub-variable Aggregate score		3.98	1.07
Training facilities	The training facilities (software and hardware) were adequate	3.53	1.118
	Mobile phones were sometimes used in multimedia production exercises	4.13	1.013
	Internet connectivity was reliable during online-based classes	3.64	1.178
	Technical support in online journalism classes was always available	3.60	1.139
Sub-variable Aggregate score		3.73	1.112
Overall aggregate score for training factors		3.9	1.1

Being a key component of online journalism education, the prevalence of multimedia production content and social media skills was not surprising. Scholars argue that journalism educators need to take cues from the technological advances in the industry and integrate such skills in the curricula, leveraging social media interactions with the students for professional teaching and learning (Aifan, 2015; Mihailidis & Shumow, 2011). The results concur with suggestions for retooling training content in cognizance of most students' heavy "digital culture". By leveraging this digital exposure, scholars argue that trainers would not only save lots of time in teaching already familiar topics but also encourage students to teach themselves much of the emerging content (Ferrucci, 2017; Oluchi, 2016). The high mean score regarding use of case studies aligned to industry supports researcher recommendations on updating journalism curricula and employing social media tools in simulated newsrooms for news production (Iyer, 2015; Hirst & Treadwell, 2011).

Regarding the approaches to online journalism training, the online interactions between lecturers and students (e.g. through email and social networking sites) had the highest mean agreement score (M=4.22, STDV=0.958). This was followed by the lecturers' use of more practical than theoretical training approaches like online projects and case studies. (M=4.10, STDV=1.115) and then the use of free online tutorials to supplement formal teaching of multimedia skills like audio or video editing (M=3.92, STDV=1.015). Respondents also generally considered the trainers as competent and therefore, able to teach the online skills (M=3.92, STDV=1.101). While seemingly recognizing that a number of students were digital-savvy and therefore could have learnt a number of online skills by themselves, the voluntary contribution of students in teaching complex topics like web design and development was acknowledged by most of the respondents (see M=3.73, STDV=1.181).

The results align with studies that suggest the need for journalism educators to adopt pedagogy strategies that impart the required digital skills for the ever-changing industry. Wotkyns' (2014) study on the level of students' satisfaction with journalism curricula particularly highlighted their appreciation with experiential learning approaches that integrated their creativity and helped to link theory with practice. Jeanti (2015) and Ferrucci (2017) also argue that teaching digital journalism should be a process where the trainer co-designs the training with his or her students, allowing for as much innovation as possible. Incorporating students in the teaching of online skills is also touted as relief for trainers since they are not necessarily expected to be well-versed with all emerging online tools (Schwalbe, 2009). Results from the current study therefore seem to support this approach where students are taught to largely drive their own learning through the vast number of online tools.

From the results, mobile phone use in multimedia production training has gained ground in the journalism schools, with a mean agreement score of 4.13 implying that phones were being used to supplement the more traditional tools of news production like recorders, cameras and computers. The low mean score regarding the adequacy of these traditional training facilities (M=3.53, STDV=1.118) possibly indicated that in the absence of these facilities, the easily accessible mobile phones came in handy for practical learning purposes. Online journalism training also seemed to by the availability of reliable internet connection (M=3.64, STDV=1.178) which is the bedrock of online skills production. To ensure online journalism classes ran well even in the absence of the lecturers' interventions, respondents generally agreed that technical assistance was always available (M=3.60, STDV=1.139). This implied that apart from technical assistance from knowledgeable student colleagues, it would seem that the training facilities were manned with support staff not only to ensure the facilities were ready for use but also to support students with the online production projects when necessary.

The results concur with other scholarly views on the need for journalism training institutions to appropriate new media tools that will enhance the online story-telling practices of the future professionals (Aifan, 2015; Bor, 2014; Wenger & Owen, 2012). As the results show, easy access to mobile phones as tools of journalistic production can address costs associated with the traditional journalism equipment (Ferruci, 2017; Salaverría, 2011). Although the ideal online journalism training facilities are far from being realized (e.g. for reasons of limited financial means), studies advocate for connected multimedia environments that afford students with unlimited opportunities to experiment and practice their new media production skills (Alves et al., 2014; Switzer & Switzer, 2013).

Overall, constructs under the training approach had the highest aggregate mean agreement score among the respondents (M=3.98, STDV=1.07). This was followed by constructs under

training content (M=3.87, STDV=1.09) and then constructs under training facilities (M=3.73, STDV=1.11). The aggregate mean score of all the training factors (M=3.9) indicated that most respondents generally agreed about the different aspects of the training in online journalism.

The impression created by these results was that students agreed (with moderate variability) that they were trained on a variety of relevant online skills, using innovative techniques which possibly complemented the traditional teaching approaches and modest online training facilities. This demonstrates the dynamic nature of online journalism training where scholars advocate for a keen eye on the evolving digital needs of the media industry coupled with revised curricula, innovative training and learning techniques and general technical readiness for a future of technology that is gradually redefining the roles of journalists (Robinson, 2013; Jeanti, 2015; Tanner, 2014).

Descriptive Analysis of Online Journalism Efficacy

The respondents' self-efficacy for online journalism was conceptualized as their beliefs in the ability to effectively do online journalism research, create and share multimedia stories online, use social media tools to communicate to different audiences, practice ethical online publishing and solve problems with different online tools. Table 2 shows the aggregated responses under this variable.

Table 2: Respondents agreement levels on their online journalism efficacy

I believe I can effectively…	**Generally Agree (SA+A)**	**Neutral (N)**	**Generally Disagree (D+SD)**
Conduct online journalism research	84.4	12.1	3.5
Communicate with different social media	76.7	12.9	10.3
Create and share multimedia stories online	73.7	15.0	11.3
Conduct ethical online publishing	80.4	15.0	4.5
Use online tools to solve different problems	85.3	9.9	4.8
AVERAGE	80.1	13	6.9

Key: SA=Strongly Agree, A=Agree, N=Neutral, D=Disagree, SD=Strongly Disagree

From the results, respondents considered themselves adept in the five online journalism skills, with an average of more than 80% of them believing they could perform all the skills. The greatest level of self-efficacy for online journalism was expressed in the ability to use online tools to solve problems (85.3%), followed by ability to conduct research online (84.4%) and understanding of the ethical implications of using online tools (80.4%). Compared to other dimensions, the respondents had low efficacy for multimedia production skills (73.7%). Only about 7% of the respondents did not express any efficacy to execute online journalism tasks.

The findings are consistent with studies that explored the digital competence of students. For example, Sutherland and Ho (2017) and Bethell (2010), argued that digital competence should best be demonstrated by the ability to identify and solve practical problems. Although scholars like Switzer & Switzer (2013) and Bor (2014) suggest that students are likely to gain social media communications skills faster than other skills such as multimedia and problem-solving skills, this study showed the contrary. It seemed to indicate that the students focused more on interrogating how social media tools can be used to address problems in organization as well

as online research skills than others. To obtain a fuller picture on the relationship between the identified training factors and the students' levels of online journalism efficacy, the next section explores the statistical nature of the relationships as well as contribution of each of the factors on the students' online journalism self-efficacy levels.

Correlation Analysis of Training Factors and Online Journalism Efficacy Beliefs

To determine the strength and direction of association between the training factors and the students' self-efficacy for online journalism, correlation analysis was done. The resulting correlation matrix with correlation coefficients for the aggregate of the training factors and online journalism efficacy is shown on Table 3.

