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Message from the Editor-in-Chief

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January 01, 2020
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A MOBILE LEARNING COMMUNITY IN A LIVING LEARNING COMMUNITY: PERCEIVED IMPACT ON DIGITAL FLUENCY AND COMMUNICATION

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ABSTRACT
Though mobile devices like smartphones, tablets, and tablet computers have an immense potential for improving student learning, there is little empirical research which reports ways in which students actually use these technologies for learning, especially in fields like Engineering. Based on a social-constructivist approach to learning, the purpose of this mixed methods study was to investigate student perceptions regarding changes in mobile device based digital fluency and communication, after participation in a Living Learning Community (LLC) based Mobile Learning Community. This study contributes to existing literature in the field in that it reports student perceptions of how mobile devices can support learning, impact soft skill practice through peer communication, and enhance basic digital fluency among students living in an Engineering LLC. Based on the findings of this study, recommendations are made which might be useful for LLC Faculty in Residence (FIRs), housing staff, and those working with LLCs.
Keywords: Living Learning Community, Mobile Learning, Mobile Devices, Digital Fluency, Soft Skills, Communication, Housing

Introduction

Mobile devices facilitate learning that can happen anytime, anywhere (Foti & Mendez, 2014) blurring the boundaries between formal and informal learning (Falloon, 2015). The use of mobile devices like tablets and smartphones are a rapidly emerging trend in learning, both within and outside the formal educational setting (Carroll et al., 2017; Kumari, Matthew, & Syal, 2017; Moreira, Ferreira, Santos, & Durao, 2017; Nweke, Teh, Al-garadi, & Alo, 2018). Mobile devices enable users to easily connect with each other, communicate, create content, conduct online research, store, and share information. Often, learners using mobile devices to support learning, perform better than learners using traditional forms of instruction (Volk, Cotič, Zajc, & Istenic Starcic, 2017; Wang, 2017) unsupported by such devices. Therefore, it can be a worthwhile goal to harness the multiple educational, creative, and communicative potentials of mobile devices using appropriate mobile device based learning strategies.

Background

Mobile devices like smartphones, tablets, and tablet computers have an immense potential for improving student learning (Riley, 2013; Welsh et al., 2015; Zhen, 2017). Learning can happen in collaborative (Brandon van der, Richard, Lise, & FAlan, 2016; Falloon, 2015), authentic settings, i.e. real life contexts (Naylor & Gibbs, 2015), and use active learning approaches (Gibeault, 2015). Mobile devices have been found to facilitate learning when students created digital learning content individually (Bose & Pakala, 2015; Liao & Humphreys, 2014) and in specific teams (Bose & Pakala, 2014; Ke & Hsu, 2015), as well as learned collaboratively with others (Kukulska-Hulme & Viberg, 2018).

The impact of using mobile devices largely depends on how it is used for teaching and learning in any particular setting (Montrieux, Vanderlinde, Schellens, & De Marez, 2015). Sometimes, the best educational outcomes are achieved when digital learning tools like tablets are used to complement traditional learning tools like paper and pencil (Souleles, 2017). While the use of tablets to facilitate learning and communication has been studied in disparate fields like medicine (Ji-Hyun et al., 2013; Langius-Eklöf et al., 2017; Mallet et al., 2016), intergenerational social development (Amaro, Oliveira, & Veloso, 2017), and early childhood education (Jauck, & Peralta, 2016),

there has been limited evidence on how it affects student learning in higher education (Wakefield, Frawley, Tyler, & Dyson, 2018).

With the connectivity, convenience, and learning opportunities enabled by mobile devices, comes the notion of the "problematic use" of such devices (Kim, 2018, p. 390) such that some have questioned whether mobile learning supports or endangers learning in classrooms (Pedro, Barbosa, & Santos, 2018; Tossell, Kortum, Shepard, Rahmati, & Zhong, 2015). Moreover, though smartphones and internet access are commonly found infrastructures in many academic campuses, there is little empirical research which reports in detail, the ways in which students actually use these technologies for learning (Barden & Bygroves, 2017).

Often, studies indicating the benefits of using mobile devices for educational purposes have shown mixed results (Garcia-Sanjuan, Jurdi, Jaen, & Nacher, 2018), statistically insignificant effect size (Kukulska-Hulme & Viberg, 2018), and have not yet been conducted in many disciplines (Hlodan, 2010) of higher education, especially with first-year Engineering students.

Theory of mobile learning. While hypothesizing on what can constitute a theory of mobile learning, some early theorists have stated that what differentiates mobile learning from other forms of learning is the assumption that learners are continually on the move (Sharples, Taylor, & Vavoula, 2005). Learning occurs across space, time, and topic, such that learning and skills can be transferred across contexts and life transitions. New technologies are increasingly being designed for a society of people on the move, trying to fit learning into the gaps of their usual life functions. Since a lot of learning occurs outside of physical and online classrooms, the challenge is to understand how learners may be engaging with their environments to create spontaneous sites of learning.

This study draws on El-Hussein and Cronje's (2010) interpretation of mobile learning as having three components – mobility of the technology, mobility of the learner, and mobility of the learning process. Though learning is inherently a process and mobile technology simply facilitates that process (Walsh, 2015), for the purposes of this study, learning specifically refers to the acquisition of basic skills and knowledge required to fluently or effortlessly use mobile devices to communicate with others and to support the gain of discipline based subject matter content expertise. This form of learning is related to mobile learning in that the former is assumed to be an inherent part of the latter.

Social-constructivist theory of learning. Mobile devices provide the learner with certain affordances like flexibility, continuity of use, quick feedback, personalized content, socialization, self-evaluation, active participation, peer coaching, outdoor and cultural authenticity (Kukulska-Hulme & Viberg, 2018, p. 207; Sharples, Taylor, & Vavoula, 2005). These affordances suggest that a social-constructivist approach may be an appropriate theory of learning which can support mobile learning. Based on the writings of Vygotsky (1978), the social-constructivist approach to education views learning as a process situated within a social context, which involves complex social interaction, and requires an understanding of the relationship between how people think and the activities they engage in (Hashim & Hoover, 2017).

Soft skill learning in Engineering. In order to succeed at their jobs, 21st century engineers are expected by their employers to possess certain soft skills including communication, teamwork, management, and entrepreneurial skills (Itani & Srour, 2016; Miller, 2017; Nair & Mukerjee, 2015). For the purposes of this paper, soft skills are being defined as human "inter-personal and intra-personal skills" (Knobbs & Grayson, 2012, p.307). Soft skills are often referred to as soft because they are intangible and difficult to quantify when compared to the relatively easier to measure, hard technical skills (Colman & Willmot, 2016).

Traditionally, Engineering has been a discipline where students and practitioners have been known to struggle with soft skills. Some claim that in certain disciplines like software engineering and computer science, the missing skill set is often soft skills like collaboration, communication, problem-solving, interpersonal, and critical thinking (Captrez & Ahmed, 2018).

Accordingly, the Accreditation Board for Engineering and Technology (ABET)'s engineering programs' accreditation criteria includes a set of soft skills, in addition to the set of traditional technical skills (Itani & Srour, 2016). This calls for a need to place emphasis on the development of both hard technical skills as well as soft skills

among engineers. As a result, many engineering programs have acknowledged the need to provide their students training on soft skills, as part of their regular engineering education curriculum.

The university is potentially a suitable place where soft skills can be nurtured through contextual (Arat, 2014) or situated learning, if soft skill building opportunities are seamlessly inbuilt into curricula (Beard, Schwieger, & Surendran, 2008). However, even with identified need and acknowledgement of its importance for future career success (Shuman, Besterfield-Sacre, & McGourty, 2005), often engineering curricula at universities do not put enough emphasis and resources on the teaching and learning of soft skills (Burnik, & Košir, 2017; Colman & Willmot, 2016; Deveci & Nunn, 2017). Earlier studies involving undergraduate Mechanical and Biomedical engineering students have indicated that, though students are aware of the professional importance of soft skills like collaboration (Wallen & Pandit, 2009), it may be difficult to teach and assess such soft skills.

Drawing from a social constructivist approach to learning and recognizing the immense educational potential of mobile devices in facilitating communication and anytime anywhere learning, a goal of this study was to investigate how mobile devices can support learning in an undergraduate engineering Living Learning Community (LLC), through the development of soft skills like communication (Börner, et al., 2018).

Living Learning Community. For the purposes of this study, LLCs are being defined as "residential housing programs that incorporate academically based themes and build community through common learning" (Brower & Inkelas, 2010, para. 4). LLCs have historically been shown to have a positive impact on student learning, interaction, and college experience (Stassen, 2003). It has increased students' mutual support, self-determination (Bauer & Kiger, 2017) as well as faculty-student interaction (Garrett & Zabriskie, 2003). A MLC within a LLC is an environment where learners have the opportunity to engage in social-constructivist learning. Learners living in the LLC can engage with peers, instructors, and housing staff to co-construct meaning and learning. Often their interpretation of the impact of this environment can be subjective, complex, and formed after discussion and interaction with others in the same community (Creswell, 2003).

Ideally, a successful LLC should have a strong student affairs-academic affairs presence and partnership, clear learning objectives and a strong academic focus throughout the program (Brower & Inkelas, 2010). Also, it should capitalize on community settings to create opportunities for learning whenever possible. However, it is also possible that when living in LLCs, certain groups of students like international students may face challenges of communication, language differences, and lack of cultural understanding (Antonio & Ofori-Dwumfuo, 2015). Hence, communication among participants of an LLC is an important area of investigation, given that communication, especially through an online medium, has been shown to have a positive bearing on achievement of student learning outcomes (Nkhoma et al., 2015; Nkhoma et al., 2018). Communication is also a much needed engineering soft skill (Ahmed, Capretz, & Campbell, 2012).

Surveying the existing literature related to the use of mobile devices to facilitate digital fluency and communication in LLCs, the researchers could not locate studies which investigated this specific area. To address this gap, this study aimed to document student perceptions of whether participating in a MLC while living in a LLC had any impact on their digital fluency and communication using a mobile device. As such, it reports students' perceptions which have the possibility of being heavily impacted by their social interactions with others as well as environmental factors beyond the purview of this study.

Purpose of Study

The purpose of this study was to investigate and report student perceptions regarding changes in mobile device based digital fluency and communication, after participation in a LLC based MLC. Unlike some other studies in this area (Wilson, Bjerke, & Martin, 2015) which measured changes in academic achievement, this study did not mean to empirically measure changes or increase in learner achievement of disciplinary content as a result of using mobile devices. The broad goal was to qualitatively document learner perceptions of changes in digital fluency and communication using mobile devices after participating in a MLC, while residing in a LLC.

It was assumed that some participants were already quite digitally fluent and used mobile devices for communication before participating in the MLC and LLC. These learners were not identified or excluded from the study since the broad goal of the study was to view the participants' learning community experience as a whole.

The researchers were open to documenting the experiences of learners who were already digitally fluent and communicated using mobile devices, and resided in community with other learners who were not so experienced. This was done with the assumption that it may capture rich data on the varying levels of preparedness of a typical unit (group, course, learning community etc.) of students. However, there was no direct research question targeted to measure this diversity of digital fluency and communication ability using mobile devices, since that level of granularity was not the goal of this study. Also, advanced quantitative methods of statistical analysis were not used in this study since the goal of this study was to capture and report preliminary data on the topic.

The data collected in this study can form the basis of more detailed and complex future studies, designed to compare statistical differences within groups or repeated measures analysis to test differences. Accordingly, the following research question was investigated:

Research Question. What are student perceptions regarding changes in digital fluency and communication after participation in a Living Learning Community based Mobile Learning Community?

Method

Supported by a social constructivist (Amineh & Asl, 2015; Karahan & Roehrig, 2014; Reynolds, 2016) approach to learning, this study investigated the above-mentioned research question, through a mixed method research design. A Likert type online survey was used in combination with a face-to-face focus group to collect data.

Case description

Engineering Living Learning Community. This study focused on a yearlong, including Fall and Spring semesters, Engineering LLC at a mid-sized regional public university in NW United States. Established in 2006,it remains open to qualifying first-year Engineering students who meet the academic as well as general requirements and expectations for inclusion in the community. Though the LLC forms in Fall, students may enter the community in Spring, if they meet all admission requirements and space permits.

The LLC was mentored by a Faculty in Residence (FIR) whose role in the community, apart from general supervision and mentoring included, regular student advising sessions and faculty office hours. The academic requirements included completion of ENGR 150 which was a credit bearing course. While the focus of the engineering LLC was on academic success with the primary activities centering on academic support, one of the major goals of the LLC was to allow students the opportunity to explore the benefits of social/community living. This goal was geared to support the development of crucial soft skills like communication, public speaking, leadership, team-building, and group work abilities, through various social and community-building activities like weekly community meals, group study sessions, picnics, hiking trips, movie nights, and other social events.

Mobile learning community. One of the unique features of the engineering LLC during the time of this study was the inclusion of a Mobile Learning Community (MLC), which aimed to provide an informal learning community for students where they could enhance their existing digital fluency and communication, using mobile devices provided by the university.

While digital competence consists of a variety of skills and proficiencies, and is an evolving concept whose definition in educational research is not yet standardized (Ilomaki, Paavola, Lakkala, & Kantosalo, 2016), this research focuses on learner digital fluency. In many cases, the term digital fluency is used to describe "user interaction with technology in general"(Wang, Wiesemes, & Gibbons, 2012, p. 570). For the purposes of this study, digital fluency is being defined as a type of literacy or learning wherein people are comfortable using digital technology as they would be, when using any other language (Huffaker, 2004). As such, this form of digital fluency may be a prerequisite to sociability, lifelong learning, and employment opportunities (Adams Becker, Pasquini, & Zentner, 2017; Colbert, Yee, & George, 2016; Li, Ye, Liu, Yang, & Wang, 2018). Often digital fluency needs to be intentionally taught in order to prepare students to deal with the challenges of a digital age (da Cruz Alves, Rodrigues, Borgatto, Gresse von Wangenheim, & Hauck, 2016). Also, in this study, perceived changes in learning or knowledge of using mobile devices is deemed to be similar to perceived changes in digital fluency, though the latter may include other skills not directly measured in this study.

The main purpose of the MLC was to help students develop a sub-community within the LLC, where they can engage with peers and instructor(s) to enhance their existing digital fluency and communication skills using mobile

devices. The broader goal was to facilitate students' use of mobile devices as a tool which can support disciplinary learning. In order to support this goal, the university loaned each student a mobile device (iPad) which they could use for the duration of their participation in the LLC.

Participants

Participants in this study were a cohort of first-year Engineering students belonging to a year long, including Fall 2016 and Spring 2017 semesters, LLC at Western State. The LLC cohort started in Fall 2016 with 72 students. In Spring 2017, after the attrition of some students, due to factors beyond the scope of this study, 68 students completed the requirements of participating in the LLC.

Procedure

The Institutional Review Board (IRB) permission to conduct this study was obtained in the summer of 2016. At the beginning of Fall 2016, first-year students joined the Western State Engineering LLC and were loaned a personal mobile device, which in this case was an *Apple iPad*, for use, while they were a part of the LLC. Students also enrolled in ENGR 150 in Fall 2016. In this course, students were encouraged to use their tablets to support learning tasks as well as to communicate with the instructor and other students.

The students included in the LLC were identified to participate in this study so that their perceptions and experiences could be documented, and used to provide recommendations to better facilitate future iterations of similar LLCs. However, all students living in the LLC did not choose to participate in the study. In Fall 2016, 53 or 74% of the students completed the pre-semester survey, and 57 (79%) students completed the post-semester survey. In Spring 2017, 27 or 40% of the students participated in the focus group meeting.

Students in the LLC also registered for ENGR 150 in Fall 2016. Students completed this course as part of the requirements for obtaining their undergraduate degree. At the beginning of Fall 2016, all LLC students were informed via email about this study and invited to participate. Participation in this study, the focus group meeting, and anonymous online surveys were voluntary activities. It did not have any bearing on course grades that the students may otherwise have received for ENGR 150. No extra credit was provided for participation in the study. Occasional promotional videos and images of students working with mobile devices were taken for campus updates. Participation in this study did not in any way affect their inclusion in the LLC. As students in ENGR 150, learners were already expected to use mobile devices to support learning as a matter of course, to complete the requirements of the course, irrespective of whether this study was conducted or not.

The FIR in collaboration with instructional designers from the Western State IDEA (Instructional Design and Education Assessment) Shop, provided training on how mobile devices can be used to support learning, at three designated training sessions. Each of these 90-minute sessions were called "Technology Night." Students were also encouraged to use mobile devices in courses other than ENGR 150. During Technology Night, students learned basic tablet functionalities, used educationally useful apps, created content using mobile devices, and worked in groups to complete learning related tasks. It was assumed that these mobile device use skills would support students in their subject matter learning tasks in ENGR 150 and other courses.

At the beginning of Fall 2016, students invited to participate in a voluntary and anonymous online survey employing a 23 item Likert scale instrument. This survey aimed to collect data regarding student perceptions of their current digital fluency with mobile device use. They were also asked how they expected the use of mobile devices would support their learning and communication with peers and instructors. The same survey instrument with slight modifications representing end of semester perceptions, was used at the end of Fall 2016, as a post-semester survey to increase reliability of the results. A face-to-face focus group meeting was conducted at the end of Spring 2017. Both quantitative and qualitative data was collected in order to triangulate student perception data.

Instruments for data collection

In keeping with the mixed method research design, the data collection instruments for this study included pre and post-semester online anonymous surveys administered during Fall 2016, and a post-semester face-to-face focus group at the end of Spring 2017. The face validity of the survey and focus group instruments were determined by

two educational technology subject matter experts, in order to ascertain whether the questions were pertinent towards identifying changes in basic mobile device based communication and digital fluency competencies.

The 23 item, four-point Likert scale online survey which was delivered using Qualtrics, an online survey management and delivery system. There was a six item focus group meeting discussion guideline. This guideline was used to structure discussions during the face-to-face focus group meeting. In the survey, 10 questions were about perceived knowledge of mobile device use to complete certain tasks which can support learning, 6 questions related to perceived knowledge of mobile device use for improved communication, 5 questions were on perceptions of how participating in the MLC contributed to support learning using mobile devices. Also, there were a question each regarding students' plans for continued use of mobile devices in courses other than ENGR 150, and increased access to course content using mobile devices. The focus group guideline contained questions regarding the impact of community living on mobile device-supported skill development and transfer of such skills to other aspects of learning. Responses at the focus group were audio-recorded using a mobile device (iPad). Data from the online surveys and focus group were anonymously summarized and analyzed to identify themes which emerged out of the content of student responses to the questions used for data gathering.

Data analysis

In order to implement the mixed methods design of this study, a concurrent triangulation strategy (Creswell, 2003, p. 217) was used to confirm, cross-validate, or corroborate data within the study. Quantitative data obtained from pre and post semester surveys was triangulated with qualitative data from a post semester focus group meeting.

Survey result analysis. The pre and post semester survey data was quantitatively summarized by one of the researchers and represented under five categories (See Tables 1 through 6). These categories broadly corresponded with the topics of the survey questions, namely, perceptions of knowledge of mobile device use for tasks which supported learning, improved communication, whether living in the MLC contributed to mobile device supported learning, plans for continued use of mobile devices in courses other than ENGR 150, and perceptions of increased access to course content using mobile devices.