Table 3: Correlations of training factors and online journalism efficacy

Training factor		**Training content**	**Training style**	**Training Facilities**	**Online journalism self-efficacy**
Training content	r	1			
	Sig. (2-tailed)				
Training style	r	.413**	1		
	Sig. (2-tailed)	.000			
Training Facilities	r	.489**	.419**	1	
	Sig. (2-tailed)	.000	.000		
Online journalism self-efficacy	r	.435**	.315**	.422**	1
	Sig. (2-tailed)	.000	.000	.000	

**. Correlation is significant at the 0.01 level (2-tailed); r = Pearson correlation coefficient

Results showed that all the training factors were significant and positively correlated to the online journalism self-efficacy levels of the students. The nature and types of online skills taught had the highest significant positive correlation with the students' online journalism self-efficacy (r=.435, p=.000) followed by training facilities (r=.422, p=0.000). The way online skills were taught had the least yet significant relationship with the students' online journalism self-efficacy (r=.315, p=.000) at 95% level of confidence. The results implied that a unit of positive improvement in the nature and types of online skills taught, training facilities and training approaches led to a corresponding increase in the students' online journalism self-efficacy levels by 43.5%, 42.2% and 31.5% respectively. Further, the results disconfirmed the H_0 that predicted no significant correlation between training factors and online journalism efficacy. The observed positive linear relationships supported studies that underscore the need for journalism schools to adapt their training to the ever-changing media industry if future professionals were to fit well in the digital industry (Ferrucci, 2017, Ferruci, 2017; Jeanti, 2015).

Test of Hypotheses

To explore the statistical significance of the influence of the training factors on the students' self-efficacy for online journalism, the null hypothesis postulated no significant relationship between the training factors and the online journalism self-efficacy. To test this hypothesis, a multiple regression analysis model was employed to establish if an aggregate mean score of the training factors could statistically predict the students' online journalism self-efficacy at 95% level of confidence. The postulated model was fitted thus: $Y = \beta 0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon i$, where Y = online journalism self-efficacy, $\beta 0$ = constant (α = constant term), β_1- β_3= intercepts

for the independent variables, X_1= training content or online skills taught, X_2= training approaches, X_3= training facilities and ε = error term/Stochastic term.

The results in Table 4 presents the fitness of the regression model used in explaining the variation of online journalism self-efficacy as a result of the identified training factors.

Table 4: Model Summary for training factors on students' online journalism self-efficacy

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.545[a]	.297	.282	.474	.297	19.288	3	137	.000

a. Predictors: (Constant), Training facilities, Training style, Training content

Results showed that, taken together, all the training factors were highly and significantly correlated with the students' online journalism self-efficacy (r=.545, p=.000). Furthermore, given the coefficient of determination of 0.297 (R^2), it was evident that the training factors exerted some explanatory power on the students' online journalism self-efficacy. This implied that 29.7% of variations in the online journalism efficacy could be explained by the training factors (on their own in the model). The remaining 70.3% could only be explained by issues not factored in the model. However, without the constant variable (β0) on the model, the training factors had a predictive power of 28.20% (adjusted R^2 of .282) on the students' online journalism self-efficacy, implying only a minor variation of .015. This adjusted R^2 result meant that a unit improvement of the training factors (without the β0) would improve the students' self-efficacy for online journalism by a factor of .282 or 28%.

The Analysis of Variance (ANOVA) results (Table 5) indicated that the proposed regression model had a statistically significant goodness-of-fit at 5% significance, indicated by the calculated F-statistic of 19.288 which was larger than the critical F-value of 2.67 (obtained from the F distribution tables) with degrees of freedom (3,140) at p-value<0.000. Moreover, the existence of a significant positive relationship between the training factors and online journalism efficacy of the students implied that the proposed model could be relied upon to demonstrate the predictive power of training factors on the online journalism efficacy of the students.

Table 5: ANOVA[a] for training factors on students' online journalism self-efficacy beliefs

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.007	3	4.336	19.288	.000[b]
	Residual	30.795	140	.225		
	Total	43.801	143			

a. Dependent Variable: Online journalism self-efficacy

b. Predictors: (Constant), Training Facilities, Training style, Training content

By further testing the significance of the regression coefficients of the training factors on the students' online journalism efficacy (see Table 6), results confirmed a positive relationship

between the training content (β=0.059, t=2.780) and training facilities (β=0.076, t=4.058) and the students' online journalism self-efficacy, with a significance of .006 and .000 respectively. Despite the training approaches having indicated a positive relationship with the students' online journalism efficacy, this relationship was of negligible significance (p>.349)

Table 6: Coefficients for training factors[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.191	.271		8.090	.000
	Training content/skills	.059	.021	.236	2.780	.006
	Training approaches	.018	.019	.077	.940	.349
	Training facilities	.076	.019	.346	4.058	.000

a. Dependent Variable: Online journalism self-efficacy

From the results, the proposed model predicting online journalism efficacy from the three training factors taken together was, therefore, fitted with regression coefficients as follows: online journalism self-efficacy = 2.191 + 0.059 (training content) + 0.018 (training approaches) + 0.076 (training facilities) + Ɛ.

With p-values 0.000<0.05 for both training content and training facilities, the H_0 was therefore rejected and a conclusion made that these training factors exerted a significant and positive influence on the online journalism self-efficacy beliefs of mass communication students in Rwanda. In an optimal model, however, the H_0 for training approaches would be accepted since it had a p-value>.05, indicating that, though this dimension had a positive relationship with students' self-efficacy for online journalism, its significance did not meet the 95% level of confidence. These findings agree with scholarly evidence that advocate for adapting the journalism training to the required digital content, training approaches and facilities to improve the career paths of graduates in the digitally-oriented industry (McDevitt & Sindorf, 2012; Cindy, 2015).

Discussion of Findings

This study sought to explore the relationship between training factors and online journalism self-efficacy beliefs of mass communication students in Rwanda. The results largely supported scholarly evidence that training determines the perceived work-preparedness of students. Respondents generally agreed with the different statements regarding the characteristics of online skills offered, the approaches used in teaching these skills as well as the nature of facilities available for teaching and learning online journalism skills. The fact that a good mix of multimedia production and social media skills are well integrated in the curriculum pointed to alignment of curricula with emerging digital skills in the industry. Of note also were the high mean scores regarding the online skills or content taught as well as the training facilities. This indicated that Rwandan journalism schools seem to have made appreciable strides in adapting online tools in the curricula and invested in some facilities to enhance the teaching and learning of these emerging skills.

Correlation analyses showed significant positive correlations between each of the training factors and online journalism self-efficacy beliefs of the students. This demonstrated that

journalism schools cannot ignore the role played by characteristics of training in their quest to develop online-ready graduates. Media researchers have argued for competence-based training characterized by teaching skills or content that will make graduates fit well in the workplace (Hirst & Treadwell, 2011). In teaching online skills among the youth such as students, evidence shows that pedagogy which considers the digital habits of these digital natives might facilitate competence development of digital skills which are transferable to the industry (Jeanti, 2015). In this study, respondents seemed to recognize that some of their colleagues had more advanced online skills than the lecturers which enabled them to contribute in the teaching and learning of more complex practical exercises like web design and development. This supports arguments by scholars that in this era of new media technologies, journalism educators should embrace co-creation of training content and innovative ideas from the learners (Wiebe & McAuley, 2010).

In the context of online journalism education, digital training resources have been considered key as the rapid development of new technologies requires frequent updates of the infrastructure (Boers et al., 2012). In this study, though technical facilities had a weak but positive correlation with the online journalism self-efficacy beliefs of the students, the high mean score regarding the use of mobile phones and online tutorials in the multimedia production classes gives hope especially with dwindling resources for the more expensive technical journalism equipment. This is in line with arguments from scholars like Mihailidis and Shumow (2011) who decry the way some journalism schools compromise practical learning through "bureaucratic inertia and resource constraints" (p.15) instead of opting for cheaper and more cost-effective alternatives like mobile phones.

The respondents' good rating on the accessibility to reliable Internet connection and technical support during the training also indicated attempts at technical readiness for the schools concerned. This augurs well for online skills training since researchers argue that training in new media technologies require a good mix of tools and techniques all of which depend on the availability of a reliable source of Internet connectivity (Iyer, 2015; Jeanti, 2015).