Focus group result analysis. The focus group audio recordings were transcribed and summarized by one of the researchers. The focus group was conducted using a guideline of pre-determined questions. A simple coding method was used where the summarized data was indexed by themes, which emerged out of the content of student responses to each of the focus group guiding questions. The transcription was read and the summary and coding were peer examined and agreed upon by a second researcher who is also a co-author of this study.

Results

The results of our inquiry are addressed below. Since this study used a concurrent triangulation strategy, qualitative and quantitative data are presented in separate sections (Creswell, 2003). The online survey results are reported first and then the responses from the focus group meeting are summarized. In the Discussion section, the analysis and interpretation combines the quantitative and qualitative data to seek convergence (Creswell, 2003, p. 222).

Online surveys

The researchers wanted to know whether students perceived experiencing changes in digital fluency and communication after participation in a LLC based MLC. Data from pre and post- semester surveys are presented so as to note the perceived changes, from before to after the semester. It has to be noted that this survey was anonymous and no respondent alignment between pre and post-semester survey data was conducted.

As seen in Table 1, the Fall 2016 pre-semester survey showed that a majority of the students "Strongly Agreed" that they were knowledgeable about using mobile devices to complete tasks which support learning like connect to the wi-fi (92.45%; *M*= 3.92), download an app (96.23%; *M*=3.96), turn device to silent mode (90.57%; *M*= 3.90), download (69.81%, *M*=3.62) and upload (66.04%; *M*=3.58) files to the cloud, adjust document privacy settings (58.49%; *M*=3.50), download/save media in the cloud (69.81%; M= 3.64), search for information in the internet (96.23%; *M*=3.96), and take notes using an app (67.92%; *M*= 3.56).

Table 1 *Pre-semester student perceptions of knowledge of mobile device use for tasks which support learning*

Degree of agreement with statement	[Strongly Disagree----- Strongly Agree]				M	SD
	1	2	3	4		
Knowledgeable on how to connect to wi-fi network	0	0	4	49	3.92	0.26
Knowledgeable on how to download an app	0	0	2	51	3.96	0.19
Knowledgeable on how to turn device to silent mode	0	0	5	48	3.90	0.29
Knowledgeable on how to download a file from the cloud	0	4	12	37	3.62	0.62
Knowledgeable on how to upload a file to the cloud	0	4	14	35	3.58	0.63
Knowledgeable on how to adjust document sharing privacy settings	0	4	18	31	3.50	0.63
Knowledgeable on how to download/save media in the cloud	0	3	13	37	3.64	0.59
Knowledgeable on how to open browser/search for internet address	0	0	0	53	4.0	0
Knowledgeable on how to search for information in the internet	0	0	2	51	3.96	0.19
Knowledgeable on how to take notes using a mobile app	1	4	12	36	3.56	0.72

At the end of Fall 2016, as seen in the table (Table 2) below, there was an increase in the percentage of students from pre to post-semester, who strongly agreed that they were more knowledgeable on how to use a mobile device to complete certain tasks which aided their learning. Self-reported knowledge of basic tasks like connecting to the wi-fi (96.49%, *M*=3.93), downloading an app (98.25%; *M*=3.98), turning the device to silent mode (94.74%, *M*=3.94), downloading (87.72%, *M*=3.87), uploading (85.96%, *M*=3.86) files to the cloud, adjusting document privacy settings (78.95%, *M*=3.75), downloading/saving media in the cloud (82.46%, *M*=3.82), and taking notes using an app (84.21%, *M*=3.78), increased from the beginning to the end of the semester. Knowledge of how to search the internet for information remained approximately the same from pre (96.23%; *M*=3.96) to post (96.49%, *M*=3.96) semester. However, the closely related skill of opening a browser to search for an internet address using a mobile device, had reportedly decreased from pre (100%, *M*=4.0) to post (94.74%, *M*=3.94) semester.

Table 2 *Post-semester student perceptions of knowledge of mobile device use for tasks which support learning*

Degree of agreement with statement	[Strongly Disagree----- Strongly Agree]				M	SD
	1	2	3	4		
More knowledgeable on how to connect to wi-fi network	1	0	1	55	3.93	0.41
More knowledgeable on how to download an app	0	0	1	56	3.98	0.13
More knowledgeable on how to turn device to silent mode	0	0	3	54	3.94	0.05
More knowledgeable on how to download a file from the cloud	0	0	7	50	3.87	0.33
More knowledgeable on how to upload a file to the cloud	0	0	8	49	3.86	0.12
More knowledgeable on how to adjust document sharing privacy settings	0	2	10	45	3.75	0.51
More knowledgeable on how to download/save media in the cloud	0	0	10	47	3.82	0.14
More knowledgeable on how to open browser/search for internet address	0	0	3	54	3.94	0.22
More knowledgeable on how to search for information in the internet	0	0	2	55	3.96	0.18
More knowledgeable on how to take notes using a mobile app	1	1	7	48	3.78	0.55

In the Fall 2016 pre and post-semester survey, students were asked what they felt regarding the use of mobile devices to support improved communication with their peers and instructors. Data from both the pre and post-semester surveys are presented so as to note the changes in perceived knowledge, from before to after the semester.
As seen in Table 3, at the beginning of their first semester at the LLC, many of the respondents strongly agreed that they were knowledgeable of how to change the privacy settings of shared content in social media (73.58%, *M*=3.67), how to use emoticons (88.68%, *M*=3.81), capture video (96.23%, *M*=3.92), create new content using already existing online media (47.17%, *M*=3.22), create presentations using mobile apps (32.08%, *M*=2.90), and use social networking apps to communicate with others in the LLC (58.49%, *M*=3.47).

Table 3 *Pre-semester student perceptions of knowledge of mobile device (tablet) use to support improved communication*

Degree of agreement with statement	[Strongly Disagree----- Strongly Agree]				M	SD
	1	2	3	4		
More knowledgeable on how to change privacy settings of shared content in social media	0	3	11	39	3.67	0.58
More knowledgeable on how to use emoticons in social media	1	2	3	47	3.81	0.59
More knowledgeable on how to capture video	1	0	1	51	3.92	0.43
More knowledgeable on how to create something new using existing media available online	2	9	17	25	3.22	0.86
More knowledgeable on how to create presentations using mobile apps	2	18	16	17	2.90	0.90
More knowledgeable on how to communicate with MLC using social networking apps	0	6	16	31	3.47	0.69

At the end of Fall 2016 (see Table 4), there was an increase in the percentage of students from pre to post-semester, who strongly agreed that they were knowledgeable on how to use a mobile device to complete certain tasks which aided communication. These tasks were --changing the privacy settings of shared content in social media (77.19%, *M*=3.44), using emoticons (91.23%, *M*=3.87), and creating new content using already existing online media (70.18%, *M*=3.59). However, certain skills like capturing videos remained approximately the same from pre (96.23%, *M*=3.92), to post (96.49%, M=3.96) semester. Other skills like creating presentations using mobile apps (54.39%, *M*=3.28) and using social networking apps to communicate with others in the LLC (49.12%, *M*=3.29) reportedly dropped from pre to post semester.

Table 4 *Post-semester student perceptions of knowledge of mobile device (tablet) use to support improved communication*

Degree of agreement with statement	[Strongly Disagree----- Strongly Agree]				M	SD
	1	2	3	4		
More knowledgeable on how to change privacy settings of shared content in social media	0	2	11	44	3.44	0.64
More knowledgeable on how to use emoticons in social media	1	0	4	52	3.87	0.46
More knowledgeable on how to capture video	0	0	2	55	3.96	0.18
More knowledgeable on how to create something new using existing media available online	1	4	12	40	3.59	0.70
More knowledgeable on how to create presentations using mobile apps	4	7	15	31	3.28	0.94
More knowledgeable on how to communicate with MLC using social networking apps	2	7	20	28	3.29	0.82

A goal of this study was to document how living in the LLC and participating in the MLC, impacted students' perceptions of mobile devices supporting their learning. At the beginning of their first semester at the LLC, pre-semester survey (see Table 5) respondents strongly agreed that they were comfortable seeking help on technical questions regarding mobile device use (49.06%, *M*=3.37) from their MLC peers, to try new ways of learning using mobile devices (33.96%, *M*=3.09), to build community with peers (26.42%, *M*=2.98), to learn collaboratively with peers (28.30%, *M*=3.03), and that being a member of the MLC accelerated their digital skills/comfort level with mobile device use (30.77%, *M*=3.03).

Table 5 *Pre-semester student perceptions of how living in the MLC contributed to mobile device supported learning*

Degree of agreement with statement	Strongly Disagree----- Strongly Agree]				M	SD
	1	2	3	4		
Comfortable seeking technical help from MLC	0	6	21	26	3.37	0.68
Try new things while learning	2	9	24	18	3.09	0.81
Build community with peers	1	13	25	14	2.98	0.77
Learn collaboratively	2	9	27	15	3.03	0.78
Accelerated mobile device digital skills	2	10	24	16	3.03	0.81

At the end of their first semester in the LLC, the post-semester survey (see Table 6) respondents strongly agreed that they were comfortable seeking help on technical questions regarding mobile device use (55.36%, *M*=3.35), from their MLC peers, to try new ways of learning supported by mobile devices (45.61%, *M*=3.14), to build community with peers (29.82%, *M*=2.80), to learn collaboratively with peers (31.58%, *M*=3.0), and that being a member of the MLC accelerated their digital skills/comfort level with mobile devices (33.33%, *M*=2.80).

Table 6 *Post-semester student perceptions of how living in the MLC contributed to mobile device supported learning*

Degree of agreement with statement	Strongly Disagree----- Strongly Agree]				M	SD
	1	2	3	4		
Comfortable seeking technical help from MLC	3	5	17	31	3.35	0.86
Try new things while learning	3	12	16	26	3.14	0.93
Build community with peers	5	18	17	17	2.80	0.97
Learn collaboratively	3	12	24	18	3.0	0.86
Accelerated mobile device digital skills	10	10	18	19	2.80	1.09

In both the pre and post-semester survey, a question each regarding plans for continued use of mobile devices in courses other than ENGR 150, and perceptions of increased access to course content using mobile devices were asked. Responses indicated that in the beginning of their first semester at the LLC, students (49.06%, *M*= 3.39) strongly agreed that using a mobile device would provide better access to course content and that they planned to use the device in at least one or two course other than ENGR 150 (35.85%). At the end of their first semester, the post-semester survey respondents indicated that fewer students (47.37%, *M*=3.33) strongly believed that mobile devices provided better access to content. However, post-semester, more students (47.37%) believed that they would use a mobile device for at least one or two courses other than ENGR 150.

Focus group meeting

The results of the focus group meeting are being reported according to themes which emerged from the content of student responses to the guiding questions asked during the meeting.

Theme One: Multiple affordances of mobile devices. When asked how living in the Engineering LLC impacted their digital/mobile device use, participant reports varied but most students talked about the multiple affordances of the mobile device/tablet, which the LLC loaned to them. One student who was also a teaching assistant (TA), said that this was her first introduction to a tablet and it was useful in terms of the mobility it provided both to take the device to classes, as well as to provide anytime, anywhere access to emails. Another student who was also a TA said:

I use it to create assignments and also in my Heat Transfer class with Dr. P where he uses Notability to grade papers. We can store our papers in a Google Drive folder and it is really easy to find. Since I was already using Notability to take notes, I can use it to grade also.

Another student reported:
I was never considering using a tablet in school. I bought my laptop before school and that was what was going to be my device. Then I came in the LLC, got an iPad [sic] and I ended up using it a lot more than I expected.

A student said that after using the tablet at the LLC, she planned to buy her own device to continue using a mobile device even after completing her time at the LLC. Other students mentioned that it was worthwhile to buy apps like Notability since they were useful for multiple classes. The tablet from the LLC was useful in other Engineering classes which needed digital homework submissions and classroom responses. The use of tablets replaced the need to carry heavy textbooks to class and enabled students to be more organized through digital note-taking. A student mentioned that it was useful to be part of a group of students using tablets for class, since it allowed the group to troubleshoot for each other and to share learning resources and expertise.

Theme Two: Transfer of mobile device use skills to other learning areas. Students were asked whether they were able to transfer their digital/mobile device skills, learned as a result of having access to a mobile device, to other learning areas. A student reported that one of the unexpected benefits of having a tablet, was the ability to use it for her job as a learning assistant, she said:

I used it a lot for my job. I have an on-campus job helping other students. So I was able to take my own notes and upload the assignment they needed to help them with. I noticed that I used the iPad [sic] the most at my job other than for my classes. This, I did not expect.

Some students used it in courses other than ENGR 150 to complete homework and research assignments. A student majoring in computer science reported that the tablet was almost a replacement for a laptop computer. Certain applications helped to make required updates to programs quick and easy.

Certain features of the tablet like the dual window view was noted to be helpful in providing visual clarity, which was useful in learning:

With the new model of the iPad [sic] you can do the dual window, I used it for Notability and documents reader. One of the classes I had [sic], the teacher would post homework documents which would reference the text books. It was nice to have both open [sic] at the same time.

Theme Three: Use of mobile devices for non-academic purposes. When asked whether they used mobile device based skills learned at the LLC for non-academic purposes, students reported using the GroupMe application extensively to socially connect with other students for LLC and non-LLC related communication, However, as mentioned by a student "most of the social media was through the phone not the tablet" provided by the LLC. No other non-academic transfer of skills was reported.

Theme Four: Peer learning of mobile device use skills. When asked what digital/mobile device skills they learned from their peers at the LLC, a student mentioned "at the beginning of the school year I did not really know how to

use Notability. I learned it from peers who already knew how to." Students also said that they would benefit if they received more hands-on training on apps like Notability, Autodesk, and Google applications.

Theme Five: Stronger sense of community through the use of mobile devices. Students were asked if the availability of a mobile device and participation in the MLC helped to build a stronger sense of community. Students responded that access to the mobile device and social networking apps like GroupMe enabled them to connect with each other easily. A student said: "if we need to get a hold of someone in the suite, we can do that. I can make my own group chats [sic] it is easy to reach out."

Students living in the LLC received devices of the same configuration. This was helpful, as one student noted "just knowing that everyone else has the same tablet as you and if you did have a question, you just ask the people you live with." Availability of the device also enabled students to connect with each other for social interaction as mentioned by a student:

It connects us a lot more, it involves us a lot more. At the beginning of the year, I sent out a group message looking for people to go paintballing with. We could get many people to sign up as a community.

It also enabled students to seek assistance from their peers, as one student noted:
Having the iPad [sic] with a group of people and using it in class made a difference. Say if I had trouble doing an assignment and someone had an app which can make it easy. Then I would be like hey, pull out your tablet and let's see the periodic table. Then that would help my learning because that is there right on my fingertips.

Having individual access to a mobile device helped students to have a sense of pride in themselves for being a part of a community. One student said:
We have one class we take together. You can tell that we live in a community since we sit in front of the class, and all have our iPads [sic] out. Even though we might not see us as a community, people see us. We all have iPads [sic], we all sit together. So it makes us look like a community.

Having a mobile device enabled all students to have access to at least one digital device since not all students owned personal laptops or smartphones. A student said:
Most students have their own laptops, some don't and some don't have Smartphones. So if we are planning on doing something in class, the instructor will say, hey everyone bring your iPad [sic], that way everyone can participate in class, if you did not have the device, some people would not be able to participate.

Theme Six: Access to mobile devices as an incentive to retention. A couple of students responded to the question prompt asking whether the availability of the tablet impacted their decision to continue in the LLC. One student mentioned that having the tablet was not necessarily a deciding factor on the decision to continue in the LLC. Another student mentioned that having the tablet made her proud to be a part of the engineering LLC, since students living in other LLCs offered by the same university at that time, did not receive a tablet for use.

When prompted to voice other thoughts regarding their experience of using a mobile device in the LLC, all students participating in the focus group mentioned that would prefer to have a tablet beyond the year in which they lived in the LLC. A student expressed the need for tablets in operating systems other than Apple ios, for non Apple users.

Discussion and Implications

Similar to findings in some prior studies in the field, student perceptions in this study indicated that mobile devices supported learning and were fairly efficient means of enabling social communication (Cheng, Liang, &, Leung, 2015; Han, Min, & Lee, 2015) and digital fluency. However, this study was not without its limitations. The study had a relatively simple design and did not compare statistical differences within groups or use repeated measures analysis to test differences.

Part of the data for this study was collected using an anonymous online survey, where in order to maintain the anonymity of respondents, the pre-semester survey data was not matched with the post-semester data. Since there was no one-to-one matching of the responses, tracking progress for individual students over time was not possible. Also, there was no way to match the anonymous survey responses with the focus group meeting responses. Hence it

was not possible to measure which participants experienced a change in their perceptions from Fall 2016 to Spring 2017.

Barring certain limitations, this study contributes to existing literature in the field in that it reports student perceptions of whether mobile devices can support learning, impact soft skill practice through peer communication, and enhance basic digital fluency among students living in a discipline specific LLC.

Data was collected concurrently in this study using a concurrent triangulation strategy, but the analysis and interpretation combined the quantitative and qualitative data to seek convergence (Creswell, 2003, p. 222). Student responses collected via the online surveys and focus group meeting indicated the emergence of some broad themes. The following is a discussion of each of these themes:

Digital fluency in using mobile devices to support learning. While earlier studies on the impact of LLCs on student experiences have been done in various aspects of student experiences like critical consciousness development (Sears & Dawn, 2017) and communication barriers faced by international students (Antonio & Ofori-Dwumfuo, 2015), the findings of this study helps to lesson the existing gap in the knowledge of whether living in an LLC has any impact on the digital fluency of students. The survey results indicated that participating in the LLC based MLC, improved students' perceived mobile device digital fluency over the course of the semester. Students used mobile devices to support disciplinary learning and to communicate with instructors and peers. Self-reported knowledge of basic tasks which support learning like downloading an app, and turning the device to a silent mode were perceived to have increased from pre to post-semester, while that of searching for information in the internet remained the same from beginning to end of semester. Students might have gained from having access to a mobile device for individual use at all times. Also, the mobile device use and learning strategies taught to students during the Technology Nights, may have contributed to increase their digital fluency of completing basic device based tasks over the course of the semester, though there were no direct questions in the survey seeking confirmation regarding the impact of the Technology Nights.

In the focus group, some students mentioned that since they were already familiar with the basics of mobile device use, it would have been beneficial if the Technology Nights were dedicated to higher level training on apps like Adobe Spark and Notability. What is clear is that some students coming into the LLC were already knowledgeable or digitally fluent, in terms of being able to complete basic mobile device use tasks. During the course of the semester their skills improved slightly on certain tasks like creating new content and media using mobile devices. What they reported as still needed, was advanced training on specific apps.

Enhanced communication using mobile devices. In their first semester of living in the LLC, students reported having increased knowledge of how to use mobile devices for communication, from pre to post-semester, for all tasks under consideration except for communicating with MLC peers using social networking apps. It appears that though students had access to a device, they chose not to use the device to communicate with other students in the MLC using social networking apps. This finding is similar to earlier studies in LLCs where when domestic and international students were paired as roommates, most students preferred to communicate in person, even though they were otherwise heavy users of digital social media (Antonio & Ofori-Dwumfuo, 2015).

Since the online survey did not have an open-ended response area, no further information on why students chose not to communicate with their peers using mobile devices was available. They may have chosen to communicate using other means like verbal and face-to-face communication at the time when data was collected via the online surveys. However, when asked the same question during the focus group meeting, at the end of their second semester at the LLC, students responded in a completely different manner, saying that they used their tablets to connect with each other, mostly for social communication. They used a social media app called GroupMe and also used the mobile device to email each other and the FIR. This may have happened due to increased knowledge of social media apps and familiarity with mobile device use by the end of Spring 2017. Also, increased camaraderie among students after living in the LLC for a while, may have contributed to perceptions of increased communication at the end of the second semester.

Creating and accessing learning content using mobile devices. As observed in earlier studies, students in this study reported that mobile devices were used to create (Hopkins, Hare, Donaghey, & Abbott, 2015; Mouza & Barrett-Greenly, 2015) and access learning content (Reichert, & Mouza, 2018; Salisbury, Laincz, & Smith, 2015).

More respondents at the end of their first semester at the LLC, compared to the beginning, reported that they used a mobile device to download and upload cloud-based files, search for information, create media content, and create presentations. The same information was reported during the focus group meeting. Based on this information, it appears that personal access to the tablet for an extended period of time allowed students to learn better how to use it to support education and communication.

Mobile device supported learning gains. Compared to the pre-semester survey, the post-semester survey showed that more students were using mobile apps like Notability and Paperport Notes to take notes in class. As observed in previous studies, this study showed that using mobile apps as compared to paper-based content/notes, allowed students to have access to study materials anytime and anywhere (Barden & Bygroves, 2018; Diaz-del-Pino, Trelles, & Falgueras, , 2018). The focus group meeting responses confirmed this information, where students reported using the devices and apps for not only in-class learning but also for research, on-campus jobs, and to help other students in their role as learning assistants.

Mobile device supported learning at the MLC in the LLC. Similar to observations made in earlier studies, this study showed that as a result of their involvement in the LLC, students reported having tried new ways of using mobile devices to support learning, build community, seek technical help from peers, and learn collaboratively (Cerratto Pargman, Nouri, & Milrad, 2018; Manathunga & Hernandez, 2018; Reychav & Mchaney, 2017). In their first semester at the LLC, though students perceived having made learning gains supported by a mobile device, they did not necessarily make those gains through peer communication using mobile devices. There were no open-ended questions in the post-semester survey, asking students to elaborate on the reasons as to why they did not use the devices to communicate with their community peers. Further data collected in the focus group at the end of the second semester indicated a difference in perception. Students now felt that they benefited by living in the LLC, since it gave them the opportunity to seek help from their peers in-person as well as by using mobile device based social media applications. Also, having personal access to a tablet and living in the LLC gave them a sense of camaraderie which transferred to the students' life outside the LLC.

Continued learning using mobile devices. As seen in some earlier studies on mobile devices, users of such devices often believe that they will be or are useful for various functions like security monitoring (Potnis, Demisse, & Deosthali, 2017), cloud storage services (Arpaci, 2016; Yang & Lin, 2015), and for learning enhancement (Hur, Shen, Kale, & Cullen, 2015;Wardley & Mang, 2016). At the end of their first semester at the LLC, students continued to believe that having a mobile device would support their learning. As compared to the pre-semester survey, a larger percentage of respondents in the post-semester survey indicated that they would be using mobile devices for courses other than ENGR 150. However, the continued use of mobile devices for other courses is largely dependent on course instructor initiative, course design, subject matter, and device availability and are beyond the scope of this study.

At the end of Spring 2017, when further data was collected via the focus group, participants confirmed their optimism about using mobile devices for future courses. Though earlier studies have shown that students often don't actually use mobile devices as much as they plan to (Bartholomew & Reeve, 2018), all students participating in the focus group of this study, indicated that they would prefer to have a tablet for future use . Some students talked about how they were using the tablet for multiple purposes like social communication, campus jobs, as well as for other classes.

Mobile devices may not support all forms of learning for all learners. At the end of their first semester, the post-semester survey responses indicated that fewer students (47.37%, *M*=3.33) believed that mobile devices provided better access to content. This finding is similar to earlier studies which showed that learners often prefer to use mobile devices like smartphones for social communication and less to access academic content, especially when they are not trained to use it for the latter purpose (Adedoja & Abimbade, 2016; Lau, Chiu, Ho, Lo, & See-To, 2017). Mobile devices are not the only means through which students can get access to learning content. Some students may prefer to access content through their desktops or other paper-based sources. This result may not be an indication of learners' lack of digital fluency and communication with mobile devices, as much as a preference to use mobile devices to support some and not all ways of learning.

Recommendations

Based on the results of this study, some recommendations can be made which might be useful for FIRs, faculty who work with students living in LLCs, housing, and student affairs personnel.

Varying levels of digital preparedness. Digital tools and content in digital formats often facilitate learners' mastery of content (Chen, Tan, & Lo, 2016; Tan, Chen, & Lee, 2013; Thoermer & Williams, 2012). With the advancement and global expansion of digital connectivity (Georgiou, Motta, & Livingstone, 2016), most students may come to the classroom already prepared, in terms of having basic digital fluency for the use of mobile devices, especially for its use for social media communication (Kim, Wang, & Oh, 2016) and for non-academic purposes (Bluestein & Kim, 2016; Dashtestani, 2016; McCoy, 2016). However, all students still may not actually know how to use digital and or mobile devices for academic purposes (Chen & deNoyelles, 2013). Moreover, digital fluency and the ability to communicate using digital devices may vary across students in the same learning or group setting (Teo, 2015). The challenge then is for instructors and student support staff to design courses and social activities, based on this already existing skill set and variety of proficiency.

Learning by purposeful design. Earlier research has shown that certain desired psycho-social learning factors related to academic development like STEM identity, self-efficacy, and metacognition, can improve when students participate in learning communities (Carrino & Gerace, 2016). However, simply providing learners with resources like mobile devices and having them live in a discipline specific residential learning community, may not necessarily provide them with sufficient reason, immediacy, or motivation to build community with their peers, learn collaboratively using mobile devices, or advance on digital fluency. More purposeful instructional and activity design, which integrates the use of mobile devices for both learning and completion of community/social activities may be required. The goal should be to utilize existing and developing digital fluency in students, to master learning and community living goals more efficiently. While designing academic and social activity curriculum for such students, examples of important questions that might guide the design may be "how can students achieve higher levels of learning facilitated by mobile devices?" Or "how can mobile devices enable students to achieve greater levels of peer interaction that would not be possible without the use of the device?"

Peer instruction and mentoring. Peer instruction which has been shown to be an effective pedagogical strategy for enhanced learning in several disciplines like Physics (Gok, 2015; Zhang, Dang, & Mazur, 2017) and Computer Science (Zingaro & Porter, 2014), may be used among LLC participants. Peer mentoring has been found to have a positive impact on the learning of a wide gamut of people like students with Autistic Spectrum Disorder (Siew, Mazzucchelli, Rooney, & Girdler, 2017), pre-service teachers (Faucette & Nugent, 2017), and undergraduate medical students (Abdolalizadeh, Pourhassan, Gandomkar, Heidari, & Sohrabpour, 2017).

Students living in a LLC already live in a community setting where a FIR or disciplinary instructor led learning and or review sessions may be arranged. This may be an ideal environment where students can communicate with peers and instructor(s) using mobile devices and teach each other digital fluency skills that support disciplinary learning. Students might be able to make more gains from a LLC in general and from specialized components of an LLC in particular, if they are provided support through peer mentors who could establish peer support networks and provide an additional layer of staff support (Rieske & Benjamin, 2015).

Soft skills. Soft skills are of increasing importance for graduates seeking employment in a competitive job market (Jones, Baldi, Phillips, & Waikar, 2016; Sethi, 2016). Students may be able to make gains in their ability to master soft skills like communication, facilitated by mobile devices. This is especially significant in certain disciplines like Engineering, where learning soft skills like interpersonal communication, leadership, and teamwork are desired learning goals (Kumar & Hsiao, 2007). By viewing learning through a social constructivist lens and leveraging mobile devices, a LLC appears to be a learning environment where such soft skills can be organically nurtured and practiced. Having long term personal access to a mobile device over an extended period of time, often allows students the time to learn how to use it more organically and productively, for academic as well as for social communication and job-related purposes.

Housing and student affairs. As seen in this study, students perceive that mobile devices can support learning, impact soft skill practice through peer communication, and enhance basic digital fluency among students living in an Engineering LLC. These findings may be helpful for housing staff and those working with LLCs, to identify and

design ways in which cross campus partnerships can be forged between university units like Student Affairs and Academic Affairs, which may otherwise work in silos.

Further studies. This study was meant to provide preliminary data on what students felt about changes in their mobile device based digital fluency and communication, after participating in a MLC within a LLC. As such it was not designed to be granular enough to measure individual participant growth over time or to compare differences within groups. However, based on the observations made in this study, more nuanced studies can be designed in the future that can provide more elaborate data. Studies which can answer questions like "how did the students' prior knowledge or existing level of digital fluency determine changes in learning that occurred after participating in the LLC?" or "what demographic of students made maximum gains from participating in a MLC based LLC?"Answers to these questions may help design better learning and college experience opportunities for students.

Conclusions

The purpose of this study was to document and report student perceptions regarding changes in digital fluency and communication after participation in a LLC based MLC. Results indicated that over time, students perceived that their mobile device digital fluency and communication skills changed as a result of having personal access to a mobile device. Also, students thought that mobile devices supported their learning and they intended to use mobile devices for future courses and tasks. Based on the findings of this study, some recommendations were made which might be useful for faculty, especially FIRs, aiming to use mobile devices to support teaching and learning, housing staff, and others working with LLCs. The data collected from this study can form the basis of more detailed and complex future studies, designed to compare statistical differences within groups or repeated measures analysis to test differences.

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BOOSTING LISTENING COMPETENCE OF L2 LEARNERS THROUGH READING SCRIPTS

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ABSTRACT
This pilot study investigated the impact of reading a written script on the second language listening achievement of high intermediate English as second language (L2) students. Thirty-five high-intermediate ESL students participated in this study. The participants took part in both the bassline conditions (listening without the script intervention) and the reading intervention condition (listening along with a script). The scores of the tests were analyzed using paired sample t-test. The findings revealed that there was a significant difference between the two conditions. The reading intervention has a major effect on second language listening comprehension performance of L2 learners.
Keywords: Listening achievement; Intermediate learners; Written scripts

INTRODUCTION

Second language (L2) learners receive a great deal of knowledge regarding the second language skills and guidelines by listening. Educators try to create the proper environment for learners to develop their listening skills by constructing different listening strategies. Moreover, instructors stimulate the second language environment by using technology such as audio, video texts, and computer-based instructions to advocate both independent and collaborative learning. Many scholars (Coniam, 2000; Hayati & Mohmedi, 2011; Lankshear & Synder, 2000; Rost, 2002; Salaberry, 1999; Winke, Gass, & Sydorenko, 2010), throughout the years, have emphasized that the use of technology enhances the instructional materials in the educational system in general and second language learning in particular. Multimedia instructional materials such as visual aids, animated graphics, and computer-based instruction have been introduced to augment the progression of the educational practice (Chen, Dwyer, & Lin, 2006). Also, integrating other language skills, such as reading a written script, can have a positive impact in providing modified input to second language (L2) learners, enhancing their understanding, and eventually progressing the level of their listening achievement (Grgurović & Hegelheimer, 2007).

In L2 classrooms, the application of multimedia listening materials creates positive effects on the learning level of students. They increase students' motivation and enhance their performance in the classroom (Richards, 1990). Therefore, the researchers will be investigating the impact of reading a written script on listening achievement and using technology (computers) as a tool to combine these processes. In other words, this study examines the effect of reading a written script of the listening materials while L2 learners are listening to the audio text.

LITERATURE REVIEW

ACTION LISTENING PROCESS

Listening comprehension is a significant skill in foreign language teaching and learning. Therefore, augmenting listening skills of L2 learners is as essential as other language skills in acquiring the language. Learners, who develop action listening process (i.e. active thinking), grow to be better listeners (Rost, 1991) as it supports their listening comprehension of the content materials.

Developing strategies to support the understanding of what is being said can improve the learners` listening skills. Accordingly, Rost (2002) introduced a sequence of listening strategies that supports action listening process, (a) *attentive listening* which means paying attention to the listener`s spoken speech to obtain understanding; (b) *intensive listening*, which is considered a vital feature of language acquisition, is recognizing the language form and distinguishing between the sounds, phonemes, and stressed words in an utterance; (c) *selective listening* involves the focus on cues in the speech that help with understanding the utterance; and (d) *interactive listening* involves the listener ability to interact in a real life listening situation to gain the ability to communicate with others and decipher any possible misunderstanding.

To further enhance action listening process and to retain input of the topic under focus, using technology such as computers can assist the instructor to create appropriate strategies that motivate the learners and help develop their listening proficiency (Taylor & Gitsaki, 2003). For instance, incorporating written script reading into listening materials, can expand L2 learners' understanding of the listening materials.

INTEGRTATING READING WITH LISTENING

L2 learners are faced with some difficulties during the listening process such as fast speech, new vocabulary, and failure to match the spoken form with the written form (Goh, 1999; Chang & Read, 2006). These difficulties result in poor performance of L2 learners when they are watching a video. However, there are some factors that could assist L2 learners to perform well during the listening process by having them see the written form of the audio text (reading a written script) while listening. That is, if L2 learners are given the opportunity to read the text while they listen, it is more likely that they will improve their listening comprehension.

Some studies (Field, 2008; Vandergrift, 2011) have shown the effectiveness of reading a written script on listening comprehension. When L2 learners read the text while they are listening, it becomes much easier for them to comprehend what they are listening to. When investigating learners' attitudes towards multimedia (video, audio and script), Brett (1996) found that 86.9% of students reported that their listening skills had improved because of a multimedia application used. Osada (2001) indicates that providing L2 listeners with aural text and its transcription would assist L2 listeners develop awareness of the relationship between form and meaning as well as word recognition skills. In addition to focusing on utilizing written scripts while listening in L2 classrooms, some scholars (Hayati & Mohmedi, 2011; Winke, Gass, & Sydorenko, 2010), centered their attentions on using captioning videos in the same language of learning in order to enhance the learners understanding of the listening materials. The application of this method has increased widely in L2 classrooms in the past decade. It has been believed that learners who watch videos with captioning are able to follow and connect the sounds that they hear to the words that they see, and, as a result, they learn how to articulate and understand the meaning of unknown words from context (Danan, 2004).

The impact of reading a written script on listening, however, can only be advantageous when students' reading skills are high. Accordingly, Chang (2009) explains that "to include written text support while listening is to compensate for a learners' listening deficiency, but this means that students must be able to read at least as fast as the speech rate" (p. 661). Thus, if L2 learners' reading skills are low, providing scripts might not be as beneficial.

As the reviewed literature has shown, applying multimedia in L2 classroom could have a positive impact on L2 when combined with script reading. Although there are much more studies that investigated the impact of subtitles and captions on advanced L2 learners' listening comprehension, we have not identified many studies that targeted the benefits of written scripts on less proficient L2 learners. Therefore, this study looks at the impact of reading a written script on high-intermediate L2 learners' listening achievement.

PURPOSE OF THE STUDY

The purpose of this study is to examine the effect of written script reading on listening comprehension and achievement on high-intermediate ESL learners. Thirty-five students participated in the present study and took part in the two conditions: baseline (without reading script) and intervention (with reading script) conditions. Paired sample t-test was conducted to test the hypothesis that assumes there is no difference between the two phases, i.e. with reading a written script or without reading a written script, on the participants' listening achievement. The findings of this study would help answer the following research question: To what extent does reading a written script impact listening achievement on high-intermediate L2 learners?

METHODOLOGY

PARTICIPANTS

A total of thirty-five high-intermediate ESL students, age ranges from 17 to 27, participated in this study. The recruited participants represent a diverse population and are from different nationalities including Brazil, China, Japan, Kuwait, Libya, Pakistan, Saudi Arabia, and UAE. They were all enrolled at university- based intensive English programs located at the Northwest United States. These intensive programs welcome new students every two months and require these new students to take a replacement test to identify their level. There were three classes of high intermediate level involved in the data collection. Most of the participants plan to apply to American universities to pursue academic degrees. The participants had undergone the two experiment phases: phase 1) receiving listening task without the intervention (without reading script), and phase 2) receiving the listening intervention (with reading script).

INSTRUMENTS

In this study, two listening clips and two comprehension tests from Pearson Education NorthStar Listening and Speaking 3rd Edition series (2009) were used to measure participants' ability to understand oral English at the university level. The materials were compatible to the participants' proficiency levels as they were taken from higher intermediate listening courses. Since the participants were English language learners who plan to pursue their academic degrees in the United States, the Pearson Education NorthStar series tests were one of the best measures to determine their listening comprehension achievement. According to the series editors, the materials presented are based on authentic resources and relevant for ESL learners. The courses level, moreover, correlate to TOEIC, TOEFL, and CEF score ranges to better prepare learners from different proficiency levels to succeed outside the language classroom.

The tests aimed at evaluating how well learners combine their listening and reading skills to perform academic tasks. Two listening tests were selected from the NorthStar series to be used in this study. One was the baseline test, the other was the intervention test. Each test consisted of a clip discussing topics about nature sciences, social sciences, humanities, or arts followed by 3 multiple-choice, 3-4 true/false questions, and 3-4 short answer questions. The tests are selected within the same level of equivalency to ensure the reliability of the instrument. Also, the tests provided by Pearson Education NorthStar series are prepared based on research and experience; therefore, these tests have undergone structured and standardized procedures to balance the level of difficulty within the tests. This type of test has been chosen to increase the internal validity and to eliminate the instrumentation threat.

INTERVENTION

To test the students' listening comprehension achievement, the participants were introduced to two phases. Phase 1) involves listening to the clip without having the written script whereas phase 2) entails following the script a long with the listening clip. The aim of using the intervention, which is reading while listening, is to see whether reading a written script has greatly affected listening (Chang, 2009), and also to see if written scripts can provide L2 listeners with more information than listening and relistening (Lund, 1991). The listening clips were transcribed and provided to the participants to follow while listening. The participants could see these transcripts on the left side of their computer screen. However, these scripts disappeared when the listening clips were stopped.

PROCEDURES

This study was conducted during an academic listening course. Two sessions were selected over one semester to collect the data. The researchers were present to explain the test procedures and to observe the participants' behavior while they took the tests. In the first session, participants watched a clip followed by a listening test. The clip and the test were viewed on a computer screen where they could see the speaker(s) while listening and the questions while answering. The participants listened to an academic lecture and answered three multiple choice questions and three true/false questions. On the intervention phase, the participants could see the video on the right side of the screen, whereas on the left side, they could read or follow the transcription of the video prompts while listening. After listening, they answered four true/false questions and four short answer questions. During the study, the tests have been integrated into the normal testing routine to exclude the threat of reactive arrangements and increase the internal validity.

DATA ANALYSIS

In this study, a paired-sample t-test was used to detect the differences between the two phases. The test design represented the difference within phases to identify the participant level in the baseline and their progress when the intervention was introduced. The dependent variable of the design is listening achievement whereas the independent variable is reading a written script with alpha set at .05. The questions of the tests (i.e. 6 questions on phase 1 test and 8 questions on phase 2 test) were totaled to be used in the design statistical test that was conducted using SPSS. The *F* statistic was calculated to assess effects of the intervention.