By showing that the aggregate mean score of training factors had significant contribution (R^2=.297, $p<0.05$) in the students' self-efficacy beliefs regarding online journalism work, the regression analysis results demonstrated the central role of these characteristics of training in explaining or predicting the level of the "online-readiness" of the mass communication students. Particularly, disaggregated mean scores also indicated that each of the factors had contribution though with different levels of significance. The findings resonate with studies that position the revival of journalism curricula and pedagogy techniques as central to the integration of new media skills in journalism training. Such studies argue for the need for journalism schools to identify the range of skills or content to be taught and how these will be continuously and effectively taught in an increasingly dynamic media industry (Tanner, 2014; Ferrucci, 2017).

Conclusion

The study explored perceptions of mass communication students regarding online skills training and how these are congruent with their online journalism self-efficacy beliefs. The respondents expressed agreement in all the factors as characteristic of the online journalism training in Rwandan journalism schools. This portends well for the development of digital skills among the future media professionals. In line with previous research, results showed that the content taught, how it is taught and the overall training environment were correlated with

the students' self-efficacy for online journalism (Cindy, 2015; Seelig, 2010). In essence, this implied that improving the quality and diversity of online skills taught and how they are delivered builds confidence in the students' ability to use online tools to work in the industry. Regression analysis also confirmed that the training factors (singly and collectively) positively contribute to the students' levels of online journalism self-efficacy, though at varying levels of statistical significance.

These results are encouraging for online journalism education in Rwanda. However, the study had some limitations that merit further investigations. Given the narrow focus of the study, including a combination of other factors beyond training (like field experiences and individual online behavior) might have produced more insightful results on the self-efficacy of the students. Furthermore, the study was limited by the use of a survey. The nuances of the lived experiences of a phenomenon (in this case, how students make sense of the factors incidental to their self-efficacy beliefs in online journalism) are best explored with a mixed methods approach. Including interviews and/or focus group discussions with selected students might possibly yield a clearer picture of the students' online journalism self-efficacy beliefs. Despite these limitations, this study can be considered as an addition to knowledge on how the dynamics of online journalism training in the digital era are likely to play into building the necessary confidence for students as they face the increasingly digitally-competitive workplace.

References

Aifan, H. A. (2015). *Saudi students' attitudes toward using social media to support learning*. (Unpublished PhD thesis), University of Kansas.

Alves, K. C., de Souza Filho, G., Moura S. and Brito F. (2014). Collaborative learning in digital journalism: Using JCollab for journalists' education. *Brazilian Journalism Research 10*(1), 238–259. https://doi.org/10.25200/BJR.v10n1.2014.633

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, Prentice-Hall.

Becker, L., Vlad, T and Kalpen, K. (2012). Annual survey of mass communication enrolments: enrolments decline for second year in a row. *Journalism & Mass Communication Educator, 67*(4), 333–361. https://doi.org/10.1177/1077695814555432.

Bethell, P (2010). Journalism students' experience of mobile phone technology: implications for journalism education. *Asia Pacific Media Educator*, *20*, 103–114.

Boers, R., Ercan, E., Rinsdorf, L. and Vaagan, R. (2012). From convergence to connectivism: Teaching Journalism 2.0. *Online Journal of Communication and Media Technologies, 2*(4), 52–64. https://doi.org/10.29333/ojcmt/2398.

Bor S. E. (2014) Teaching social media journalism: Challenges and opportunities for future curriculum design. *Journalism & Mass Communication Educator, 69*, 243–255. https://doi.org/10.1177/1077695814531767.

Broaddus, M. B. (2012). *Students' writing self-efficacy, motivation, and experience: Predictors in journalism education*. (Unpublished PhD dissertation), University of Tennessee.

Ehreneich, B. (2009). Welcome to a dying industry, journalism grads. *SFGate.* Retrieved from http://www.sfgate.com/cgi-bin/article.cgi.

Faizan, R. and Zehra, N. (2016). Quality work-life as predictor to organisational commitment under contrasting leadership styles: I.T responses from Pakistan's private software houses. *Global Journal of Management and Administration*, *16*(6), 9–23.

Ferrari, A. (2012). Digital competence in practice: An analysis of frameworks. *JRC Technical Reports*. Institute for Prospective Technological Studies.

Ferrucci, P (2017). "We've lost the basics": Perceptions of journalism education from veterans in the field. *Journalism & Mass Communication Educator,* 1–11. https://doi.org/10.1177/1077695817731870.

Gallardo-Echenique E., Minelli de Oliveira J., Marqués-Molias L., Esteve-Mon F. (2015). Digital competence in the knowledge society. *MERLOT Journal of Online Learning and Teaching, 11*(1), 1–16.

Hirst, M and Treadwell G (2011). Blogs bother me: Social media, journalism students and the curriculum. *Journalism Practice 5*, 446–461. https://doi.org/10.1080/17512786.2011.555367.

Huang, K.T., Ball, C., Cotton, S. R. & O'Neal, L. (2020). Effective experiences: A social cognitive analysis of young students' technology self-efficacy and STEM attitudes. *Social Inclusion, 8*(2), 213–221. https://doi.org/10.17645/si.v8i2.2612.

Iordache, C., Mariën, I., & Baelden, D. (2017). Developing digital skills and competences: A quick-scan analysis of 13 digital literacy models. *Italian Journal of Sociology of Education, 9*(1), 6–30. https://doi.org/10.14658/pupj-ijse-2017-1-2.

Iyer, P. (2015). *Competencies for future newsrooms in Australia: a mid-career learning strategy for journalists*. (Unpublished PhD Thesis), University of Wollongong, Australia.

Jeanti, S. (2015). Doing it for real: Designing experiential journalism curricula that prepare Students for the new and uncertain world of journalism work. *Coolabah 16*, 122–142. https://doi.org/10.1344/co201516122-142.

Joo, Y. & Choi, M.B. (2000). Self-efficacy for self-regulated learning, academic self-efficacy, and Internet self-efficacy in Web-based instruction. *Educational Technology Research and Development, 48*(2):5–17. https://doi.org/10.1007/BF02313398.

Kaul, V. (2013). Journalism in the age of digital technology. *Online Journal of Communication and Media Technologies, 3*(1), 125–143. https://doi.org/10.29333/ojcmt/2414

McDevitt, M. & Sindorf, S. (2012). How to kill a journalism school: The digital sublime in the discourse of discontinuance. *Journalism & Mass Communication Educator*, *67*, 109–118. https//doi.org/10.1177/1077695812440942.

Media High Council (2016). *Training report on web design and maintenance for Rwandan journalists*. Kigali, Rwanda.

Mihailidis, P and Shumow, M (2011*).* Theorizing journalism education, citizenship, and new media technologies in a global media age. *Taiwan Journal of Democracy, 7*(2), 27–47. https://doi.org/10.29654/TJD.201112.0003.

Mwai, C (2017, November 7). *Local media mulls survival in digital age*. The New Times. https://www.newtimes.co.rw/section/read/223157

Oluchi, E. (2016). Media Convergence: A Paradigm Shift in Journalism Education in Nigeria. *Review of Journalism and Mass Communication,* 4(1), 19–42. https://doi.org/10.15640/rjmc.v4n1a2.

Patrão, C. & Figueiredo, A. (2018). A social web based pedagogical strategy for teaching journalism in higher education. *RED-Revista de Educación a Distancia [Distance Education Magazine], 57*(8). https:// doi.org/10.6018/red/57/8.

Quinn, S (2010). Opportunities for journalism education in an online entrepreneurial world. *Asia Pacific Media Educator*, *20,* 69–80.

Robinson, S (2013). Teaching journalism as process: A proposed paradigm for J-School curricula in the digital age. *Teaching Journalism and Mass Communication*, *3*(1), 1–12.

Royal, C. (2015) Developing and assessing experiential learning opportunities. *Teaching Journalism and Mass Communication*, *5*(1), 22–32.

Rwanda Governance Board (2018). *Rwanda Media Barometer (2018)*. Kigali, Rwanda.

Salaverría, R. (2011). Online journalism meets the university: Ideas for teaching and research. *Brazilian Journalism Research, 7*(2), 137–152. https://doi.org/10.25200/BJR.v7n2.2011.356

Schwalbe, C. B. (2009). Leveraging the digital media habits of the millennials: Strategies for teaching journalism courses. *Southwestern Mass Communication Journal*, *25*, 53–68.