RESULTS

The results show that there was a significant difference in the scores for students listening achievement on the baseline phase ($M = 3.21$, $SD = 1.07$) and the intervention phase ($M = 4.00$, $SD = 1.30$); $t(34) = 3.02$, $p = 0.005$. A comparison was piloted for this purpose between conditions (baseline and intervention) being measured repeatedly. The *F* value of the main effect of time was reported to be significant $p = .0001$ with an alpha set on .05. There was a significant difference by group over time. The intermediate ESL students, who received the reading treatment, had mean score of 3.21in the first phase at the beginning of the study; however, these learners

had improved dramatically and received a mean score of 4.00 in the second phase. It is not surprising that the ESL learners had performed well after receiving the reading intervention since it had previously effected listening achievement greatly and that effect represented a high level of comprehension gain (Chang, 2009). In the following diagram (Figure 1), the students in the baseline phase scored lower in the pretest than in the intervention phase, however, after introducing the intervention, the scores of the intervention phase increased significantly. The students' performance in the post-test was almost doubly higher the performance of the pretest.

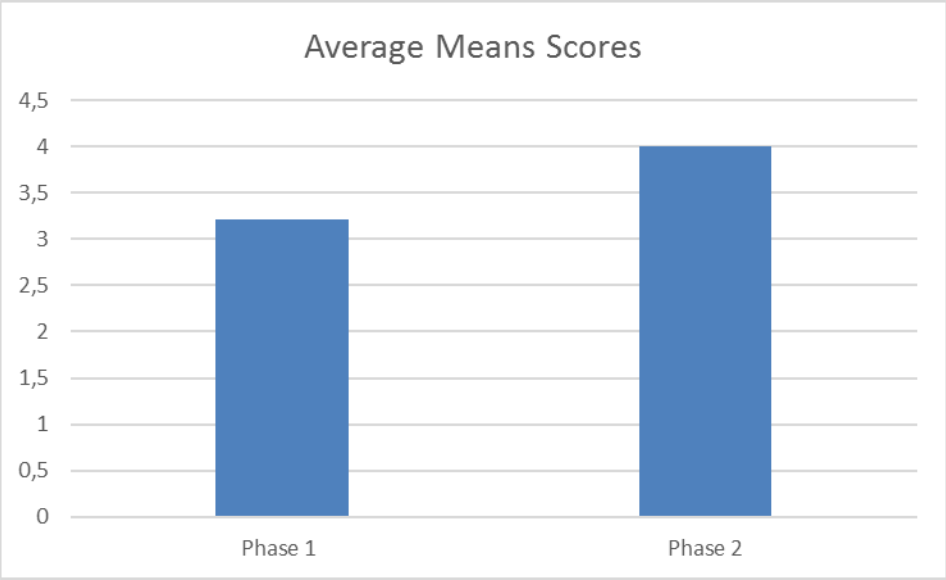

Figure 1. Average Means Scores

DISCUSSIONS AND CONCLUSION

The findings of the study show that the students performed better in the second phase (with the presence of written scripts) than on the baseline phase. Analyzing the presented results, one might argue that written scripts could have contributed to fulfill some of Rost's (2002) listening strategies of *intensive listening*, where learners were able to recognize the words bounds and phrases and differentiate between their sounds as all were provided in a script. *Selective listening* was also highlighted as the participants were provided multimedia representation of the listening text (audio, video, and written script), which could have boosted their recognition of the speech cues and in turn enhanced their understanding proven by their higher scores on the posttest. This study conflicts with the redundancy principle (Sweller, 2005) of the cognitive load theory that suggests the effect of redundant input (i.e. video, audio and script) on learners hinders the learning process. In contrast, the current study found that using multimedia inputs was beneficial to the learners.

As indicated in previous literature, this condition (written script) was appropriate for the intermediate L2 learners. One explanation for this may be attributed to the fact that reading skills of the intermediate L2 learners were high enough to enable them to perform better when the script was combined with the listening video. This finding supports Chang's (2009) claim that the reading proficiency of L2 learners should be as decent as their listening proficiency.

Another reason why the L2 learners' understanding of the listening materials was better when they were supported by written scripts of the same listening video might be related to the semantic and syntactic cues provided in the written scripts. That is, L2 learners might have been able to decode the content based on their word recognition, sentence structure and contextual knowledge associated with the written text (Chang, 2011; Vandergrift, 2007), which in turn helped them understand the listening video. It could have been challenging for them to recognize these cues if they were not provided with the written script. However, the two baseline and intervention phases, had the same conditions except that in the intervention phase the students was exposed to the reading treatment. Interaction of pretesting and treatment comes into play when the pretest provokes participants so that they react to the treatment inversely (Dimitrov & Rumrill, 2003). For example, it is hard to ignore the fact that some participants in the baseline phase might have got more practice with listening, after sensing that their performance was not adequate on the pretest, which could have affected their posttest scores.

In brief, listening comprehension is considered to be a very essential skill in L2 learning. Therefore, learners need to be instructed following various methods where different options and strategies are provided. Giving learners the choice between diverse help options to select from (including written scripts) can be a practical strategy with which leaners successfully engage and interact with authentic materials and contexts so that they acquire language proficiency, and eventually decode L2 content without any support. In future research, a larger sample size needs to be considered in order to increase the reliability of the findings as well as follow-up interviews to determine the effectiveness of such help options from the learner's prospective.

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CORRELATION BETWEEN ENVIRONMENTAL LITERACY COMPONENTS (KNOWLEDGE, ATTITUDE AND BEHAVIOR) IN MADEIRA ISLAND (PORTUGAL) 9TH GRADE STUDENTS

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ABSTRACT:
Pearson's correlations among environmental literacy main components for 9th grade students from Madeira Island (Portugal) reveal the known intricacy of the framework for environmentally responsible behaviors. Findings show that knowledge, attitude and behavior correlate each other positively and significantly in a small level, and that demographic variables strongly influence these relationships. The established relationship among the environmental literacy main components shows a pathway where knowledge has greater ease on changing attitudes (r=0.276, p=0.000) than behaviors (r=0.198, p=0.000), being behaviors more related to attitudes (p=0.224, p=0.000). Also, since the shared variance between components was very small, other factors not evaluated on present study should play a major role among 9th grade students from Madeira Island.
Keywords: Environmental Literacy components, environmental knowledge, New Ecologic Paradigm, environmentally responsible behavior, correlations.

1. INTRODUCTION

The main goal of environmental education is to improve environmental literacy, a very difficult task considering that a profusion of different factors acts in an interdependent and complex way to achieve it (Hollweg et. al., 2011). Despite several models and frameworks have been proposed to explain the pathway through which environmental literacy and, particularly, environmentally responsible behaviors develop, its complex structure and interdependencies still not completely known and understood (Hsu, 1997; Keene & Blumstein, 2010).

In the early 1990s, environmental literacy was considered essentially the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore, or improve the health of those systems (Disinger and Roth, 1992). After that, Simmons (1995, pp. 55-58) identified seven elements of environmental literacy: 1. Affect (e.g., environmental sensitivity, attitudes, and moral reasoning); 2. Ecological knowledge; 3. Socio-political knowledge (e.g., the relationship of cultural, political, economic, and other social factors to ecology and environment); 4. Knowledge on environmental issues; 5. Skills pertaining to environmental problems/issues and action strategies, systemic thinking, and forecasting; 6. Determinants of environmentally responsible behavior (i.e., locus of control and assumption of personal responsibility); 7. Behavior (i.e., various forms of active participation aimed at solving problems and resolving issues). Another framework example, created by Wilke (1995, pp. 5-6), defined four clusters of environmental literacy components: cognitive dimensions (knowledge and skill), affective dimensions, additional determinants of environmentally responsible behavior, and personal and/or group involvement in environmentally responsible behavior.

Nowadays, is of common understanding that environmental literacy must include knowledge and understanding of environmental concepts, problems, and issues, a set of cognitive and affective dispositions, and a set of cognitive skills and abilities, together with the appropriate behavioral strategies to apply such knowledge and understanding in order to make sound and effective decisions in a range of environmental contexts (Hollweg et al., 2011). As a simple definition, environmental literacy could be seen as a domain of four interrelated components: knowledge, dispositions, competencies, and environmentally responsible behavior (Hungerford & Volk, 1990; Hollweg et al., 2011). However, since it is not possible to include its whole structure in any single assessment, several authors identified knowledge, attitude and environmentally responsible behavior as the most important environmental literacy components to be included in surveys (Krnel & Naglič, 2009; McBeth & Volk, 2010; Kuhlemeier, et. al., 1999).

Along past decades several theories and models have been developed in order to explain the way knowledge, attitude and behavior environmental literacy components relate to each other and, particularly, mediate behavior (Kibert, 2000). One of the most widespread of these models is Azjen's (1988) Theory of Planned Behavior, an evolution of the Theory of Reasoned Action (Azjen & Fishbein, 1980), where attitudes and subjective norms (individual's perception about the beliefs of their nearest society's members) contribute to behavioral intentions, which then conduct to behaviors adoption. In fact, social environment has been shown to mediate the influence

of environmental attitudes on environmental behaviors (Petrzelka & Korsching, 1996) and, despite not directly specified in this model, knowledge elements are represented through their influence on beliefs, assuming a mediated connection through attitudes, subjective norms and intention prior to behavior (Dillon & Gayford, 1997). The Theory of Planned Behavior also adds that, besides attitude and subjective norms, a perceived behavioral control component influence, directly or through intentions, the behavior adoption (Kibert, 2000). This perceived behavioral control component "refers to the perceived ease or difficulty of performing the behavior and it is assumed to reflect past experience as well as anticipated impediments and obstacles (Azjen 1988, p. 132), acting as a mediating factor of whether or not an individual, independently from their attitude, will engage in environmentally responsible behaviors (Kibert, 2000). Another important model is the one of the Responsible Environmental Behavior proposed by Hines and colleagues (1986/87). Unlike the Theory of Planned Behavior, this model describes how different types of knowledge interact to determine the intention to act, which then leads to the desired environmentally responsible behavior. This knowledge should not be only factual but also on action strategies and issues in order to allow individuals to adapt when situational factors create changeable conditions. Nevertheless, the model of Responsible Environmental Behavior emphasizes that, besides the different types of knowledge and action skills, self-efficacy (locus of control) and environmentally sensitive attitudes are essential components to drive behaviors that needs to be developed through environmental education (Kibert, 2000).

Those, under the above and other frameworks, and confirming its complexity and multifactorial dependence, environmental literacy has been commonly investigated in different populations, and several variables, such as age, gender, income, place of residence and parental education level, among others, have been found to be its predictors (Erdoğan, 2009). Also, knowledge, attitude and behavior towards the environment, the main components of environmental literacy, have been correlated in order to evaluate and better understand the way they interact in different populations. Environmental knowledge has been found to be highly correlated with environmentally responsible behavior in some studies (Sia et al., 1985/86: r = 0.55) (Hsu & Roth, 1998: r = 0.46) but weakly in others (Kuhlemeier et al., 1999: r = 0.20) (Timur et al., 2014: r=0.111). It seems that these inconsistent results are dependent on the kind of knowledge considered, showing higher correlations when knowledge about an ecological behavior rather than factual knowledge is considered (Kaiser et al., 1999). Also, other factors seem to influence the correlation since different values have been obtained depending on the characteristics of the population (Hines et al., 1986/87: individuals from environmental organizations r=0.691, general public r=0.268, and children r=0.192; Kibert, 2000: undergraduate university students r= not significant; Kuhlemeier et al., 1999: 9th grade students in Holland r=0.20; Ngev et al., 2008: 6th and 12th grade students in Israel, r= not significant; Timur et al., 2014: pre-service teachers r=0.111; Digby, 2010: Adults from Minnesota, USA: r=0.178). Knowledge also correlates with attitude, again varying depending on the population and its characteristics (Digby, 2010: Adults from Minnesota, USA: r=0.145; Ngev et al., 2008: 6th grade, r=0.4101, and 12th grade students, r=0.23, in Israel) but, despite some variation, the components that tends to show highest correlations are attitude and behavior (Makki et al., 2003: Lebanon secondary students' r= 0.77; Meinhold & Malkus, 2005: adults in USA West Coast r=0.45; Kuhlemeier et al., 1999: 9th grade students in Holland r=0.36; Ngev et al., 2008: 6th grade, r=0.3695, and 12th grade students, r=0.56, in Israel; Digby, 2010: Adults from Minnesota, USA: r=0.267).

Despite environmental literacy has been investigated all over the world since the past three decades, this concept has been disregarded in Portuguese environmental education and research. However, some studies have been developed with particular focus on knowledge and attitude toward the environment, being the environmentally responsible behavior almost forgotten (Spínola, 2015; Spínola, 2014; Câmara, 2014; Almeida & Azeiteiro, 2011; Cordeiro, 2010; Pedro, 2009; Freitas, 2007). Some of them, despite several statistic limitations, consider also the influence of categorical and demographic variables as predictors for environmental literacy but none evaluates the correlations between the main components of environmental literacy: knowledge, attitude and behavior. Madeira is an insular region of Portugal where environmental literacy studies are even scarcer. However, since Madeira population is socio-culturally similar to the rest of the country, as well because the school curriculum and education system is the same, studying its environmental literacy could contribute to enlighten the subject in Portugal and overseas.

2. RESEARCH QUESTIONS

The purpose of present study is to determine, for the first time, whether there is, or not, a correlation between the environmental literacy components of knowledge, attitude, and behavior in 9th grade students from Madeira Island (Portugal). So, we put the following questions: Knowledge and attitude towards the environment correlate each other positively and significantly, and with environmentally responsible behavior in 9th grade students from Madeira Island (Portugal)? And, if yes, to which extend does they correlate? Does any specific items on knowledge, attitude and behavior correlates higher than the overall components of environmental

literacy? Do demographic variables influence the levels of correlation between knowledge, attitude and behavior?
Therefore, and taking in consideration previous studies, we hypothesized that:
1- Knowledge, attitude and behaviors toward the environment in 9th grade students from Madeira Island correlate each other but attitude and behavior correlate higher than knowledge and behavior, and even knowledge and attitude;
2- Environmental literacy components in Madeira Island 9th grade students correlate significantly and positively in a medium level;
3- Specific knowledge in who to correctly perform environmentally responsible actions correlates higher with the adoption of the respective specific behaviors than overall.
4- Demographic variables influence the levels of correlation between knowledge, attitude and behavior.

3. METHOD

The survey design was based in others published elsewhere but adjusted to local specificities (Kuhlemeier et al., 1999; Krnel & Naglič, 2009; McBeth & Volk, 2010). It was anonymous with close-ended questions, consisting of a header and three main sections, each one measuring and assessing: knowledge (10 questions), attitude (15 questions) and environmentally responsible behavior (15 questions) (questionnaire available upon request). Knowledge section addressed the 3 main themes developed in environmental education activities on Portuguese schools: water (3 questions), energy (3 questions), and wastes (4 questions); each one going along 3 main aspects: cause of problems, regional context and behavior options. To measure pro-environmental attitude the questionnaire included the New Ecologic Paradigm (NEP) Scale, an instrument widely validated in the measure of pro-environmental orientation (Dunlap et al., 2000; Trobe & Acott, 2000; Kostova et al., 2011; Shoukry et al., 2012). The environmentally responsible behaviors were assessed through statements spanning across the 3 main themes already selected for knowledge: water (4 statements), energy (6 statements) and wastes (5 statements). Each statement addressed specific everyday behaviors and students were asked to select their frequency in a Likert-type scale ranging from 1 (never) to 5 (always). A special care was taken to overcome potential social desirability bias that could overcome in self-reported assessments (Nederhof, 1985). In order to obtain an internal validity indicator, two redundant questions [“a) I put paper, glass bottles and plastic bags in different containers” and j) “I put all kind of wastes in the same container”] were added. The questionnaire was pre-tested, and the final version was applied to all sample students between April and May 2013, after informed consent from each school board.

The sample included 491 9th grade students from 5 elementary schools from Madeira Island (Portugal). Data collected in the survey was entered into a Microsoft Office Excel worksheet coding in 1 to 5 the responses based on the Likert-type scale employed for the attitude and behavioral sections, and for correct answers in the knowledge section. Following coding, the data was imported into IBM SPSS statistics software (version 23) for statistical analysis. Firstly, reliability (the Cronbach’s Alpha score was 0.705 for the entire measuring instrument) and validity (confirmed by factor analysis and internal validity indicator questions that show a significant large positive correlation [r=0.641 p=0.000]) were evaluated followed by a set of descriptive statistics. Composite scores for each section and, in each section, for specific group items were calculated and then Pearson’s correlations (r) and the shared variance (r^2 x 100) were determined. As a guideline, a correlation coefficient interval of r=0.10 to 0.29 represents a small positive relationship, a r=0.30 to 0.49 represents a medium positive relationship and a r=0.50 to 1.0 represents a large positive relationship (Pallant, 2007).

4. RESULTS

The 491 9th grade students involved in this survey had a mean age of 15 years, males (51.3%) are slightly most prevalent than females (48.7%) and 45% are from educational establishments involved in the environmental education Eco-Schools Program. More than two thirds (65%) reside in an urban area (Funchal city) and the remaining (35%) in rural municipalities. Students with higher marks in 8th grade Natural Sciences discipline (4 or more, in a scale of five points) were most prevalent (52.1%) that the others (47.9%, with 3 or less) and only 20.6% admit to had been involved in environmental activities at school along the past few years. Missing values account for 3.1% on total sample.

Ninth grade students from Madeira Island showed an average correct answers of 71.8% on knowledge section, an average value of 3.59 on New Ecological Paradigm (NEP) scale for attitude (meaning that, in average, they rank between undefined and pro-NEP) and an average value of 3.43 for environmentally responsible behaviors (meaning that, in average, they practice environmentally responsible behaviors in a prevalence between ‘sometimes’ and ‘very often’). The values obtained for group items in each section reflect the overall results but show some variations in knowledge (water: 65.9%; energy: 71.3%; and wastes: 72.5%), attitude (limits to growth: 3.00- undefined; anti-anthropocentrism: 4.00- pro NEP; fragility of nature’s balance: 3.67- between

undefined and pro NEP; rejection of exemptionalism: 3.44- between undefined and pro NEP; and possibility of an eco-crisis: 3.70- between undefined and pro NEP) and behaviors (water savings: 3.67- between 'sometimes' and 'very often'; energy savings: 3.22- between 'sometimes' and 'very often'; and wastes management: 3.55- between 'sometimes' and 'very often').

Pearson's correlations among environmental literacy main components show small positive but significant relationships in 9th grade students from Madeira Island (table1). The highest correlation values where found for knowledge and attitude (total sample r=0.277, p=0.000), reaching a medium positive relationship in rural (r=0.340, p=0.000), male (r=0.301, p=0.000) and among students that assume to have not participated in environmental activities at school (r=0.324, p=0.000). Among these two components, the group items with the highest Pearson's correlation value were 'waste knowledge' and the pro-NEP attitude concordance with 'fragility of nature's balance' (r=0.281, p=0.00) (table 2), particularly higher for rural (r=0.401, p=0.000) and male students (r=0.376, p=0.000). For rural students 'waste knowledge' also correlates higher than overall students for pro-NEP attitude concordance with the 'possibility of an eco-crisis' (r=0.367, p=0.000). On the other hand, none of the thematic knowledges considered (water, energy and wastes) correlates with the pro-NEP attitude concordance with the existence of 'limits to growth' (table 2).