Seelig, M. (2010). Journalism and mass communication education: The impact of technology on pedagogy. *Explorations in Media Ecology, 9* (4), 245–258.

Shank, D. B. & Cotton, S. R. (2014). Does technology empower urban youth? The relationship of technology use to self-efficacy. *Computers & Education, 70*, 184–193. https://doi.org/10.1016/j.compedu.2013.08.018.

Sutherland, K and Ho, S, (2017). Undergraduate perceptions of social media proficiency and graduate employability: A pilot study. *Higher Education, Skills and Work-Based Learning*, *7*(3), 261–274. https://doi.org/10.1108/HESWBL-02-2017-0018.

Switzer, J & Switzer, R (2013). The myth of the tech-savvy student: the role of media educators in a Web 2.0. World. *Journal of Media Education*, *4*(4). 15–27.

Tanner, S. (2014). *Graduate qualities and journalism curriculum renewal: Balancing tertiary expectations and industry needs in a changing environment*. (Unpublished PhD thesis), Edith Cowan University, Australia.

Wenger, D., & Owens, L. (2012). Help wanted 2010: An examination of new media skills required by top U.S. news companies. *Journalism and Mass Communication Educator*, *67*(1), 9–25. https://doi.org/10.1177/1077695811426826

Wiebe, S. & Mcauley, S. (2010). Harnessing new technologies to teach academic writing to the Net generation. *in education, 16* (1), 117–130.

Wotkyns III, R. S. (2014). Curriculum development in the digital age of journalism. *GSTF Journal on Media & Communications*, *2*(1), 28–33. https://doi.org/10.7603/s40874-014-0005-6.

Yamane, T. (1967). *Statistics: An introductory analysis*, (2nd ed.). Harper and Row.

Corresponding author: Joseph Njuguna
Contact e-mail: jnjuguna110@gmail.com

Developing an Open Educational Resource and Exploring OER-Enabled Pedagogy in Higher Education

Beth Tillinghast
University of Hawaii at Manoa
United States

Abstract

There is a growing trend in higher education to explore the various benefits of Open Educational Resources. This applies not only to the cost benefits, but also to potential pedagogical benefits as well. This study explores the process of developing and implementing an Open Educational Resource for an undergraduate course and experimenting with OER-enabled pedagogy. Interview data provide an account of this process, outlining challenges and highlighting insights, which might prove useful for other professionals contemplating the move toward developing Open Educational Resources. Interview data are also organized using the Unified Theory of Acceptance and Use of Technology constructs pertaining to attitude, performance expectancy, effort expectancy, social influence, technology self-efficacy, and facilitating conditions. A qualitative interpretive approach was then used to analyze the data. Analysis indicates that most of the constructs can strongly influence faculty to adopt Open Educational Resources but that "social influence" has no effect on adoption. Findings also include reflections on OER-enabled pedagogy as it was applied in the course. These findings indicate that OER-enabled pedagogy has the potential for increasing student engagement, though this potential has not yet been realized. Finally, findings provide an outline of recommendations that might guide others when considering developing and implementing Open Educational Resources.

Keywords: Open Educational Resources, OER-enabled pedagogy, UTAUT; OER, OER use, development

Over the centuries, the concept of formal education has been intricately coupled with the idea that books are an indispensable component of that experience (Reed, 2018). Indeed, some of the first institutions of learning were formed around large collections of materials such as found at the Library of Alexandria (Cubberley, 1902). Modern education has continued to demonstrate this reliance on books, with an ongoing dependence on commercial textbooks as an integral part of the curriculum (Weller, 2014). Unfortunately, this practice has been shown to have an impact on the student experience in the current higher education context. This is due to the high cost of textbooks, which can potentially prove to be an access barrier to essential educational resources (Brandle et al., 2019). In fact, as of 2017, the U.S. Bureau of Labor Statistics reported that the cost of textbooks rose by 142% over the last decade and a half, which represents a rate that is four times that of inflation (U.S. Bureau of Labor Statistics, 2017). As a result of these high costs, students may choose not to purchase textbooks. In a study published in 2018 by Wakefield Research, 42% of students surveyed said they had avoided purchasing course materials because of costs (Lederman, 2018).

Considering this backdrop, it is no wonder that there has been an uptake in interest in the adoption and development of Open Educational Resources (OER). OER are learning resources that are made available either at no cost in digital format or for very low cost in print format. They either reside in the public domain or carry with them the necessary Creative Commons licenses to allow for flexible reuse, revision, remixing, retention, and redistribution (the 5 Rs) increasing their flexibility (Wiley et al., 2014). It becomes apparent that OER, providing both free and flexible access, would be a logical alternative in addressing the textbook cost issue. In addition to the cost-saving aspect of OER, others are exploring the potential to promote open practices and to investigate pedagogical shifts through the use of these resources (DeRosa & Robinson, 2017; Ehlers, 2011; Wiley & Hilton III, 2018).

This research examines the experiences and perceptions of faculty and staff as they develop an OER for an undergraduate nutrition course and apply it in instruction. It further examines the experience of one instructor undertaking teaching with OER-enabled pedagogy (OP), which is a pedagogical approach involving students in the co-creation of content (Wiley & Hilton III, 2018). Findings are organized by recording the experiences of faculty and staff as they develop and implement an OER and then by examining perceptions through the lens of the Unified Theory of Acceptance and Use of Technology (UTAUT) model. Recommendations from this experience are also presented, which might prove useful for exploring the development of OER. This knowledge could, in turn, be used to promote greater use and development of OER, and, therefore, to support greater student access to and application of learning resources. This access might subsequently impact student success in higher education.

Literature Review

A large amount of research exists that explores factors that might motivate faculty to adopt OER and factors that might present challenges (Algers & Silva-Fletcher, 2015; Anderson et al., 2017). The literature shows that faculty are motivated to adopt OER in order to cut costs for students and to enhance educational equity (Belikov & Bodily, 2016) as well as to pursue pedagogical freedom (Dermody, 2019).

A more recent movement in the consideration of OER adoption is how these resources play a role in the further development of open educational practices (OEP) and how these practices can potentially enhance student learning (Cronin, 2017; see Figure 1).

Figure 1: OER can play a role in promoting various aspects of OEP.

One of the first discussions of OEP was put forth by Ehlers (2011), who described a second phase of OER development whereby there is a shift from a focus on OER as merely resources to a focus on how they can promote open practices in education. In a paper discussing how open resources support the exploration of open pedagogy, DeRosa and Robinson (2017) reported that when students are exposed to and engaged in the use and reuse of learning resources, they can begin to develop new and deeper relationships with the resources, which might impact learning. Since the term "open pedagogy" has become associated with OER in recent years, and in order to avoid confusion, this research used the term "OER-enabled pedagogy" as defined by Wiley and Hilton (2018) as "the set of teaching and learning practices that are only possible or practical in the context of the 5R permissions that are characteristic of OER" (p. 133).

The scholarly literature does not provide in-depth research on faculty who have already adopted OER and who may be experimenting with OP. In addition, it does not provide a great deal of research detailing the process of OER creation and application within a course (Mallinson & Krull, 2015). An account of this process might prove useful for other professionals contemplating the move toward OER creation by providing insights into the actual process as well as useful guideposts along the way. Therefore, the focus of this research was to explore the experiences and perceptions of faculty and staff in higher education as they initiated and developed an OER for an undergraduate course and then applied it in instruction.

Methodology

This study applied an interpretive qualitative approach (Creswell et al., 2006) in order to explore the perspectives of faculty and staff engaged with the development and application of an OER textbook and OP in the context of higher education. This approach uses word-based data in its analysis and views human action as meaningful and best studied in its social contexts (Yanow & Schwartz-Shea, 2006). Eight participants took part in this research. They represented the various roles involved with the development and application of an OER for one specific undergraduate class at a research-intensive university. An exempt status IRB approval was secured for the study as well as consent for all interviews. Data were recorded, transcribed, validated by participants, and anonymized.