As expected, considering previous studies, the lowest values of correlation were found between knowledge and behavior (r=0.198, p= 0.00), a value similar to Dutch 9th grade students (Kuhlemeier et al., 1999), being lower for rural and students with a worst performance in the 8th grade Natural Sciences discipline (table 1). Furthermore, in opposition to previous studies (Kaiser et al., 1999) and rejecting our hypothesis, thematic knowledge on water, energy and wastes doesn't correlate any better with the adoption of behaviors in each one of those areas (table2). Surprisingly, the highest group items correlation was between 'waste knowledge' and 'water saving behaviors' (r=0.196, p=0.00) when with 'waste management behaviors' the value was no higher that r=0.129 (table 2). Moreover, even most specific knowledge's undoubtedly important for behavior performance doesn't correlates higher with the respective behaviors. For example, knowledge on waste segregation for recycling and the respective behavior correlates only with r=0.131 (p=0.005) and even knowing that switching off television directly on the apparatus button eliminates stand by consumption and saves energy correlates weakly with that specific behavior (r=0.157, p=0.024).

Despite with high values in other studies (Makki et al., 2003; Meinhold & Malkus, 2005; Kuhlemeier et al., 1999; Ngev et al., 2008), attitude and behavior among 9th grade students from Madeira island also showed a small positive correlation with r=0.224 (p=0.000), rising for male (p=0.287, p=0.000) and particularly for students with a better performance in the 8th grade Natural Sciences discipline (table 1). Among these two environmental literacy components, significant and positive values of correlation, despite at small level, were found between behaviors of both waste management and water savings, with almost all NEP group items (table 2). However, for energy saving behaviors only pro-NEP 'anti-anthropocentrism' orientation had show a positive and significant correlation (r=0.124, p=0.007).

Internal correlation among each environmental literacy component tends to be higher than the above presented results (table 2). The highest internal correlations were found among NEP attitude, especially for pro NEP concordance with 'fragility of nature's balance' and 'possibility of an eco-crisis' (r=0.885, p=0.00), followed by 'anti-anthropocentrism' and 'rejection of exemptionalism' for human species (r=0.494, p=0.00). Internal correlations among knowledge group items were low with no significant relationship at all between water and wastes (r=0.059, p=0.19). For behaviors, the internal correlation values were found to be higher than in knowledge but lower than in attitude, reaching r=0.304 (p=0.00) for waste management and water saving behaviors (table 2).

Table 1. Pearson's correlations (r), percentage of shared variance (r^2 x 100) and significance (p) between knowledge, attitude and behavior environmental literacy components in 9th grade students from Madeira Island, by total, female, male, urban, rural, marks lower or equal to 3 (≤3NS) and higher or equal to 4 in 8th grade Natural Sciences discipline (≥4NS), eco-schools (ES), non eco-schools (NES), participants in environmental activities (EA) and nonparticipants in environmental activities (NEA). n= number of samples.

	Total	Female	Male	Urban	Rural	≤3NS	≥4NS	ES	NES	EA	NEA
Knowledge Behavior	r=0.198 r^2=3.9 % n=486 p=0.000	r=0.190 r^2=3.6 % n=237 p=0.003	r=0.179 r^2=3.2 % n=244 p=0.005	r=0.221 r^2=4.9 % n=346 p=0.000	r=0.144 r^2=2.1 % n=140 p=0.09	r=0.134 r^2=1.8 % n=229 p=0.043	r=0.279 r^2=7.8 % n=241 p=0.000	r=0.175 r^2=3.1 % n=219 p=0.009	r=0.217 r^2=4.7 % n=267 p=0.000	r=0.207 r^2=4.3 % n=99 p=0.04	r=0.195 r^2=3.8 % n=381 p=0.000
Knowledge Attitude	r=0.276 r^2=7.6 % n=480 p=0.000	r=0.249 r^2=6.2 % n=235 p=0.000	r=0.301 r^2=9.1 % n=240 p=0.000	r=0.252 r^2=6.4 % n=345 p=0.000	r=0.340 r^2=11.6 % n=135 p=0.000	r=0.257 r^2=6.6 % n=226 p=0.000	r=0.223 r^2=5.0 % n=238 p=0.001	r=0.271 r^2=7.3 % n=212 p=0.000	r=0.282 r^2=8.0 % n=268 p=0.000	r=0.082 r^2=0.7 % n=95 p=0.43	r=0.324 r^2=10.5 % n=379 p=0.000
Attitude Behavior	r=0.224 r^2=5.0 % n=474 p=0.000	r=0.174 r^2=3.0 % n=233 p=0.008	r=0.287 r^2=8.2 % n=236 p=0.000	r=0.221 r^2=4.9 % n=340 p=0.000	r=0.248 r^2=6.2 % n=134 p=0.004	r=0.145 r^2=2.1 % n=226 p=0.03	r=0.312 r^2=9.7 % n=232 p=0.000	r=0.196 r^2=3.8 % n=211 p=0.004	r=0.248 r^2=6.2 % n=263 p=0.000	r=0.248 r^2=6.2 % n=95 p=0.015	r=0.215 r^2=4.6 % n=381 p=0.000

Table 2. Pearson's correlations (r) between group items on knowledge, attitude and behavior environmental literacy components for 9th grade students from Madeira Island. Significant results in bold.

Correlated variables	1	2	3	4	5	6	7	8	9	10	11
1-Water knowledge		**r=0.158 p=0.000**	r=0.059 p=0.19	r=0.043 p=0.35	r=-0.012 p=0.80	**r=0.099 p=0.03**	r=0.052 p=0.26	**r=0.098 p=0.03**	r=0.027 p=0.55	**r=0.184 p=0.00**	r=0.010 p=0.82
2-Energy knowledge			**r=0.232 p=0.00**	r=0.023 p=0.62	**r=0.094 p=0.039**	r=0.088 p=0.055	**r=0.132 p=0.004**	**r=0.133 p=0.00**	r=0.087 p=0.055	r=0.055 p=0.23	r=0.048 p=0.29
3- Wastes knowledge				r=0.041 p=0.37	**r=0.205 p=0.00**	**r=0.281 p=0.00**	**r=0.176 p=0.00**	**r=0.251 p=0.00**	**r=0.196 p=0.00**	r=0.047 p=0.30	**r=0.129 p=0.00**
4- NEP limits to growth					**r=0.161 p=0.00**	**r=0.176 p=0.00**	**r=0.218 p=0.00**	**r=0.204 p=0.00**	r=0.021 p=0.65	r=0.038 p=0.41	r=0.061 p=0.19
5- NEP anti-anthropocentrism						**r=0.410 p=0.00**	**r=0.494 p=0.00**	**r=0.395 p=0.00**	**r=0.175 p=0.00**	**r=0.124 p=0.007**	**r=0.162 p=0.00**
6- NEP fragility of nature's balance							**r=0.360 p=0.00**	**r=0.885 p=0.00**	**r=0.146 p=0.001**	r=0.066 p=0.15	**r=0.143 p=0.00**
7- NEP rejection of exemptionalism								**r=0.383 p=0.00**	**r=0.165 p=0.00**	r=0.079 p=0.088	**r=0.120 p=0.01**
8- NEP possibility of an eco-crisis									**r=0.162 p=0.00**	r=0.051 p=0.265	**r=0.154 p=0.00**
9- Water saving behaviors										**r=0.240 p=0.00**	**r=0.304 p=0.00**
10- Energy saving behaviors											**r=0.211 p=0.00**
11- Wastes management behaviors											

4. DISCUSSION

Environmental literacy is a widely accepted concept that has been subject to investigation along the past few decades. Knowledge, attitude and behavior are considered the main components of environmental literacy and several studies showed their interrelationship as well with other variables like gender, age, socio-economic status and place of residence, among others. Since the 1980's, several theoretical models and frameworks have been developed in order to explain and understand environmental literacy concept and, those, help increasing the efficiency of environmental education through new and innovative strategies. The huge bulk of data collected through the research effort of past decades have been analyzed and interpreted in the scope of these theoretical frameworks, namely the Theory of Planned Behavior (Azjen, 1988) and the model of Responsible Environmental Behavior (Hines et al., 1986/87), but, despite important progresses, environmental literacy still is a concept needing clarification and better understanding. In fact, besides economic, socio-cultural and demographic predictors, correlation studies between environmental literacy main components had shown incongruent results along different populations, as well, in the same population, along different variables (Hines et al., 1986/87; Ngev et al., 2008), confirming its complexity and multifactorial dependence.

Present study on environmental literacy components correlation among 9th grade students from Madeira Island (Portugal) reveals its known intricacy and asks for more and directed research. However, this investigation allows clear answers for each posed research question, showing that, among 9th grade students from Madeira Island, environmental literacy main components correlate each other positively and significantly in a small level, lower than hypothesized, revealing that, especially, place of residence (urban or rural), gender and performance on the 8th grade Natural Sciences discipline strongly influence these relationships. Therefore, the study seems to indicate that the correlation levels between knowledge, attitude and behavior are determined by different influences that act upon each specific environmental literacy group or single items and through population variables, making clear the difficulties to draw a clear picture of the environmental literacy framework. This could mean that each item participating in the construction of the environmental literacy components establishes different relationships depending on the individual and population characteristics. In fact, among 9th grade students from Madeira Island there are evidences of this intermingled and networking relationship since, for example, the correlation between the pro-NEP attitude concordance with 'fragility of nature's balance' and 'waste knowledge' is clearly higher among rural and male students than others. The inability to establish relevant correlation values between the specific knowledge in who to correctly perform environmentally responsible tasks and the adoption of those specific behaviors could be as well a consequence of other stronger factors at play. Also, supporting this analysis is a relatively high diversity of Pearson's correlation values, despite always in a coherent interval between small and medium positive relationships, which were found along the variables considered for the 9th grade student's population.

Despite the small levels of positive correlation generally found on present study, our results are supportive of previous models that intends to explain environmental literacy, in particular the Model of Responsible Environmental Behavior (Hines et al. 1986/87), since the established relationships among the studied components show us a pathway where knowledge has greater ease on changing attitudes ($r=0.276$, $p=0.000$) than behaviors ($r=0.198$, $p=0.000$), being behaviors more influenced by attitudes ($p=0.224$, $p=0.000$). Therefore, since the shared variances between the three main environmental literacy components are very small, other factors and components not evaluated on present study, namely situational factors, intention to act, personality factors, locus of control, personal responsibility and subjective norms, should play a major role among 9th grade students from Madeira Island. In addition, our findings on the correlation level's diversity among demographic variables could also partially mirror the effect of these unevaluated factors. In fact, these demographic variables seem to pool economic and socio-cultural contexts as we can see, for example, with the high influences that socio-economic status exert on student's performance (Taylor et al., 2009).

Has expected, the internal correlation levels between the group items of each environmental literacy components (knowledge, attitude and behavior) tends to be higher than among different components (see table 2), reaching large positive correlation values for some NEP group items. These results support the idea that each environmental literacy component (environmental knowledge, NEP attitude and environmentally responsible behaviors) is effectively an independent solid construct in which their internal different items are interdependent. In a concrete outcome to improve environmental education strategies, this could mean that the development of each environmental literacy component should benefit from an integrated approach since the different behaviors tend to support each other, as well the five NEP group items and even the majority of knowledge topics. Again, showing that these internal relationships could follow independent and specific influences and pathways for each component are the antagonistic results obtained on the internal correlation between water and wastes themes for knowledge and behavior. As we can see in table 2, water doesn't correlate

with wastes for knowledge (r=0.059, p=0.19) but correlates significantly at a medium positive level for behavior (r=0.304, p=0.00).

Present study is a minor contribution for an overall understanding of the environmental literacy concept but had the merit of open the research among students from Madeira Island. For now, it characterizes the relationships between environmental knowledge, NEP attitude and environmentally responsible behavior among 9th grade students from a specific region of Portugal, asking for new surveys that should consider other important factors that influence the environmental literacy levels, namely situational factors, intention to act, personality factors, locus of control, personal responsibility and subjective norms. Also, the demonstrated influence of demographic variables upon the correlation levels between the environmental literacy main components needs clarification, especially to understand why male, for attitude-behavior and knowledge-attitude, rural residence, for knowledge-attitude, and better performances in Natural Sciences discipline, for attitude-behaviors and knowledge-behavior, had the clear influence that was found. Intriguing, and also needing clarification in a next survey, is the neutral to negative influence of the Eco-Schools environmental education program on the correlation levels, when it was expected to be a variable that could act in a positive direction. The same for the participation in environmental activities at school, especially for knowledge-attitude correlation where our results showed a significant negative effect when it was expected to be positive. A future study should also address better the correlation between knowledge on environmentally responsible behavior strategies and the correspondent practical actions in order to confirm or not present results and, if yes, understand the reasons underlying the lack of relationships.

5. CONCLUSION

Evaluating the levels of correlation between the main environmental literacy components in different populations, and along their demographic and other variables, is an important contribution to better understand the pathway underlying the adoption of environmentally responsible behaviors, which environmental education so much intends to disseminate. As a contribution on that way, our findings on 9th grade students from Madeira Island corroborate previously developed models that intend to explain the relationship between environmental literacy components, showing that, on this specific population, they correlate in a small positive and significant level. Additionally, the complexity of the environmental literacy concept and of the pathway to environmentally responsible behaviors was confirmed, making clear that achieving environmental education goals is an exceptionally difficult task considering the intermingled network of multiple factors and influences at play. However, despite the need for further research on this population, present study identified a set of demographic variables that influences the relationships between environmental literacy components, as also several internal characteristics on those correlations that ask for future clarifications.

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EXAMINING THE LINK BETWEEN MULTICULTURAL EDUCATION AND EQUITY SCHOOLING IN CHANGING MALTA

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ABSTRACT
The study examines how Maltese school leaders who have completed an educational leadership program in the past six years understand the concept of equity schooling and the role that multicultural education plays in the formation of polices which aid this important quest. The qualitative method of investigation was used throughout the study. The semi-structured interview method was thought to be ideal since it allowed the researcher to probe (McLeod, 2014) into the interwoven links between Multicultural education and equity schooling. It also allowed participants to feel at ease with the researcher thus increasing the validity of the study. 55% of the school leaders interviewed were familiar with the concept of equity schooling. Ten percent of those interviewed equated multicultural education with social justice whilst stressing on equal participation of all children irrespective of children's cultural or linguistic background while 20% perceived multicultural education as an essential prerequisite towards fair and equal distribution of resources. Only 35% of respondents spoke about equity schooling in terms of 'cultural proficiency', 'cultural competence', 'responding to cultural backgrounds', or similar notions. This indicated a dire need for more emphasis on school equity issues in schools together with an infusion of culturally responsive education courses within Educational Leadership programs.

INTRODUCTION

The education of students whose background differs from mainstream culture continues to be a mammoth challenge for educational leaders. Multicultural education and equity schooling are interlinked concepts found in both social science and education research. Both address the engagement of minority students within the learning process, leading to increased academic achievement. By being familiar with these concepts and implementing relevant changes in diverse educational settings, school leaders are in a better position to truly reach the potential of all students.

Background of the study

The increasing multicultural realities within the Maltese social context have prompted Maltese school leaders to incorporate leadership practices aimed at stimulating healthy learning environments, characterized by a number of supportive and responsive structures primarily geared at spurring teachers to include all children in their daily curricular planning (Vassallo, 2016a). A large number of initiatives aimed at supporting interactions between teachers and students proved instrumental towards the construction of new realities based on mutual respect and tolerance (Vassallo, 2016b). The Maltese National Curriculum Framework (MEDEF, 2011, p. 20) further supports these initiatives by highlighting the need for student services to be "given in the context of diversity, implying that they address the learner's current/ actual level of competence with a view of subsequent progress and achievement." This statement further pushes school leaders to develop leadership strategies and skills aimed at reaching the needs of multicultural students in our classrooms in an atmosphere of equity, respect and trust.

According to Bigelow (1993) multicultural education aims to ensure such equity in education for all students so as to make the world a better place both individually and collectively. Banks (1993, p. 23) concurs when he states that "multicultural education… is not an ethnic- or gender-specific movement. It is a movement designed to empower all students to become knowledgeable, caring, and active citizens in a deeply troubled and ethnically polarized nation and world." Malta, small island in the Mediterranean Sea, is witnessing a change in population demographics and an increasingly questioned effectivity of its educational system. Equality suggests that everyone has equal opportunities to learn and everyone learns equally the same way. The concept of equality makes a strong case for equal treatment and access to resources. Educators might believe in an "equal" approach to teaching and learning because they feel fairness is an essential response to differences. However there exist instances when doing so clearly undermines the reality that different children would actually benefit from different approaches and resources in order for them to participate fully in schooling and engage to their potential (Banks & Banks, 1995).

Bell's (2007) offers five prerequisites for the enactment of social justice to prevail. She strongly advocates for a full and equitable participation in society together with the mutual shaping of society to meet the needs of all groups. She also mentions the equitable distribution of resources to safeguard the physical and psychological

safety of all individuals within the different groups, and places emphasis on self-determination and interdependence as the tools necessary to achieve self-efficacy and social responsibility within society. She claims that social justice is both a goal and a process. It is the "equal participation of all groups in a society that is mutually shaped to meet their needs… in which distribution of resources is equitable and all members are physically and psychologically safe and secure" (Bell, 2007, p. 1). Achieving an ideal vision of social justice is a rather complex, arduous and elusive task. It requires actions that are "democratic and participatory, inclusive and affirming of human agency and human capacities for working collaboratively to create change" (Bell, 2007, p. 2).

Bell (2007) believes that the ultimate aim of social justice education is to enable people to inculcate the necessary critical tools to mitigate against oppression and work in such manner as to stop or deviate domineering patterns and/or behaviours both in themselves and in the institutions and communities in which they reside. According to Robins et al. (2006) multiculturalism is the preservation of different cultures or cultural identities within a society or nation, holding each as equally valuable to and influential on the members of the society. He also proposes other definitions:
Cultural proficiency: See the difference and respond effectively in a variety of environments.
Cultural competence: See the difference, understand the difference that difference makes.
Cultural pre-competence: See the difference, respond inadequately.
Cultural blindness: See the difference, act like you don't.
Cultural incapacity: See the difference, make it wrong.
Cultural destructiveness: See the difference, stomp it out (p.3).

Equality assumes that all students within a classroom have equal opportunities to learn and everyone learns in the same way. Equality also assumes that everyone should receive the same treatment and access to resources. The quest of ensuring equality in education prompts educators to advocate for even distribution of existing resources to all students irrespective of their backgrounds or cultural origin. It is evident across the curriculum, but most explicit in the construction of required textbooks and delineated suggestions for content-rich, nonfiction texts, basal readers, and other texts for ELA instruction and reading in the content area.

Educators might pursue an "equal" approach to teaching and learning because they feel it is the most fair response to differences, but in many instances, doing so undermines the reality that different individuals might legitimately benefit from different approaches and resources to fully engage their potential. Common assessments, for example, make several assumptions that may be problematic. They assume that the content used to determine whether a student meets a standard is experienced and interpreted the same way for all students regardless of their cultural background. A common assessment of reading comprehension that uses a text passage taken from *To Kill a Mockingbird* may be interpreted differently by a student from an under resourced community in New York City than a student from an affluent suburban community outside of Atlanta. They also assume that all students can show what they know equally well in the same way (such as through answering multiple choice questions), and that all students experience the assessment process itself in the same way. It is still the individual's responsibility to fill the gap between available resources and the resources needed in order to succeed academically. For those without access to the necessary resources, it is difficult to catch up to their more privileged peers. Fairness in education is not accomplished through a mechanically equal distribution of resources and opportunities. Rather, fairness is achieved when the students who inhabit classrooms and schools have access to the resources they need to learn, grow, and thrive.

LITERATURE REVIEW

Broadly defined multicultural education can be termed to be a designed set of educational strategies intended to assist teachers to respond to the many issues arising from the changing demographics of their students. It aims to provide students with a knowledge base of histories, cultures, and contributions of diverse cultural groups (Banks, 1995).Other scholars (Kislev, 2016; Evans & Levinson, 2009; Sleeter & McLaren, 2000) advocate in favour of increased awareness of one's own cultural identity, how cultural identities are formed, dominant and dominated cultural groups, oppression, racism, social justice, radicalization and methods of appropriately addressing differences among differing groups of people. Multicultural education, as a tool to promote equity schooling and social justice is therefore a set of continuous deliberate processes of understanding and celebrating customs, beliefs and identities of each student whilst mitigating against forms of oppression that individuals or groups may be experiencing. The principal goal of multicultural education, besides bridging the achievement gap between ethnic groups is to inculcate and foster an environment where social justice prevails, extending beyond the concrete walls of classrooms and not limited to racial or cultural diversity issues (Bell, 2007; Freire, 1970/2007; Marshall & Gerstl-Pepin, 2005; Torres & Noguera, 2008; Young, 1990).

On the other hand, the discourse of social justice would include essential elements such as respect and dignity, imbalance of powers, knowledge of differences and disproportionate distribution of wealth. Students from dominant cultures need to appreciate and value the cultural capital which other students bring about in the classroom, and teachers need to create an environment which serves as a catalyst for this to happen. Both students and teachers need to be cognizant of the multiple faces which oppression possesses. Students from minority cultures need to cultivate strong relationships and nurture a positive self-image so as to develop an identity which supports their full engagement in schools. While the discourse of social justice in education is widespread among researchers, yet its application in the real context of the classroom is rather scarce (Pollock et al. 2010). Similarly, research conducted by Borrero, Conner and Mejia (2012), points towards the need for schools to develop more awareness towards the need to promote more social justice initiatives within their schools. They eloquently state that schools are lacking in the promotion of social justice but also on the general understanding of what it entails. Understanding how school leaders define social justice and examining ways of how schools can promote social justice are essential prerequisites towards the construction of meaningful dialogue aimed at providing practical assistance towards minority group needs. Being successful at school is a significant and important step towards the effective engagement of minority groups in society. This further highlights the importance of training school leaders in educational leadership. As Turhan (2010) aptly puts it:

> Social injustices in today's schools can lead to tomorrow's economic imbalances. School administrators have a great role to ensure social justice in schools. Therefore, studies related to leadership roles of school administrators to ensure social justice are needed (p. 1360).

The responsibility which school leaders have to empower educators to be proactive in their quest for more just and equitable schools has prompted the author to identify those factors which strengthen the link between the multicultural education and equity schooling. The purpose of the study is therefore to understand the evolving role which multicultural education plays in the creation of polices which help construct equity and just schools and also to highlight the necessary practices which need to be enacted to transform these policies into tangible action plans which promote real and effective change.

METHODOLOGY

The qualitative method of investigation was used throughout this study. This method was preferred over other means of investigation as it allowed the researcher to focus more on the subtleties of collected data rather than on metrics. Moreover, qualitative means allow the participants to feel more at ease while responding, since they are not influenced by a group. This allowed the researcher to 'delve deeply' (Denzin et al., 2005) into the extent of which school leaders established links between multicultural education and equity schooling and allowed respondents to determine how and in what ways school leaders in primary schools in Malta understand the concept of equity schooling and what role does multicultural education assume towards its promotion and implementation.

One qualitative method of investigation is the semi-structured interview. This was used to offer a balance between the flexibility of an open-ended interview and the focus of a structured ethnographic survey. It gave the researcher the advantage of returning to the same topic numerous times, thus enabling the participant to produce information with stimulated memory (Bailey, 2008). It also allowed the possibility of capturing verbal and non-verbal cues and also allowed probing into emotions and behaviours (McLeod, 2014). With the interview being more like an everyday conversation, a safe and relaxed environment could be created and this encouraged elaborate responses. The validity was also enhanced by hiring a moderator from a foreign university whose task was to conduct 50% (10 participants) of the interviews herself. This would ensure that responses were genuine and not influenced by "what I want to hear." Validity was also ensured by using the respondent validation technique. This involves checking initial results with participants to see if they respond affirmatively. Confidentiality and anonymity were stressed prior to the interview. The highest of ethical standards were maintained throughout the whole research study.

Participants' responses were analyzed to detect perceptual differences within the various forms of oppression such as injustice, racism, repression, disability, sexism and social class. These were then coded and analysed to determine whether existing practices within the school environment are inclusive or exclusive in nature.

The research questions that guided this study were as follows:

1. How does a school leader, define equity schooling?

2. How does a school leader define Multicultural Education?

3. How does Multicultural Education (as you define it) promotes equity schooling within school?

4. How do school plans/activities/policies contribute to the promotion of equity?

Invitations were sent to 25 randomly selected school leaders who had completed a program in Educational leadership/ management within the past six years from the commencement of this study. Five invitation were not returned and this resulted in a selection of 20 school leaders (80%) who accepted to be interviewed. The semi-structured interviews were analyzed using NVIVO (a software program used for qualitative research and specifically of unstructured text) where a number of key themes were identified for each question. Responses were then coded in relationship to Bell's (2007) characteristics of social justice and Robins et al.'s (2006) definition of multiculturalism and continuum of cultural proficiency. The number of coded responses in each category was tallied.

RESULTS

Familiarity with the concept of social justice

55 % of the participants felt that they were familiar with the concept of equity schooling in education, with 30% reporting limited familiarity with the term as applied in the educational milieu while 15% reported no familiarity with the term. 20% of school leaders associated equity schooling with restorative justice, i.e they limited their perception to established structures such as 'the prefect of discipline's office', the' school's discipline board', or the 'college principal's office'. These responses however were deemed by the author as dissonant with Bell's (2007) concept of social justice.

The results are tabulated in the table below:

Table 1

Familiarity with the concept of equity schooling

Familiar	Limited familiarity	No familiarity
55%	20%	15%

One of the school leaders defined social justice as "the bringing together of people of many different faiths, traditions, socio-economic statuses … but also includes NGOs (Non-governmental organizations) working in favour of environmental issues, industrial relations, etc". Another school leader described his view of social justice in terms of the teachings of Jesus in favour of the poor and the needy. Out of all respondents, only one answered that she has deliberately initiated an activity which supported social justice. The author views these conceptualizations as a detachment from the notion of educational leaders as active protagonists with a clear focus on equity and universal understanding of social justice leadership exists among scholars working toward this end (McKenzie et al., 2008). Therefore, the most important responsibility of school administrators is to institutionalize social justice in schools.

Equity as the emergent central theme

Equity was the central theme that emerged from responses related to the definition of social justice, as well as perceived and desired implementation of social justice measures in schools. The most common statements attempting to define social justice revolved around "being fair", "equal distribution of resources", "just treatment to all." About half (55%) of educators in the study included equity of resources, equal learning opportunities (35%), "playing on level terms" (10%) or "same treatment" (45%) as part of their definition of social justice. When participants were further probed into how equal distribution of resources ensures equal justice, responses were rather unwieldy. Table 2 shows a summary of the results.

Table 2

Emerging Themes as essential for social justice

Being fair/just treatment	Equal distribution of resources	Equal learning opportunities	Playing on level terms
45%	55%	35%	10%

Student Support Services

More than half (60%) of the educational leaders interviewed believed that counselling programs were one of the means available to school leaders towards the achievements of social justice. 90% of respondents pointed at special education programs and inclusionary practices as the primary means of achieving social justice in their schools. 80% highlighted anti-bullying programs as effective means of achieving social justice, while 75% mentioned substance abuse programs as the vehicles towards achieving social justice in schools. 10% of participants also linked school equity with other issues for example the need for more security in schools and the need for more funding. Results are tabulated in table 3 (below).

Table 3

Student support services

Counselling Program.	Special Education and Inclusion programs	Anti-bullying programs	Substance abuse programs	Security	Funding
60%	90%	80%	75%	10%	10%

Enactment of Social Justice

One school leader stated that "while it is important for schools to enact in practice the principles of social justice, it is the students' family who should take the lead, while school can build on it." There were few responses which delved beyond the concept of social justice and moved beyond the idea of equity to encompass the deeper and larger concepts included in Bell's (2007) definition of social justice**.** Only one participant mentioned the full participation of all groups residing in the school. None of respondents mentioned "self-determination and interdependence of all individuals in a society" (Bell, 2007). 10% mentioned "individual social responsibility" (Bell, 2007), as essential pre-requisite for the fulfilling of social justice in schools. When asked to describe plans/activities/policies promoting social justice, which they have recently endorsed in their school and which are conducive to the promotion of social justice, 25% of school leaders interviewed resorted to explaining "the need for more training for school leaders and also of other staff on issues related to justice in Education".

30% of the participants linked the concept of justice with that of better policies to effectively tackle bullying and conduct behaviour. They also linked the notion of social justice to tougher penalties on drug trafficking, while 10% stressed the need for more effective measures on school absenteeism. Table 4 (below) shows a representation of the results.

Table 4

Enactment of Social Justice

Individual social responsibility	Need for more training on justice education	Anti-bullying programs	Tackling school absenteeism
10%	25%	30%	10%

Training on social justice and multicultural issues

A point to highlight is that 20% of those interviewed equated *social justice* with training for cultural diversity (in particular migrant education). They also stressed that need for more courses with Diversity/ Multicultural Education as focus. Definitions for multicultural education were more homogeneous than definitions given for social justice. 60% of participants stressed the need for more courses in Multicultural Education. They also stressed that the curriculum needs to have direct references to pedagogical practices which are more apt to schools/ classrooms with large number of foreigners. In their own words "we need to know how to teach these children" [referring to migrant children]. This is concomitant with the definition of *cultural proficiency* as

suggested by Robins et al. (2006), which stresses the need to "See the difference and respond effectively [to the] variety of environments". Table 5 (below) summarizes the findings.

Table 5

Training on Social Justice and Multicultural Issues

Training for Cultural Diversity	Training on Multicultural Education
20%	60%

Differentiated instruction, equity schooling and multicultural environments

60% of the school leaders interviewed mentioned "differentiated instruction", "learner-centered pedagogies", "the [effective] classroom inclusion of students from African cultures", "the [effective] classroom inclusion of students from Eastern Cultures" as necessary precepts towards justice in schools. School leaders however advised that not enough was done to "successfully deal with issues of race and racism." 70% of school leaders viewed multicultural education as a tool supporting students in becoming more aware of peers from other cultures. One school leader outlined that multicultural education is an "opportunity to help students become aware of the strengths and weaknesses of other students, and also provides an opportunity to help one another." Similarly, another school leader claimed that "…we cannot preach equality without understanding what are the means to reach equality standards." The researcher noted that school leaders who linked multicultural education with social justice also mentioned "equality of opportunities" as a desired goal (table 6).

Table 6

Differentiated instruction, equity schooling and multicultural environments

Training in Inclusionary Practices	Multicultural Education as a tool
60%	70%

Multicultural Education and Social Justice

During the interview, only 10% of the school leaders established a link between multicultural education and social justice. Some were strongly in favour of assimilatory practices whereby all children are introduced to new cultural practices as perpetuated by the dominant Maltese culture. As one school leader put it "I think we are overly tolerant … while accepting that there are other cultures around us, I strongly feel that we, as the host culture need to be respected more, since we are the ones who are providing a whole lot of services."

This view was echoed by another school leader who asked "Would I be accommodated to if I were to live in another country? I don't think so. So why should we be exceedingly accommodating to so many cultures?" Another school leader claimed that the study or promotion of multicultural education "would bring the smooth running of the school in jeopardy since the cultural standards of different racial groups might be used as excuses to permit unacceptable behaviours in classes.

It must be noted that 20% of the participants who linked multicultural education with restorative justice explained that the multicultural awareness should not be thought of as a preamble toward special considerations such as in disciplinary matters or levels of classroom participation or academic expectations. On the other hand, one school leader expressed a more considerate approach stating that

> in my [her] experience… cultural backgrounds have tremendous impact on students' behaviour…and this includes discipline, participation, relationships with the opposite gender etc. I strongly believe that we all need more knowledge, awareness and skills as to how we can be *truly just to all* students

(participant's emphasis). It is not uncommon that students of particular backgrounds are more often to referred for disciplinary procedures.

Only one participant expressed the need to educate all educators and not only those who came in direct contact with children. Four participants expressed the need to urge students to generate discussions about topics such as justice in education, anxieties arising from prejudice and discrimination or oppressive policies and practices. 40 % of respondents stressed that issues of racism could be addressed through multicultural education, development of non-discriminatory policies, anti-bullying and drug abuse programs. 35 % stated that internal politics could also result in forms of oppression. 5 % of respondents mentioned that gender discrimination as a form of oppression, while another 5% of respondents highlighted that not providing for persons with disability is a form of oppression. 5% also mentioned social class status as a form of oppression within their school community (table 7).

Table 7

Multicultural Education and Social Justice

Linked *ME with social justice	Linked ME with restorative justice	Linked ME with racism issues	Linked ME with internal politics	Linked ME with gender issues	Linked ME with disability issues	Linked Me with social status issues
10%	20%	40%	35%	5%	5%	5%

* ME= Multicultural Education

Cultural Competency

All educators (100%) who participated in the study exemplified beliefs compatible with five out of six levels of Robbins et al.'s (2005) continuum of *cultural proficiency*, with the greatest percentage of them being at the pre-competent level (35%), closely followed by *cultural blindness* (25%). None of the school leaders demonstrated cultural destructiveness in their responses to the interview (fig 1).

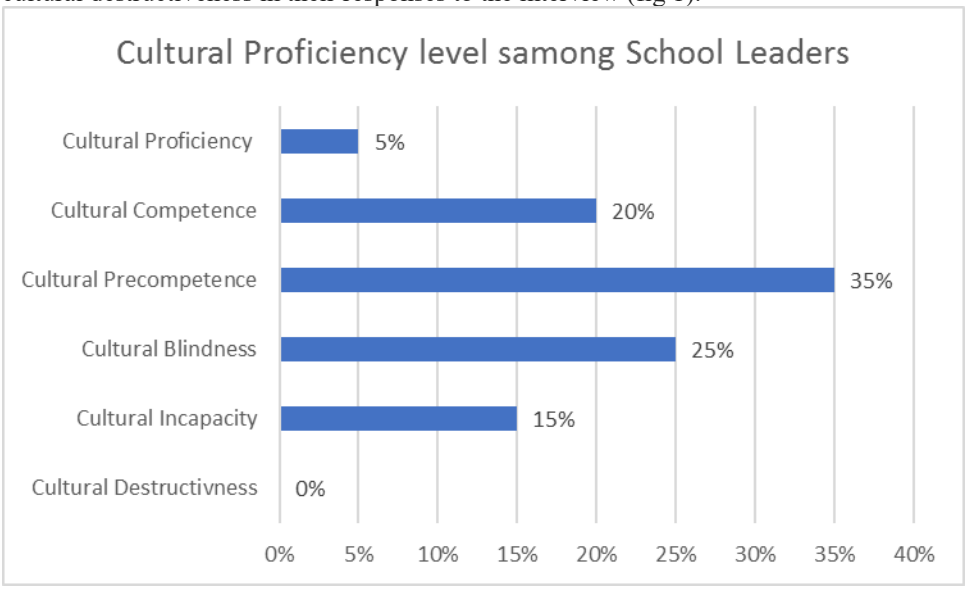

Figure 1: Cultural Proficiency levels among school leaders

Only 5 % of the school leaders in the study expressed views concomitant with Robbins et al.'s (2005) highest level in the Cultural Continuum (Cultural Proficiency). The responses conforming to this level showed that school leaders were "creating a socially just democracy that effectively serves the needs of all cultural groups" (Lindsey et al., 2009, pp. 6-7). The second highest level along the Cultural Continuum is the *competence level* which was exemplified by 20% of educators in the study. Seeing the difference and aligning those differences with the "individuals' and their group's values and behaviours to include all other cultures' values and behaviours" (Finch, 2016) characterizes this level within the cultural continuum. Responses mirroring this

category expressed positive regard towards differences and pledged support in favour of educational processes which advocate for change in the way cultural differences are perceived by the larger society. Concurrently, however, they expressed doubts as upskilling strategies needed for such aims to be fulfilled.

The largest group of respondents (35%,) fell within the cultural pre-competence set of responses i.e. they identified themselves with differences but indicated no desire or urgency to respond to perceived differences. 25 % of school leaders participating in the study stressed that it was more important to focus on similarities rather than differences among groups and individuals. These responses conformed more to the *cultural blindness* category. These responses were deemed to fit into the *cultural blindness* category which Robbins et al. (2005) defined as "seeing the difference but acting like you do not". This view emphasizes that differences do not really matter.

At the level of cultural incapacity, individuals or groups do not intentionally seek to be culturally destructive but rather lack the capacity to assist minority clients or communities. They tend to believe in a school system which maintains its biases of one dominant group over another or, in other words, assumes a paternalistic stance towards "lesser" races. None of the educators in the study expressed opinions in favour of policies and practices conducive to destruction of cultures or to members within the culture.

Responses from school leaders demonstrated minimal cognition and nominal efforts to link social justice and multicultural education. The role that multicultural education plays in the promotion of social justice was very weakly elaborated by school leaders. Similarly, educational practices advocated by school leaders to support multicultural education and social justice were rather loosely interlinked. Here, the author does not imply that school practices addressing evident inequities are not dealt with effectively in schools but rather that schools are devoid of systematic discussions enabling the mechanisms of social justice to promote the necessary change in educational establishments.

DISCUSSION

The results show that school leaders need to be better prepared to promote a broader and deeper understanding of social justice and equity. The author contends that the notion of social justice needs to become a major discourse among educational scholars and practitioners in an upcoming era of greater cultural and geographical shifts and where higher educational attainment is at stake.

The results also shed light on the school leader's role in developing a school culture conducive to learning; ensuring appropriate management of school operations and resources and facilitating collaboration between school staff and families. The need to effectively respond to the diverse needs of the school population with fairness and equity should also be high on the agenda, honed by school leaders.

Educational leaders are in an ideal position to promote positive social, emotional, cognitive well-being to all students under their care. In doing so, they guide their staff to promote learning which builds upon the students' unique strengths and challenges. This would ensure that students are properly supported with efficacious cognitive strategies which together with counselling school services provide the fabric of support to all students irrespective of their cultural origin.

School leaders advocating for social justice leadership would need to adopt a more constructivist approach to training teachers and learning support educators. This would then serve as a springboard for the construction of school policies which are concomitant with the principles of multicultural education. Moreover, formal training in Multicultural Education and social justice is needed. The links between Multicultural Education and Social Justice need to be further explored and researched. Teams composed of researchers specializing in diversity and differentiated teaching would need to team up with experts in Multicultural, equity and social justice education to develop research methodologies which are appropriate to continue researching this complex but very interesting area.