Participants

Eight individuals made up the participating team. Two faculty members had been involved in securing a university OER Initiative Grant (http://oer.hawaii.edu/projects/) in 2017 and in organizing and guiding the overall development of a textbook for their academic area. Graduate assistants (GAs), acting as resource developers, worked on adapting or creating detailed information within the text under the guidance of the faculty. An institutional OER technologist provided instructional design and resource development support as well. Instructors implemented the OER textbook and provided feedback to enhance later modifications. One of three course instructors experimented with implementing OP activities within two sections of the course. Interviews with these participants represented all but one member of the entire team and represented all of the participant roles.

The UTAUT Model

Constructs associated with the UTAUT framework guided this research (Venkatesh et al., 2003). The UTAUT model is based on eight different technology acceptance models and is applied in research to explain user intentions to use an information system and subsequent usage behavior (Venkatesh et al., 2003). This framework is based on core constructs that determine the intention to adopt a specific technology: performance expectancy, effort expectancy, social influence, and facilitating conditions. The original UTAUT framework also included the constructs of attitude and Internet self-efficacy, which were incorporated into the framework for this research.

The UTAUT model has helped to guide research exploring different aspects of technology acceptance in the context of open access adoption studies and open practices (Dulle & Minishi-Majanja, 2011; Kandiero, 2015; Mtebe & Raisamo, 2014; Percy & Van Belle, 2012). These authors have indicated that the original UTAUT framework used in quantitative research has proved consistent as a model, with high validity and reliability, and is robust in predicting the acceptance of a new technology as compared to other models (Percy & Van Belle, 2012). Though this model has primarily been applied to research investigating potential acceptance and use of a technology, it is also appropriate to apply as a guiding framework when exploring the process of development and adoption of a technology because it examines influencing factors.

Research Question

The research question explored in this study was as follows:

> What are the perceptions and experiences of faculty and staff in the development of an OER, in instruction introducing the OER, and in the application of OER-enabled pedagogy in an undergraduate course?

Instrumentation

The instrument developed for this study consisted of semi-structured interview questions with a guiding interview protocol. Questions, which were based on the constructs that outline the UTAUT model, varied as appropriate to the participant role. Questions addressed the roles of faculty, OER technologist, resource developer, and instructor.

The interview questions referenced those developed by a number of researchers applying the UTAUT model (Dulle and Minsihi-Majana, 2011; Venkatesh et al., 2003). They also referenced those developed to examine instructional priorities for adopting OER (Jung &

Hong, 2016). The referenced instruments were either released under a Creative Commons license, which allows reuse, or permission was sought for their use.

Data Collection and Analysis

Qualitative data were gathered through recorded semi-structured interviews with the eight participants who were involved throughout the project. Data were then transcribed professionally and later validated by the interviewees. Analysis was conducted as passages in the text were identified and coded. Next these codes were categorized and then thematically analyzed. Through this process, the words of the participants were used to deepen understanding and shed light on the process of OER development and use (Corden & Sainsbury, 2006). The narrative developed from the data was later sent to the participants for final review and validation.

Findings

Findings for this study were organized in two ways. Firstly, the experiences of the faculty and staff as they moved from the initial conception of the OER project through the development and application in instruction were recorded in a narrative format. Secondly, findings and the emerging themes were organized by and recorded through the lens of the UTAUT framework. Insights from the findings were also translated into recommendations in order to provide a guide for subsequent OER development.

Development and Application of the OER

Inception. To prepare for the upcoming semester, the lead faculty visited the bookstore to pick up the newest edition of the textbook she had been using. She reported being 'appalled. It was $130 for a book that didn't have any binding, no cover, and it had two different sets of page numbers!' She didn't think she could ask students to work with such an obviously "awful" textbook and immediately emailed the campus OER technologist to find a solution.

The technologist suggested that the faculty apply for a campus OER grant offered through the Outreach College. She applied for and was awarded the grant. At this point, she identified a team that would become responsible for the development of the OER. The team would ultimately consist of the lead faculty, a support faculty, the OER Technologist, two graduate assistants, and three instructors, who would later implement the text.

The goal of the project from the faculty members' perspective was to develop a free resource that could be shared and that was as good as, or better than, the customary commercial textbook. Also, the faculty wanted a resource over which they had control of the content and one that was "placed-based and more appropriate for their student population".

Development. The actual work began in January 2017. After the first GA was hired, weekly meetings became the norm, which continued for the year during the development phase. These meetings became a critical component of the workflow and helped to "ensure a successful product". The GA reported that the first order of business was to "brainstorm everything. Figuring out … what was the mission for this book, what were our goals … then outlining the chapters … before beginning to research". The technologist relied on his background as an instructional designer to provide guidance in the overall design of the resource as the team "made a version that was based on how [the faculty] wished the course would be".

After the initial brainstorming meetings, the faculty members' role became to first "organize the sequence of topic areas" and then "find OER resources that were already out there … judging which ones best fit the level of science that we were teaching and were reliable and seemed to be sound"". The OER technologist assisted the team in this phase by directing them to existing resources.

Throughout the process, someone needed to take the key role in leading the OER development. The lead faculty fulfilled this role by "ultimately being the one responsible to see [the project] from start to finish" and to ensure that funding was available.

The GA reported helping with the "basic outline of the textbook, and then actually finding the content or writing the content if it wasn't available". The GA shared, "The faculty were able to contribute to [the text] to make sure that we had the key points correct … as a lot of nutrition books seem to have wrong information". After the first semester, the Gas changed. The newly hired GA brought fresh eyes to the project finding that "there were a lot of things missing that we really wanted to include". For example, they wanted to make sure that "every chapter there has a connection to something … that relates to Hawaii or Pacific Islanders". This GA was also responsible for finding openly licensed photos and images, which became "a huge, time-consuming factor". As the content started emerging, the GA was also aware of the need to provide a consistent tone and similar structure throughout the material. As the resource more fully formed, the technologist organized an outside review by working with the Rebus Project, which provides a community of collaborators with publishing guidance for OER projects. Through this project, the resource was reviewed by "subject matter experts from a couple of different institutions … and [by] different copy editors … to look for tone and consistency".

Most of the work had been completed in Google Docs for collaboration purposes. The final product would be offered as a Pressbook. The OER technologist indicated that "Once you're in Pressbooks, the process [of developing the OER], the workflow, is not as streamlined, not as smooth". It was in the Pressbook development phase where the team began "doing the real aesthetic things of making sure the references looked fine or fixing tables". The team needed to work with "the resolution of images so they would print well" and "to add in alternative text … for accessibility". The final stage also included sharing the resource beyond the boundaries of the university. The OER technologist "shared it over Twitter, over social media, and emailed it to a couple of different listservs, and sent it to a few folks … who were waiting for the book".

Transition into instruction. In the process of transitioning to a new instructional resource, the instructors reported that there "wasn't much of an impact [on their workload] … just updating links on … a personal website". One instructor reported that the "impact was really positive. It feels so nice as an instructor to say, 'We have this free resource for you'". Another instructor reported, "a bigger impact [was that] I felt good about the way the information was being shared to students and the fact that it was free, that they could have access to this textbook even after the course is over. It is also more relatable, with local information and beautiful local pictures".

OER-enabled pedagogy. When launching the new textbook, one instructor decided to begin work on a unit that she felt was missing from nutrition textbooks. Her goal was to begin developing a unit on "health at every size, body positivity, and size diversity". Realizing that this goal would unfold over several semesters, she began by involving students in research in this field, which would later appear in the textbook. "I was able to create an assignment for the students [on this topic], and on how to use the library database, and how to look up peer reviewed journals under [this] topic that were not in the book yet". She continued by saying,

"The whole premise of the class is that we're teaching evidence-based recommendations and information. To have them try to find research, read it, and connect to a topic we were developing. … To get them a little excited to know this is part of the research [process], and they're contributing, and that it might make a difference".