The study highlights the need for deliberate, elaborately planned activities targeting awareness, aptitude, knowledge and skills needed by all school leaders. As Dantley and Tillman (2009) explain, "leadership for social justice investigates and possess solutions for issues that generate and reproduce societal inequities" (p. 17). For a school leader to be aware of individuals or groups being "othered" s/he must possess an intriguing ability to look from different viewpoints the notions of culture, gender, race, socioeconomic backgrounds and academic abilities. Being able to look through the lenses of individuals and groups from minority cultures is an essential prerequisite towards the inclusion of justice as a central theme in educational leadership programs (Vassallo, 2016a). Robbins et al.'s (2005) cultural continuum provides educators with a flexible tool for

developing awareness and sensitivity towards minority groups which might be inadvertently oppressed by the dominant culture.

Bell (2007) delves into three important purposes of understanding theories of oppression. Oppression theory helps us to frame out our intentions and to implement them in the classroom. It provides a systematic tool which assists leaders in developing different courses of action. They also provide a springboard for questioning about the changing circumstance which minorities are frequently subjected to. Also, theory helps us to locate our position within our mammoth enterprise to learn from the past as we try to shape our future (p. 4).

University faculties across the world need to highlight their commitment towards social justice leadership rather than merely giving lip service for structural changes to happen. The recruitment of staff who strongly adhere to the principles of Multicultural and social justice education need to be actively taken up, establishing clear criteria against which attitudes and values are assessed. Such recruitment needs to be inclusive of individuals from racial and ethnic minority groups. Also, professional development sessions focusing on for education faculty staff would be an asset (Lopez 2010). Educational leadership programs need to have an internal evaluation mechanism which critically evaluates the program for dominant assumptions, underlying privileges and power imbalances. Byrne-Jimenez (2010) argues that such an exercise "require[s] faculty to rethink underlying assumptions, actions and policies, roles and relationships, pedagogical approaches, and levels of preparedness that challenge current modes of operation and force faculty to answer 'why' and for 'whom'" (p. 6). Leadership preparation programs need to integrate social justice awareness, knowledge, attitude and skills across the whole curriculum and not simply as an add on to an already overburdened curriculum. Rather than being lectured at the surface level aspiring school leaders need to be critical and transformative in their approach using a wide range of instructional strategies such as, case studies, field work experiences, historical inquiries, videos outlining oppression of minority groups, cross-cultural focus groups, autobiographies of oppressed individuals/ groups, interactive discussions targeting underlying assumptions, reflective practices that seek multiple perspectives and engage in broader social, cultural and political activities stimulating community outreach.

Moreover, engaging in action research as a tool for school improvement prompts school leaders to watch put for emerging issues within the school. This will assist them into mirror leadership, multicultural and social justice theory into practical inquiries, thus prompting them to challenge the existing status quo and find alternative solutions for improvement. This will also assist them into "looking through the lenses of others" (Vassallo, 2016, a, p.1) and consequently engage in "sustained conversations about differences" (Bustamante, R. M., Nelson, J. A., & Onwuegbuzie, A. J. (2009, p. 36).

In particular, Educational leadership programs need to be more inclusive of aspects of oppression with particular plans of action directed at:

1. the ubiquity of "social inequality woven throughout social institutions as well as embedded within individual consciousness" (Bell, 2007, p. 4);

2. the presence of "structural and material constraints that significantly shape a person's life chances and sense of possibility" (Bell, 2007, p. 4), affecting both individual and group's self-determination (Young, 1990);

3. the hierarchical echelons within society which benefit dominant or privileged groups and undermine the development of subordinated groups pushing them into abysses;

4. the ascribed dominant and subordinate roles by individuals (Friere, 1970, 2007); and

5. specific forms of oppression (Bell, 2007).

For educational leaders to be empowered to foster changes in schools, which pave the way for increased awareness of social justice, a strong knowledge base of oppression and anti-racist issues need to be in place. Educational Leadership Programs would need to put more effort and focus on equipping leaders to respond to inequity and social injustice that pervade their school walls. Allen, Harper and Koschoreck (2017) articulate that such programs would be inclusive of discussions about

a) the inclusion of all members of the school community;

b) a willingness to continuously examine one's own assumptions, beliefs, and practices;

c) exploring the benefits that diversity brings to the school community;

d) construction of safe and supportive learning environments;

e) the proposition that diversity enriches the school and

f) the development of a caring school community.

The common element present in each of these authors' expositions and which links educational leadership to social justice is action. Hence, Educational leadership preparation programs necessitate delving deeply into the study of oppressive practices, and cultivate the impetus to change practices, strategies and systems that precipitate inequity and oppression. Such endeavor is necessary to stimulate social actions to continue addressing issues of social justice in schools.

CONCLUSION

Based on literature review and subsequent analysis, it is evident that there is increased concern about whether school leaders are prepared to face the mammoth task of fostering social justice in their schools and classrooms. Research suggests that leadership preparation programs ought to engage in new ways that promote a broader and deeper understanding of issues related to social justice (Marshall & Oliva, 2005; Normore, 2008; Young & Mountford, 2006). The paper also attempts to spur dialogue across national and international borders, stressing the need for preparation programs to commit to pedagogies for social justice. Bogotch (2005) emphasizes that discussions on educational leadership competences need to deliberately and continuously refocus their attention on the need for social justice.

School leaders have an obligation to move beyond the rhetoric of abstract discourses and delve more into research and make the bold step to transform educational leadership courses from purely academic to agents of social change and social action. We need to be more critical into examining how recruitment processes, policies and procedures affect school leaders' initiatives into promoting social justice activities in schools. This implies that leadership programs should promote opportunities for working through anti-racist pedagogies, critical and constructive dialogues, multicultural and diversity education, and social justice. Given the scarcity of research linking multicultural school leadership and justice education, an online database consisting of multicultural educational leadership and social justice issues needs to be initiated. This would provide insight into the various contexts into which educational leaders operate in the quest for a more just and equity schools. These studies will provide a think-tank for the generation of ideas and experiences.

For reasons of ethical responsibility, confidentiality and anonymity, this study does not differentiate between various school leadership programs. However, the study poses a challenge to all programs and invites coordinators to critically examine and reflect on the embedded knowledge and views of participants and together construct a way forward. With only 55% of School leaders interviewed expressing familiarity with the concept of equity schooling, the impact of multicultural educational programs and their impact on institutional change towards social equity is unclear. With just 10% of school leaders linking knowledge of social justice to their preparation program (past or current), the development of culturally responsive leadership skills to mitigate against inequities in educational institutions and to empower minority group students to contribute to more socially just school policies and practices remains rather elusive.

Program development leaders within university colleges may feel that discussions about diversity in classrooms should be enough for future leaders to start implementing more socially just policies and practices, mitigate against biases and deep-seated perceptions. The study draws the attention of program providers that some misconceived assumptions are so ingrained that they fall below levels of awareness and are usually devoid of real understanding of those who are disempowered. The differences in responses to the research questions outlined above suggest that aspiring multicultural justice leaders may need different forms of support. One can also deduce that they are likely to face resistance when addressing issues of social inequity in their schools. The study sheds light on the importance for school leaders to continue developing moral imperatives which act as springboards for improves awareness on social and justice issues.

Research would need to refocus its efforts to examine how to explicitly address institutionalized disempowerment of minority groups so as to be able to support school leaders in their noble quest for supporting social justice. In the current educational debate, where segregation appears to be reoccurring (Rosiek & Kinslow, 2016), and discrimination is on the uprise (Colorado Civil Rights Commission, 2010), school leadership needs to focus on Equity Action Plans that can be used to stimulate reflection among educators on the impending issues on social justice and assisting them in developing concrete solution when injustices occur. For school leaders to enact change they must have a strong knowledge base in Multicultural Education principles so

as to identify and confront inequities and to include such issues in their daily planning. They would also need to develop in personal awareness and increase cognizance about institutionalization of oppression and the manners in which it is incessantly cycled. Finally, the author strongly believes that it is imperative for school leaders to be provided with enough budgeting resources to assist them in confronting and addressing inequality issues effectively through the implementation of responsive action plans addressing oppression cycles.

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LEARNING STYLES AND PERSONALITY TRAITS OF COMPUTER SCIENCE UNDERGRADUATES IN MALAYSIA

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ABSTRACT
Learners come with diversity in their individual needs and characteristics such as different learning styles and preferences, personality traits and cognitive abilities. The aim of this study is to investigate the relation between the Felder-Silverman learning styles, the Big Five personality traits, and gender among Computer Science undergraduates. 90 students completed a demographic data form, the Index of Learning Styles (ILS), and the Big Five Inventory (BFI). A quantitative research methodology was used to conduct the study. Statistical Package for the Social Sciences (SPSS, version 24.0) was used for statistical analysis. Results have shown that the most common learning style was visual and the majority of students had neuroticism personality trait. There was no significant relationship between gender and learning styles or personality traits. Further finding indicated that there was no significant relationship between the students' learning styles and their personality traits.
Keywords: Learning Styles, Personality Traits, Felder-Silverman Learning Styles, Big Five Traits, Education

INTRODUCTION

One of the major concerns of education sector is looking for ways of how students can learn most effectively and efficiently (Dunn, 1984; Mustafa, 2005; Smith, 1997; U.S. Department of Education, 2012). According to Jonassen and Grabowski (1993), individual differences play a vital role in the design of effective learning environments. Individual differences include different age, gender, cognitive abilities, meta-cognitive abilities, psychomotor skills, personality, anxiety, emotions and affect, cognitive styles, learning styles, experience, background knowledge, motivation, expectations, preferences, and interaction styles (Greenberg & Baron, 2008; Nakic, Granic, & Glavinic, 2015). There has been much research over the past 50 years focusing on individual differences and learning. As the focus on learning has shifted from conventional teacher-centered to student-centered, the issue of how best to support and encourage learners must be considered in order to foster better knowledge delivery. Thus, the individual differences between learners must be taken into consideration by the education practitioners. Our study is focusing on learning style and personality as the most important relationship between person type and learning style can be seen within the structure of personality (Messick, 1994).

The idea of matching learning styles to personality traits is not new (Eysenck, 1978; Fallan, 2006; Furnham, 1992; Highhouse & Doverspike, 1987; Ibrahimoglu, Unaldi, Samancioglu & Baglibel, 2013). Numerous studies have found that there is a correlation between learning styles and personality traits (Busato, Prins, Elshout, & Hamaker, 1999; Eysenck, 1981; Furnham, Jackson & Miller, 1999; Izadi & Rezai, 2015; Jackson & Lawty-jones, 1996; Kim, Roh, & Ihm, 2018; Komarraju, Karau, Schmeck, & Avdic, 2011; Salehi, Hedjazi, Hosseini, & Ebrahimi, 2014; Siddiquei & Khalid, 2018; Sottilare, 2006; Threeton & Walter, 2009). Studies conducted to determine learning styles and personality traits are able to reveal the learning requirements and needs. With the results obtained from the studies, teaching and learning programs could be configured to meet the needs of educators and students, and thus, progress can be made.

The aim of this study is to investigate the correlation between learning styles, personality traits, and gender of public university students. Hence, the following research questions will be answered:

1. What is the predominant learning style and personality trait of Computer Science students?
2. What is the correlation of learning styles and personality to gender?
3. Is there a significant relationship between the students' learning styles and their personality types?

The researchers identified Felder and Silverman learning style model (FSLSM) as a suitable model for learning style classification and the Big Five (BF) personality model is chosen as the personality construct. This topic was investigated for the purpose of providing more information regarding how to better serve the educational needs in the context of (1) adapting individual differences in a development of a holistic curriculum and (2) assisting educators to understand how students learn, thus proper academic guidance can be given to help them in the learning process. The rest of paper constructed as Section 2 reviews all literatures which are related to this

research. Section 3 explains the overview of research methodology. Result of the study is elaborated in Section 4. Section 5 draws the discussion of this study and conclusion is presented in Section 6.

RELATED WORK

The literature related to (1) learning style models with specific reference to the Felder and Silverman learning style model (FSLSM), (2) theories of personality with specific reference to the Big Five (BF) personality model, and (3) the correlation between learning styles and personality traits are discussed in this section.

Learning Style Models

A learning style model classifies students according to where they fit on a number of scales pertaining to the ways they receive and process information (Felder & Silverman, 1988). These models specify a small number of dimensions that collectively provide a good basis for designing effective instruction (Felder, 2010). In addition, a learning style model has a learning instrument accordingly. This instrument enables educational practitioners to classify the students according to their preferred way of learning. Five commonly used learning style models based on Coffield's review (2004) are Kolb Learning Style Model (Kolb, 1984), Honey and Mumford Learning Style Model (1982), Dunn and Dunn Learning Style Model (Dunn & Dunn, 1974), Gardner's Multiple Intelligences Theory (1983), and Felder Silverman Learning Style Model (Felder & Silverman, 1988). Felder's learning style model was selected for this research because it is the most referenced model and widely adopted by technology-enhanced learning systems (Feldman, Monteserin, & Amandi, 2015). The main purpose of Felder's learning style model is to enhance the teaching styles in engineering education as learning styles of most engineering students and teaching styles of most engineering professors are incompatible in several dimensions (Felder & Silverman, 1988). Its strengths are based on the concept of learners' behavioral tendencies and proposed teaching styles, and the fact that it expresses both learning style preferences and the strength of that preferences.

Felder Silverman Learning Style Model

The Felder Silverman learning style model (Felder & Silverman, 1988) is based on Jung's theory of psychological types (Jung, 1921) and Kolb's model (Kolb, 1984). In Felder's model in which developed to describe the learning styles in engineering education, learners are classified into four dimensions: Processing (active-reflective), Perception (sensory-intuitive), Input (visual-verbal), and Understanding (sequential-global). Every dimension of Felder's model defines two opposite learning styles known as poles, see [Table 1].

Table 1: Felder's learning dimensions (Carver, Howard, & Lane, 1999).

Definition	Dimensions		Definition
Do It	Active	Reflective	Think About It
Learn Facts	Sensing	Intuitive	Learn Concepts
Require Pictures	Visual	Verbal	Require Reading Or Lecture
Stey By Step	Sequential	Global	Big Picture

Some of the recent works that employed Felder's model were by Deborah et al. (2015), Yang et al. (2014), Graf and Kinshuk (2013), Pham and Florea (2013), and Saberi and Montazer (2012). This popularity is because of Felder's model:

- describes the learning style of a learner in more detail, distinguishing between preferences on four dimensions (Graf, Viola, Leo, & Kinshuk, 2007; Konert, Gutjahr, Gobel, & Steinmetz, 2014).
- enables practitioners to implement only one or two dimensions of learning style (Crockett, Latham, Mclean, Bandar, & Shea, 2011; García, Amandi, Schiaffino, & Campo, 2007; García, Schiaffino, & Amandi, 2008; Zatarain-Cabada et al., 2010).
- is particularly designed for engineering students and thus, many advanced learning technologies are developed to teach computer science courses (Jeremic´, Jovanovic´, & Gasevic´, 2012; Klašnja-Milićević, Vesin, Ivanović, &, Budimac, 2011; Wang, Li, & Chang, 2006).
- incorporates teaching styles that match preferred learning styles (Felder & Silverman, 1988).

Theories of Personality

Personality is considered as a very important category of individual differences since the individual is often judged depending on his/her personality. According to Messick (1994), personality traits can assist or hinder learning performance depending on the nature and intensity of the personality characteristics. In an online education, extraversion and introversion personality traits may be beneficial in determining student's performance. The introverts perform better in their online learning course (Irani, Telg, Scherler, & Harrington, 2003) than extroverts because the environment itself relies on the absence of verbal communication (Bayless,

2001) and offered additional time for reflection (Downing & Chim, 2004). Similarly, the perceivers and judgers may indicate individual performance as the learner's ability to maintain deadline without instant face-to-face interaction (Rimmerman, 2005). Hence, it suggests that personality plays an essential role for the understanding of individual differences in learning (Keller & Karau, 2013; Pavalache-Ilie & Cocorada, 2014). Furthermore, personality traits seem suitable as underlying factors that explain different typical learning patterns (Vermetten, Lodewijks, & Vermunt, 2001), thus resulting in valuable aspect in educational contexts such as academic performance and motivation.

Big Five Personality Model

The initial Big Five (BF) personality model has been employed by Allport and Odbert (1936). After decades of intensive research, the psychologists are reaching the consensus on using the BF (also known as Five-Factor) model with the five domains of personality traits to describe individual's personality as it is essentially correct in its representation of the structure of traits (McCrae & John, 1992). John and Srivastava (1999) reported that the BF structure does not suggest the reduction the personality differences to only five traits, but it represents personality at the broadest level of abstraction. Each dimension of the model encapsulates a large number of distinct and more specific personality features. The five main domains are openness, conscientiousness, extraversion, agreeableness, and neuroticism, refer [Figure 1]:

- Openness to experience – Curious, intelligent, and imaginative. High scorers tend to be artistic and sophisticated in taste and appreciate diverse views, ideas and experiences. In comparison, low openness indicates that people are practical, traditional, and down-to-earth.
- Conscientiousness – Individual is dependable, careful, responsible, organized and persevering. Conscientious individuals are extremely reliable and tend to be high achievers, hard workers, and planners. They have the relatively low interactions with the social networks to avoid distraction and procrastination.
- Extraversion – Outgoing, amicable, assertive, and talkative. Friendly and energetic, extraverts draw inspiration from social situations. On the other hand, introverts are reserved, serious, and tend to be alone.
- Agreeableness – Cooperative, helpful, and nurturing. People who score high in agreeableness are peace-keepers who are generally optimistic and trusting of others. They tend to be courteous, flexible, forgiving, and avoid conflict. Agreeableness is said to have favourable influence to social interactions and their perceived quality.
- Neuroticism – Individual with low emotional stability shows negative characteristics such as anxious, insecure, and sensitive. Neurotics are moody, tense, and easily tipped into experiencing negative emotions. They usually feel depressed, sad, and not confident.

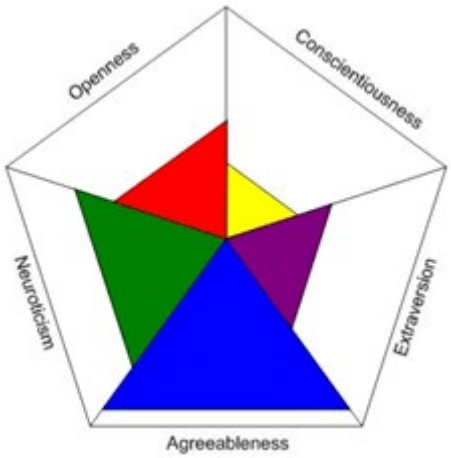

Figure 1: The Big five factors represent an individual's personality (Golbeck, Robles, & Turner, 2011).

Learning Styles and Personality Traits

Many researchers have studied the relationship between learning styles and personality through conventional and automatic approaches, including Eysenck (1978) which indicated that there is correlation between personality traits and learning styles. Meanwhile, Jackson and Lawty-jones (1996) reported that each of the elements of learning styles is related to at least one of the personality traits. Additionally, Furnham et al. (1999) found the relationship between personality traits and learning styles, and have clearly asserted that learning styles are sub set of personality.