In terms of the impact of this approach on instruction, the instructor shared that "students are taking part in deciding what is important, and making those decisions, and developing those critical thinking skills about maybe what … their textbooks have, or don't have, or that they wish they did have". The instructor continued by saying, "they have … that student eye, … and we're trying to develop them into these critical thinkers who can look at evidence and determine 'Is this worth putting in a textbook, or not?' … It's creative, and it makes a lot of sense".

UTAUT Constructs with Emerging Themes

The following section reviews the data using the structure of the UTAUT framework in order to explore the perceptions of the OER team as they developed and applied the resource in instruction. It also provides data on the perception of OP as applied in the context of this study.

Attitude. This construct refers to an individual's feelings – both positive and negative – towards the use of a technology (Venkatesh et al., 2003). Three main themes emerged from the data: pride in localizing the information; a sense of well-being that students were being served; and sharing of the resource was part of the overall goal.

One of the faculty stated, "Two thirds of our students come from here. So, we really try to be mindful of that and have the place – our community – reflected in the textbook… with Hawaiian values and examples… You wouldn't get that in a traditional publisher's textbook".

One instructor, who had recently been a student herself, relayed that "the personal satisfaction I get is just knowing that I have students who are probably helping their families to pay rent, or a mortgage, or bills… If I can help to offset that by having this resource available, then you know, they feel more supported in their education. I think it goes back to equity… and how we are not all privileged".

Another faculty member reflected on the idea of sharing the OER, "I would be honored to share the OER … it's part of the big objective that this be used elsewhere, too". The technologist relayed that they "put the most liberal open license on [the OER]. Because we want this content, and this book, to travel as far as possible".

Performance expectancy. This construct focuses on the degree to which an individual perceives that using a system or technology will help in attaining a gain in job performance (Venkatesh et al., 2003). Those interviewed perceived that the application of the OER 1) afforded benefits to assist students in their learning, 2) provided control over content, and 3) allowed professional recognition.

Through the interviews, several benefits to students came to light. Data indicated that the OER benefited students in terms of equity and accessibility when an OER was employed. This was achieved by both removing the cost barrier for the resource and by opening up forms of access. One faculty mentioned that, besides being free, one of the main benefits of an OER was "being able to view it on the web and then also download it in multiple formats". The OER technologist also mentioned that "hundreds of students go through this course every semester.

… and they know that they will always have access to the book". In addition, one faculty shared that it had become evident through her experience that "the place-based aspects of [a resource] help students relate to material, which then typically enhances learning".

Participants felt that the flexibility of having control over the content in order to revise and update the OER was an important strength in using OER. One faculty remarked, "I like the concept of something that we can have in-house control over. It evolves as we use it. We should be able to improve it and pass it on to the next generation". The OER technologist recognized the flexibility using an OER offers: "… it opens up the possibilities of what [faculty] can do with the book when they know they can change. It's like being liberated".

Finally, the team shared a range of professional gains. One faculty didn't know if work on the project would be beneficial to promotion because no institutional recognition is given to scholarship when developing OER. However, another faculty felt that the campus promotion and tenure committee "saw the value" in the work done on the OER because use statistics were available to support instructional efficacy. In addition, the team had received almost 20 requests from different institutions indicating they were interested in adopting the OER, which impacts networking and professional reputation.

Effort expectancy. This construct refers to the degree of ease associated with the use of the technology or system (Venkatesh et al., 2003). It is applied in this research as the ease of developing the OER and applying it to instruction. Themes that emerged related to the challenges in developing the OER, and that there were minimal challenges in instruction.

Numerous challenges came to light during the interviews: time needed for resource development; securing supporting funding; finding and adapting content; and creating graphics. All team members expressed surprise in regard to the amount of time it took to fully develop the OER. As one GA mentioned, "The idea of an OER textbook, a free textbook, sounds great, but when you are actually doing a lot of the work, … you realize how much work it really is!" In addition to recognizing direct costs of developing the OER, one faculty discussed other indirect costs. The lead faculty estimated the total cost for the GA support for the entire project as $27,000 and further speculated, "Everything else came through our time – [the time of the faculty and the OER technologist] … so maybe [costing] a total of at least $60,000 to $80,000".

In regard to implementing the new textbook, all instructors interviewed felt that, rather than presenting a challenge, the resource provided a benefit. One instructor mentioned the only real impact was updating the syllabus.

Social influence. This construct represents the degree to which an individual perceives that important others believe an individual should use the system (Venkatesh et al., 2003). There was no one outstanding positive social influence identified by the team members. In fact, the lack of social influence was noted more prominently, including from department and college.

Technology self-efficacy. This refers to an individual's personal belief that he or she possesses the aptitude and skills to succeed when engaging with a technology (Moghavvemi, 2014). For this research, this concept revealed the need for skills to create the resource using appropriate technology and the technical understanding of open publishing.

"You definitely have to have a pretty solid set of technology skills to be able to create [a textbook]". This statement by a GA summed up the team perspective about necessary technology skills. When asked how the skills brought to the project by the OER technologist contributed to the overall development of the OER, the team, as a whole, felt those skills were critical. In fact, the technologist shared, "I don't think that I would have been able to get this done in the same amount of time if I wasn't familiar with open source software and open content and copyright".

Facilitating conditions. This is the degree to which an individual perceives that infrastructures are available for support (Venkatesh et al., 2003). Factors discussed here include the need for institutional support, and team support that provides expertise in a variety of areas.

One important institutional step in supporting OER development is through a program such as an OER Grant Project (https://oer.hawaii.edu/projects/). Institutional support also came in the form of providing the suite of tools with which to create and then host the delivery of the OER. The OER Technologist mentioned a final form of potential institutional support: "having policies in place for tenure and promotion that value OER production as a scholarly output".

The interviews also brought to light how very important a team approach became as the OER evolved. The OER technologist shared, "if we had a small [consistent] team, a small crew of people that all know how to do [the publishing tasks] … that would make it so much easier". One faculty shared how important it was to have an OER technologist as part of the team: "I would say [the technologist] was probably one of the most important [members]".

OER-enabled pedagogy Though only one team member, an instructor, applied OP in instruction with the newly-developed OER, other team members reflected on the potential value of exploring OP. Two themes emerged from the interviews: OP has the potential to increase student involvement in their learning; and the potential is not realized on campus at that time.

As outlined earlier, one instructor introduced an OP assignment by having students research a topic of their interest pertinent to the concept of "Health at Every Size". This instructor shared, "… it makes sense to me … that students are taking part in deciding what is important and making those decisions and developing those critical thinking skills about what their textbook should have or that they wish it did have. … It's creative and makes a lot of sense".

In reflecting on OP on campus, the OER technologist indicated, "I think OER-enabled pedagogy showcases what's possible when the content is open. And I think there's a lot of potential in that". However, he cautioned that "I think it would take some time and some effort to design pedagogical tools that could be implemented within a course".

Discussion

This study provides an insight into the perceptions and experiences of one team of university faculty and staff as they created an OER for an undergraduate course, adopted it in their instruction, and explored the use of OP. Findings from this research are important in that they provide an accounting of the process of OER development and application not seen in the

literature. Themes relating to OP were pedagogical in nature and were, therefore, examined outside of the UTAUT framework.

All members of the OER team felt positive about the experience of developing and implementing the OER. The overall goals were to provide a resource free to students and one that was place-based and appropriate for local students. Much research has explored the positive impact on student learning when OER are freely offered (Colvard et al., 2018; Lieberman, 2018). Other research has indicated the importance of place in culturally relevant science education (Sutherland & Swayze, 2012). Instructors in this research were particularly excited about the localization of the content and felt that it positively impacted their teaching experience with the students, which is consistent with outside research (Ivins, 2011).

Findings for several of the constructs in this research parallel those found in other UTAUT research on the topic of OER in higher education. "Attitude" was found to be an important factor in OER adoption. In their research, Huang and Wu (2013) found that "attitude" was the strongest predictor of behavioral intention to use OER. In addition, "effort expectancy" was found to positively impact the intention to use OER in several studies (Kandiero, 2015; Mtebe & Raisamo, 2014; Padhi, 2018). Finally, findings from this study are consistent with other OER-related UTAUT findings in regard to the construct of "social influence". These studies indicate no social influence on the intention to use or the use of OER (Mtebe & Raisamo, 2014; Padhi, 2018; Percy & Van Belle, 2012).

There exists an inconsistency with research in the literature and some of the findings in this research. "Performance expectancy" is important in this research, though not in the findings by Mtebe and Raisamo (2014). However, in support of this finding, research conducted by Padhi (2018) found that performance expectancy had a positive impact on OER use. The research of Jhangiani et al. (2016) as well as that of Percy and Van Belle (2012) support this finding. The most curious and inconsistent finding was regarding the construct of "facilitating conditions". The current research revealed its critical importance through both institutional support and team support. Though the findings of Percy and Van Belle (2012) corroborated this finding in the current research, those from Mtebe and Raisamo (2014) and Padhi (2018) did not.

Though the importance of technological infrastructure was addressed outside of the scope of the UTAUT framework in several studies (Mtebe & Raisamo, 2014; Padhi, 2018; Percy & Van Belle, 2012), technology self-efficacy was not included as a construct in the theoretical framework within the studies referenced here. The current research found that this construct was very important as revealed in themes regarding the skills needed to create a resource and in understanding open publishing. These findings are consistent with OER research conducted outside of the UTAUT framework (Butcher, 2015; Towey et al., 2016).

OER-Enabled Pedagogy

The instructor, who had introduced OP through a research assignment, felt that the students were developing critical-thinking skills through their involvement. The instructor also felt that applying this pedagogical approach was creative and would lead to students taking more responsibility for their learning. In some literature, assignments associated with OP are identified as non-disposable assignments (NDAs; Wiley, 2013); however, "little organized literature exists to effectively define, implement, and, accordingly, empirically evaluate the use of NDAs" (Seraphin, 2018, p. 1). Though there is not a plethora of research focusing on OP, the findings in this research align with the literature, which reveal an excitement and potential benefit to student learning when OP is applied (Dermody, 2019; Hegarty, 2015; Wiley et al.,

2017). This research agrees with that found in a study exploring student perceptions of the use of OP as opposed to traditional educational assignments. In that research, OP was perceived as positive by a majority of students in a multi-institutional study (Hilton III et al., 2019).

The OER technologist pointed out that the development of OER is really the first step in exploring the freedoms that teaching with OER can afford. In fact, because there is little direction in the literature on best practices in implementing OP and because the OP assignment in this research represented an initial first exploration into applying OP, the full potential in this context has yet to be realized. There is literature that explores the potential of OP for student learning (DeRosa & Robinson, 2017; Dermody, 2019) but not a great deal of empirical research that has examined the actual potential (Seraphin et al., 2018).

Recommendations

Future research might include more in-depth study into factors that promote or detract from OER and OP development and use. Future research might also encompass the assessment of student learning when students produce their own learning materials. Some researchers have stressed the importance of localization (Ivins, 2011; Wiley et al., 2014), with recommendations to localize OER included in the 2012 Paris Declaration on OER (UNESCO, 2012). However, there seems to be little research reporting on this specific concept.

The findings from this research have practical implications as well. They have helped to present a realistic accounting of the process in developing an OER. Recommendations emerged from the data that might be taken into consideration when launching an OER development project. The recommendations fell into four main categories. Firstly, institutional support is necessary in order to provide varied incentives such as funding through grants. It is also important to institute programs that promote awareness of OER as well as policies that support promotion and tenure. Secondly, technical support is also necessary. This can take the form of expertise in open resources, accessibility, copyright and licensing, and instructional design. Knowledge of publishing platforms, design for layout and editing, and image creation are also critical in promoting the smooth development of OER. Thirdly, OER development can benefit from the support of a team, who would bring diverse skills to the project. Members would include a project lead, subject matter experts, and members with necessary technical skills. The final recommendation is that a time management plan be developed, one that is both flexible and realistic.

Limitations

One limitation of this research is its generalizability to other contexts (Leung, 2015). It is recognized that there are differences in the academic culture between various institutions and disciplines. In addition, the original team for this project was made up of nine individuals, eight of whom agreed to participate in interviews. The small number of participants may affect the generalizability of the findings; however, this research was well documented, which can boost reliability through replication (Leung, 2015).

Conclusion

This study explored the perspectives of faculty and staff engaged with the development and application of an OER textbook at an institution of higher education. It applied a qualitative interpretive approach through semi-structured interviews with those university professionals

involved with the OER project development and subsequent application in instruction. This included one instructor's experience in applying OP.

These findings can help fill a gap in the literature and potentially provide an informed approach to the planning and development of OER. The data from this research helped to outline factors needed for the support and management of an OER-development project and provided reflections on the challenges and benefits throughout the process.

The participants in this research have already begun implementing a future edition of the OER. This will include edits from feedback originating from instructors, students, and other professionals outside of the campus who are using the resource. The upcoming version will also embed study activities and include a student activity pack and test bank. These features have shown to be very important for the instructors. The instructor, who experimented with an OP activity, plans to take the next step in having students assist in developing a new unit for the OER. Finally, the lead faculty is preparing to develop a new OER for an upper division class for the department. In this research, the process of developing an OER has positively impacted the participants and has opened up potential projects and creative applications of OER.

Acknowledgment

The author would like to warmly thank Dr. Christine Sorensen-Irvine, who provided guidance and feedback on this work, and to those who participated in the study.

References

Algers, A., & Silva-Fletcher, A. (2015). Teachers' perceived value, motivations for and adoption of open educational resources in animal and food sciences. *iJET, 10*(2), 35–45. https://doi.org/10.3991/ijet.v10i2.4427

Anderson, T., Gaines, A., Leachman, C., & Williamson E. P. (2017). Faculty and instructor perceptions of Open Educational Resources in engineering. *The Reference Librarian, 58*(4), 257–277. https://doi.org/10.1080/02763877.2017.1355768

Belikov, O. M., & Bodily, R. (2016). Incentives and barriers to OER adoption: A qualitative analysis of faculty perceptions. *Open Praxis, 8*(3), 235–246. https://doi.org/10.5944/openpraxis.8.3.308

Brandle, S. M., Katz, S., Hays, A., Beth, A., Cooney, C., Miles, L., DiSanto, J., and Morrison, A. (2019). But what do the students think: Results of the CUNY cross-campus zero-textbook cost student survey. Open Praxis, 11(1), 85–101. https://doi.org/10.5944/openpraxis.11.1.932.

Butcher, N. (2015). A basic guide to open educational resources (OER). France: UNESCO. Retrieved from http://unesdoc.unesco.org/images/0021/002158/215804e.pdf

Colvard, N. B., Watson, C. E., & Park, H. (2018). The impact of open educational resources on various student success metrics. *International Journal of Teaching and learning in Higher Education, 30*(2), 262–276.

Corden, A., & Sainsbury, R. (2006). *Using verbatim quotations in reporting qualitative social research: Researchers' views.* Retrieved from https://www.york.ac.uk/inst/spru/pubs/pdf/verbquotresearch.pdf

Creswell, J. W., Shope, R., Clark, V. L., Green, D. O. (2006). How interpretive qualitative research extends mixed methods research. *Research in the Schools, 13*(1), 1–11.

Cronin, C. (2017). Openness and praxis: Exploring the use of open education practices in higher education. *International Review of Research in Open and Distributed Learning, 18*(5). https://doi.org/10.19173/irrodl.v18i5.3096

Cubberley, E. P. (1902). *The history of education: Educational practice and progress considered as a phase of the development and spread of western civilization.* Retrieved from https://archive.org/details/historyofeducati00cubbuoft/page/n6/mode/2up

DeRosa, R., & Robinson, S. (2017). From OER to open pedagogy: Harnessing the power of open. In R. S. Jhangiani, & R. Biswas-Diener (Eds.), *Open: The philosophy and practices that are revolutionizing education and science* (pp. 115–124). Ubiquity Press. https://doi.org/10.5334/bbc.i

Dermody, R. (2019). Open pedagogy for teaching structures. In C. Brause, P. L. Clouston, N. Darling (Eds.), *Building technology educator's society: Vol 2019*, Article 3. https://doi.org/10.7275/s9xd-h436

Dulle, F. W., & Minishi-Majanja, M. K. (2011). The suitability of the unified theory of acceptance and use of technology (UTAUT) model in open access adoption studies. *Information Development, 2,* 32–45. https:/doi.org/10.1177/0266666910385375

Ehlers, U. D. (2011). Extending the territory: From open educational resources to open educational practices. *Journal of Open, Flexible and Distance, 15*(2), 1–10.

Hegarty, B. (2015). Attributes of open pedagogy: A model for using Open Educational Resources. *Educational Technology*, July-August 2015, 3–13.

Hilton III, J. L., Wiley, D., Chafee, R., Darrow, J., Guilmett, J., Harper, S., Hilton, B. (2019). Student perceptions of open pedagogy: An exploratory study. *Open Praxis, 11*(3), 275–288. https://doi.org/10.5944/openpraxis.11.3.973

Huang, W. D., & Wu, C. (2013). Motivation system in open learning: A structural equation modeling on the learners of a traditional Chinese-based open courseware system (MyOOPS). *Proceedings of the Association for Educational Communications and Technology, USA.*

Ivins, T. Z. (2011). *Localization of open educational resources* (*OER*) *in Nepal*: *Strategies of Himalayan knowledge-workers.* (Unpublished PhD dissertation). Brigham Young University.

Jhangiani, R., Pitt, R., Hendricks, C., Key, J., & Lalonde, C. (2016). *BCcampus Research Report*: *Exploring faculty use of open educational resources at British Columbia postsecondary institutions*. Retrieved from https://bccampus.ca/wp-content/uploads/2016/01/BCFacultyUseOfOER_final.pdf

Jung, I., & Hong, S. (2016). Faculty members' instructional priorities for adopting OER. *The International Review of Research in Open and Distributed Learning*, *17*(6). https://doi.org/10.19173/irrodl.v17i6.2803

Kandiero, A. (2015). *Educators' challenges and behavioural intention to adopt Open Educational Resources: The case of Africa University, Zimbabwe.* (Unpublished Master's dissertation). University of Cape Town.

Lederman, D. (2018, August 1). Textbook prices' impact on student behavior. *Inside Higher Education.* Retrieved from https://www.insidehighered.com/digital-learning/article/2018/08/01/survey-examines-impact-textbook-prices-student-behavior

Leung, L. (2015). Validity, reliability, and generalizability in qualitative research. *Journal of Family Medicine and Primary Care, 4*(3), 324–327. https://doi.org/10.4103/2249-4863.161306

Lieberman, M. (2018). Textbook alternatives take hold at community colleges. *Inside Higher Education.* Retrieved from https://www.insidehighered.com/digital-learning/article/2018/05/09/two-year-institutions-report-significant-savings-oer-initiatives

Mallinson, B. J., & Krull, G. E. (2015). An OER online course remixing experience. *Open Praxis 7*(3), 263–271. https://doi.org/10.5944/openpraxis.7.3.195

Moghavvemi, S. (2014). Impact of perceived self-efficacy and capability to use IT innovation on individual use behaviour. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.2561739

Mtebe, J., & Raisamo, R. (2014). Challenges and instructors' intention to adopt and use open educational resources in higher education in Tanzania. *The International Review of Research in Open and Distributed Learning, 15*(1). https://doi.org/10.19173/irrodl.v15i1.1687

Padhi, N. (2018). Acceptance and usability of OER in Indian higher education: An investigation using UTAUT model. *Open Praxis, 10*(1), 55–65. https://doi.org/10.5944/openpraxis.10.1.623

Percy, T., & Van Belle, J. (2012). Exploring the barriers and enablers to the use of open educational resources by university academics in Africa. OSS 2012. In I. Hammouda, B. Lundell, T. Mikkonen, & W. Scacchi, (Eds.), *Open source systems: Long-term sustainability,* (pp. 112–128). Springer.

Reed, J. M. (2018). The history of the textbook: The state of the discipline. *Book History, 21*, 397–424. https://doi.org/10.1353/bh.2018.0013

Seraphin, S. B., Grizzell, J. A., Kerr-German, A., Perkins, M. A., Grzanka, P. R., & Hardin, E. E. (2018). A conceptual framework for non-disposable assignments: Inspiring implementation, innovation, and research. *Psychology Learning & Teaching, 18*(1), 84–97. https:/doi.org/10.1177/1475725718811711.

Sutherland, D., & Swayze, N. (2012). The importance of place in indigenous science education. *Cultural Studies of Science Education, 7*(1), 83–92. https://doi.org/10.1007/s11422-011-9371-1

Towey, D., Ng, R. Y., & Wang, T. (2016). Open educational resources (OERs) and technology enhanced learning (TEL) in vocational and professional education and training (VPET). *2016 IEEE International Conference on Teaching, Assessment, and Learning for Engineering.* https://doi.org/10.1109/TALE.2016.7851808

UNESCO. (2012). *2012 Paris OER Declaration*. Retrieved from http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/Events/English_Paris_OER_Declaration.pdf

U.S. Bureau of Labor Statistics. (2017, August 13). *Consumer price index – All urban consumers: College textbooks.* Retrieved from https://www.bls.gov/news.release/archives/cpi_10132017.pdf

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425–478. https://doi.org/10.2307/30036540

Weller, M. (2014). *The battle for open: How openness won and why it doesn't feel like victory.* Ubiquity Press. https:// doi.org/10.5334/bam

Wiley, D. (2013, October 21). *Iterating toward openness: What is open pedagogy?* Retrieved from https://opencontent.org/blog/archives/2975

Wiley, D., Bliss, T. J., & McEwen, M. (2014). Open educational resources: A review of the literature. In J. M. Spector, M. D. Merrill, J. Elen & M. J. Bishop (Eds.), *Handbook of research on educational communications and technology* (pp. 781–789). Springer

Wiley, D., & Hilton III, J. L. (2018). Defining OER-enabled pedagogy. *The International Review of Research in Open and Distributed Learning*, *19*(4). https://doi.org/10.19173/irrodl.v19i4.3601

Wiley, D., Webb, A., Weston, S., & Tonks, D. (2017). A preliminary exploration of the relationships between student-created OER, sustainability, and student success. *The International Review of Research in Open and Distributed Learning, 18*(4). https://doi.org/10.19173/irrodl.v18i4.3022

Yanow, D. & Schwartz-Shea, P. (Eds.) (2006). *Interpretation and method: Empirical research methods and the interpretive turn*. M.E. Sharpe.

Corresponding author: Beth Tillinghast
Contact email: betht@hawaii.edu

Reviewers Vol. 8, Issue 2

The editorial team would like to thank the following reviewers for their contributions to the peer review for this issue of the journal. Their dedication and assistance are greatly appreciated.

Philip Ajewole
Hasan Alwadi
Ivy Chia Sook May
Shiao-wei Chu
Melinda Cowart
Heloisa Delgado
Murielle El Hajj Nahas
Mikel Garant
Ana Garcia Diaz
Hee Seon Jang
Leda Kamenopoulou
Michelangelo Magasic
Debbie Meharg
Serpil Meri-Yilan
Elena Mishieva
Leonardo Munalim
Guruprasad Nagraj
Suja Nair
Menyani Nourreddine
Esther Ntuli
Queen Ogbomo
Agnes Papadopoulou
Urarat Parnrod
Anemona Peres
Metee Pigultong
Elena Raevskikh
Shwadhin Sharma
Smriti Singh
Stephanie Wendt
Tony Yeigh
Michelle Yeo

the iafor
journal of education

ISSN: 2187-0594