In the early days of applying personality concepts in the field of learning, there are two major dimensions of personality are being focused namely neuroticism (N)-stability and extraversion (E)-introversion (Eysenck, 1978). In his work, Eysenck concluded that introverts are better motivated in performance tasks than extraverts, with the condition that their ordinary of effort and attempt and the use of working memory capacity is closer to the maximum (Eysenck, 1981). In other study conducted by Furnham (1992), it is reported that students who are extravert tended to be active in their response to information while introvert students tended to be reflective as predicted. Furthermore, a study investigated by Busato et al. (1999) presented that neuroticism correlated positively with the undirected learning style and negative correlation with the meaning directed and reproduction directed learning styles which was taken from Vermunt's learning styles (Vermunt, 1992, as cited in Coffield, Moseley, Hall, & Ecclestone, 2004).

An increasing research trend of personality roles in the learning process could be seen particularly in the last 25 years. For instance, Highhouse and Doverspike (1987) explored the relationship between college students' learning styles and personality types. They found that Kolb's learning styles are correlated significantly with personality types. On the other hand, Furnham (1992) investigated the relationship between Honey and Mumford's Learning Style Questionnaire (LSQ) and the personality traits in the Eysenck *Personality* Questionnaire (EPQ). The result shows that extravert students are quite clearly activists and pragmatists while introvert students are reflectors. In addition, Furnham also reported that neuroticism moderately correlated with the learning styles and neurotics were more likely to be theorists. In another study conducted by Sottilare (2006), a highly significant correlation between openness and extraversion personality traits and active-reflective and sensing-intuitive learning styles were found. Additionally, Komarraju et al. (2011) have examined a study on the correlation between the BF personality traits, learning styles, and academic achievement. In their study, the Inventory of Learning Processes (ILP) by Schmeck, Ribich, and Ramaniah (1977) has been used as a learning style model which categorized learning styles as synthesis analysis, methodical study, fact retention, and elaborative processing. The results of this study indicated that two of the BF traits i.e. conscientiousness and agreeableness, were positively correlated with all four Schmeck's learning styles, whereas, neuroticism was negatively related with all four learning styles.

The literature showed that the main factors of personality are closely related to learning styles. Hence, throughout the research, it has become clear to researchers and practitioners that there is a significant correlation between learning styles and personality traits.

RESEARCH METHOD

This quantitative research was carried out with a descriptive statistical method to explore the learning styles and personality traits of students and their relation to the variables of gender.

Participants

In the study, 152 students from Universiti Sains Malaysia (School of Computer Sciences) were chosen by the process of convenience sampling. The first year students of Computer Science program who is taking Discrete Mathematics course were given online questionnaires. After the removal of invalid ones, 90 questionnaires were evaluated in total. The sample comprised of 54.4% female (n = 49) and 45.6% male (n = 41).

Instruments

Students completed three online self-report inventories: (1) The demographic data form designed by the first author that gathers participant background information such as name, gender, age, race, and course. (2) Index of Learning Styles (ILS), developed by Felder and Solomon (2003) to identify learning style preferences in Felder's model. (3) Big Five Inventory (BFI) (John, Donahue, & Kentle, 1991), a self-report inventory for identifying personality based on the BF personality model.

Index of Learning Styles

The Index of Learning Styles (ILS) is a 44-items questionnaire with 11 items per dimension and each item has two choices ('a' or 'b', corresponding to one or the other category of the dimension). These learning style preferences were categorized by using values between -11 and +11 for each dimension, and only the odd numbers were suggested in order to characterize each learning style (Felder & Spurlin, 2005). When answering a question, for instance, with a visual preference, +1 is added to the value of the visual/verbal dimension, whereas an answer for a verbal preference decreases the value by 1. Therefore, each question is answered either with a value of +1 (answer 'a') or -1 (answer 'b'). Answer 'a' corresponds to the preference for the first pole of each dimension (active, sensing, visual, or sequential), answer 'b' to the second pole of each dimension (reflective, intuitive, verbal, or global). Thus, using the same example above, if a student's score of 'a' responses is 0 or 1, it

would represent a strong preference for verbal learning, whereas 10 or 11 'a' indicates strong preference for visual learning (Felder & Spurlin, 2005). In addition, if a student's score resulted a balanced value, it shows that the student does not have a specific preference for one of the two poles of a dimension.

Big Five Inventory

The Big Five Inventory (BFI) consists of 44-items questionnaire on typical behaviors or reactions. It measures "neuroticism", "extraversion", "openness", "agreeableness" and "conscientiousness" factors. In the inventory, the five-point Likert-type questions are rated on a five-step scale from 1 (disagree strongly) to 5 (agree strongly). The BFI was developed to represent the prototype definitions developed through expert ratings and subsequent factor analytic verification in observer personality ratings (John & Srivastava, 1999). This inventory has been shown to be a satisfactory tool in associating BF traits with elements in educational context such as motivation (Busato et al., (1999), academic achievement (Komarraju et al. (2011), and predicting learning approaches (Zhang, 2003).

Data Analysis

Statistical Package for the Social Sciences (SPSS, version 24.0) was used to analyze the collected data. First, this study is attempted to investigate the predominant learning styles of Computer Science undergraduates. The first research question was answered by calculating the frequencies and percentages of the ILS and BFI data collected from the completed online questionnaires. The learning style and personality trait with the highest frequency and percentage were identified as predominant. Second, the study sought to examine the correlation between the participants' learning styles and personality traits to gender. To answer the second research question, Chi-square analysis was used to examine the relationship of learning styles and personality according to gender. Finally, to address the third research question, one-way Analysis of Variance (ANOVA) was used to investigate any occurring relationship between learning styles and personality traits.

RESULTS

Findings of the statistical analysis are presented in this section. Table 2 shows the distribution of students' learning styles according to gender. The result of the study suggested that visual learning style was the predominant classification of 71 (78.9%) students within this study. Meanwhile, only 19 students (21.1%) had verbal learning style. Visual and verbal learning styles fall under the same dimension that is Input dimension. This dimension relates to how learners prefer to receive information. Visual learners remember best what they see for examples pictures, diagrams, time lines, films, and demonstrations, while verbal learners remember much of what they hear or read. The statistics also show that male students demonstrated a stronger preference for active (68.3% to 49.0%), sensing (68.3% to 57.1%) and global (39.0% to 36.7%) learning styles compared to female. Contrarily, the female students displayed higher preference towards the other learning styles when compared to male such as intuitive (42.9% to 31.7%), reflective (51.0% to 31.7%), and sequential (63.3% to 61.0%).

Table 2: Distribution of students' learning styles according to gender (n = 90).

	Sensing		**Intuitive**		**Visual**		**Verbal**		**Active**		**Reflective**		**Sequential**		**Global**	
	N	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Female	28	57.1	21	42.9	42	85.7	7	14.3	24	49.0	25	51.0	31	63.3	18	36.7
Male	28	68.3	13	31.7	29	70.7	12	29.3	28	68.3	13	31.7	25	61.0	16	39.0
Total	56	62.2	34	37.8	71	78.9	19	21.1	52	57.8	38	42.2	56	62.2	34	37.8

Chi-square analysis ($p<.05$)

In the study of personality traits variable, descriptive findings indicated that neuroticism personality trait with 55.6 per cent has the highest rate among the students, refer [Table 3]. While the lowest frequency, with 4.5 percent was the agreeableness personality trait. The rest of the students exhibited low level in personality traits of openness (10.0%) and conscientiousness (6.7%), and medium level in extraversion (23.3%).

Table 3: Distribution of students' personality traits according to gender (n = 90).

	Openness		Conscientiousness		Extraversion		Agreeableness		Neuroticism	
	n	*%*	*N*	*%*	*N*	*%*	*n*	*%*	*n*	*%*
Female	6	12.2	4	8.2	11	22.4	2	4.1	26	53.1
Male	3	7.3	2	4.9	10	24.4	2	4.9	24	58.5
Total	9	10.0	6	6.7	21	23.3	4	4.5	50	55.6

Chi-square analysis ($p<.05$)

Pearson correlation analysis was calculated to check significant relationships among the research variables. The results of correlation analysis to examine the relationship between learning styles and gender in Table 4 shows that students' learning styles did not significantly vary according to their gender. Similarly, Table 5 also revealed that personality traits did not significantly vary to gender.

Table 4: Correlation coefficient between learning styles and gender.

Variable	Pearson	Chi-square	Pearson Correlation
	Value	Asymptotic Significance (2-sided)	
Sensing – Intuitive	1.181	.277	.115
Visual – Verbal	3.009	.083	-.183
Active – Reflective	3.413	.065	.195
Sequence – Global	0.050	.823	-.024

Correlation is significant at the 0.01 level (2-tailed)

Table 5: Correlation between personality traits and gender - ANOVA result.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1.383	1	1.383	.701	.405
Within Groups	173.506	88	1.972		
Total	174.889	89			

One-way ANOVA (F .701, p>.001)

In addition, Analysis of Variance test (ANOVA) was used to investigate the relationships between students' learning styles and their personality traits. The mean data for each learning styles dimension (Sensing-Intuitive, Visual-Verbal, Active-Reflective, and Sequential-Global) among the five personality traits showed there was no statistically significant difference. It could be seen in Table 6 that Sensing-Intuitive learners had higher conscientiousness scores (F = 0.583, p = .676) than other learning styles. Similarly, Visual-Verbal learners were revealed with higher conscientiousness scores (F = 0.407, p = .803) than other learning styles.

Table 6: Mean (Standard Deviation) of learning styles among personality traits.

Learning Style	Openness (n = 9)	Conscientiousness (n =6)	Extraversion (n = 21)	Agreeableness (n = 4)	Neuroticism (n = 50)	F-ratio
Sensing – Intuitive	1.44 (.527)	1.50 (.548)	1.48 (.512)	1.25 (.500)	1.32 (.471)	.583
Visual – Verbal	3.22 (.441)	3.33 (.516)	3.19 (.402)	3.00 (.000)	3.22 (.418)	.407
Active – Reflective	5.33 (.500)	5.33 (.516)	5.52 (.512)	5.50 (.577)	5.40 (.495)	.378
Sequence – Global	7.22 (.441)	7.33 (.516)	7.43 (.507)	7.25 (.500)	7.40 (.495)	.382

The mean difference is significant at the 0.05 level

Meanwhile, a one-way ANOVA showed that the difference in scores for Active – Reflective learners (F = 0.378, p = .823) and Sequence – Global learners (F = 0.382, p = .821) were not statistically significant. Based on findings of performed study it was cleared that there was no significant relationship between learning styles and personality traits.

DISCUSSION

The present study examined (1) the predominant learning style and personality trait of undergraduates; (2) the variation of learning styles and personality traits according to their gender; and (3) the relationship between their learning styles and personality traits. Learning style and personality are examples of the individual differences in human, in our research scope was students. Identifying students' learning styles is crucial in teaching and learning to help educators to understand how students learn and to provide personalization (Graf & Kinshuk, 2007). Studies conducted to determine learning styles and personality traits have provided valuable information about the relationship between the two of them and must be considered in order to foster better knowledge deliverable.

Descriptive findings indicated that the predominant learning style of the undergraduates was visual learning. The literature explains that the strength of a visual learner is remember best in what they see - pictures, diagrams, time lines, films, demonstrations (Felder & Silverman, 1988). Most college-aged students are visual learners (Clarke, Flaherty, & Yankey, 2006; Kibasan & Singson, 2016) and as we know, complex processes or algorithms and mathematical functions are a bit difficult to understand. Their brains are "wired" differently than older people, thus, they process information in a randomized or networked pattern which allows them to build concept maps (Baker, Matulich, & Papp, 2007). On the contrary, the least learning style is verbal. This is supported by Shuib and Azizan (2015) who observed a strong preference for visual learning style as compared to verbal in Malaysian public university. This explains why students become disinterested and disengaged very

quickly when they are asked to sit through a traditional 50-minute class involving lectures only (Baker, Matulich, & Papp, 2007).

From the results, most Computer Science students were in low level of openness, conscientiousness, and agreeableness personality traits, and medium level of extraversion. The predominant personality trait of the undergraduates was neuroticism. Neurotic person is characterized as having a tendency to have negative emotionality, such as feeling anxious, nervous, sad, and tense (John & Srivastava, 1999). Students might not be attracted to the subjects being taught and less motivated but at the same time they were fear of failure, or of test-taking anxiety (De Raad & Schouwenburg, 1996). Due to that, they were lack of focus and had experiencing studying as stressful. Moreover, it was found that neuroticism is linked with a lack of critical ability and problems in understanding how things relate to each other (Schouwenburg, 1995, as cited in Heinström, 2000). As Computer Science students, they need to learn programming languages and they may find that the languages are difficult to learn. Learning to program is often a process of learning to break a system into its component parts, leaning their individual functions, and working through the relationships between them. Likewise, critical thinking in programming is learning to tackle complex problems and the skill of breaking down tasks and further understand them through their component parts. Failure of doing that leads to rote action. As a consequence, they only concentrate on memorizing the lesson materials so that, they can get through the exams with success. They are just not interested to find a deeper meaning or understanding of the materials, and this is known as surface learning style (Entwistle, 1988). Besides, student population of more women than men also contributes to higher neuroticism in this study. This is aligned with a study by Ireland, Hepler, Li, and Albarracín (2015) where women tend to score higher on neuroticism than men do.

In this study, it was found that learning styles and gender were independent for Computer Science students on all scales. This finding is consistent with previous research that also found no significant relationship between learning styles and gender (ALQahtani & Al-Gahtani, 2014; Escarlos Jr. & Escarlos, 2018; Khan et al., 2018; Kim et al., 2018; Pornsakulvanich, Dumrongsiri, & Sajampun, 2012; Shuib & Azizan, 2015; Siddiquei & Khalid, 2018; Torres, 2014; Yanardöner, Kiziltepe, Seggie, & Sekerler, 2014). The reason for this finding could be partly due to the changing learning environment with increasing technological influences where learners are more and more adapting themselves to such changes, regardless of their gender difference (Shuib & Azizan, 2015). This is supported by Din et al. (2012) who observed that there was no difference between Malaysian male and female undergraduates associated with their ability to acquire meaningful learning experiences through technology. In the relationship between personality traits and gender, it is interesting to note that this study found that personality traits among the learners are not sensitive to gender difference. This finding is consistent with results from Khan et al. (2018), Yanardöner et al. (2014) and Hakimi, Hejazi, and Lavasani (2011). However, Kim et al. (2018) and Siddiquei and Khalid (2018) reached different results in this regard. Gender and MBTI thinking-feeling (TF) variables were statistically significant in Kim et al. (2018) and Siddiquei and Khalid (2018) had found gender differences in three dimensions of personality out of the five: agreeableness, conscientiousness, and neuroticism. These contradictory results perhaps are resulted from differences in cultural beliefs, respondents being studied, gender roles in each society, and clichés within a society (Hakimi et al., 2011).

Finally, most of previous studies pointed out that learning styles had significant relationship to personality traits (Ibrahimoglu et al., 2013; Kamarulzaman, 2012; Komarraju, 2011; Marcela, 2015; Sadeghi, Kasim, Tan & Abdullah, 2012; Salehi et al., 2014). In contrast, our finding revealed that students' learning styles had no significant difference to their personality traits. This is consistent with Khan et al. (2018) and Yanardöner et al. (2014), but it is difficult to compare the correlation results of this study to both of the studies as they utilized different measuring tool i.e. the Learning Style Inventory (LSI) (Kolb & Kolb, 2005). On the surface, there seems to be a link between the individual learning styles and his or her personality. Nevertheless, the use of different models and measuring tools might lead to different result outcome. Another reason for this contradictory results could be due to differences involved in age of participants and cultural.

CONCLUSION

In our study, the relationship between learning styles and personality traits were addressed. The result of the study suggested that respondents in this study have a strong preference for visual learning style as compared to verbal. Whilst there are ongoing debates relating to how education practitioners should consider individual differences such as gender when designing learning materials, this study contrarily has discovered that there were no significant gender differences in the learning styles and personality traits among the students. Finally, the findings of this study revealed that the difference of personality traits and learning styles between male and female learners was not significant as well. Even though some of the results of this study were not consistent with previous studies, they indirectly resembled past research on this topic, that a relationship was found

between learning styles and personality traits. Similar studies, with larger samples of different groups and different statistical methods and variables, they could contribute to the relevant literature.

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SOCIAL PRESENCE IN AN ONLINE TEACHER EDUCATION PROGRAM: PRE-SERVICE TEACHER PERCEPTIONS

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ABSTRACT
The Prekindergarten Associate degree program, offered on the regional campuses at a public Midwestern university, is a teacher preparation program designed for students planning to teach children birth through age five in a childcare or preschool setting. Many students in the program are nontraditional, often working full time and caring for family members. The program was changed from face-to-face to a fully online format to improve access for these nontraditional students. As the program launched, the researchers were concerned about the impact of moving to a fully online format on the online social learning environment. Students from two online Prekindergarten courses were invited to complete a survey to learn more about their perceptions of social presence in the online courses. Additionally, a small group of randomly selected students was invited to participate in an interview. Study participants reported that the new online format created an accessible way to earn their associate degree that they would not have been able to do if the program was in a face-to-face format. However, some students also stated that social presence was not a high priority since their primary goal was to earn a degree.
Keywords: online instruction, pre-service teachers, social presence, teacher education

INTRODUCTION

While college enrollment has been in decline for the past several years, enrollment in online college courses continues to increase (Seaman, Allen, & Seaman, 2018). As of fall 2016, 31.6% of higher education students have enrolled in at least one online course. Distance education is not a recent phenomenon. However, the growth of online education in traditional college institutions has made it challenging to meet the demand for online courses and programs (Santilli & Beck, 2005; Lloyd, Byrne & McCoy, 2012; Lee, 2017). Along with the increasing demand, there is a growing body of literature focused on the quality of online instruction, including the opportunities for engagement and social interaction in online learning spaces (Fung, 2004; Tezer & Bicen, 2008; Zhang, Allon, & Van Mieghem, 2017; Amemado & Manca, 2017). Since teaching and learning are inherently social endeavors, it is critical to consider the effects of geographical and psychological distance between instructors and their students (Bibeau, 2001).

The demand for online teacher education programs has grown dramatically (Faulk & King, 2014). Given the flexibility of online learning programs, they are an attractive option for nontraditional students who are employed full-time and have significant commitments outside the classroom (Li & Irby, 2008) which may in turn positively impact student persistence and graduation rates (Wlodkowski, 2003; Pontes, Hasit, Pontes, Lewis, & Siefring, 2010). Additionally, with a variety of online learning options now being offered, students can work at their own pace, providing greater flexibility (DuPlessis, Walker, & Naughton, 2008). Students who participate and stay engaged in online courses also have lower dropout rates (Lee & Choi, 2010) and potentially higher grades (Zhang et al., 2017). With the separation by distance in online learning, there is a lack of a shared physical space for students and instructors to collaborate and share ideas. The development of virtual synchronous options may provide students additional opportunities to interact and develop social connections (Rabe-Hemp, Woollen & Humistan, 2009). However, it can take time for students to feel comfortable learning in an autonomous format (Kop, 2011).

While the literature on online learning and social presence is expansive, research is scarce on the topic of online teacher education programs. This study aims to provide detail on the development of social presence in two required teacher education courses that were moved from face-to-face to a fully online format. The purpose of this study is to explore the development of social presence as well as student perceptions of social presence in two online teacher preparation courses. The research questions for this study are the following: (a) How do students (pre-service teachers) perceive the importance of social presence in online courses? (b) Did the two online teacher preparation courses promote the development of social presence? Adapting a part of an instrument developed by Arbaugh et al. (2008), the researchers gathered data on student perspectives f social presence. Additional data were collected through open-ended survey questions and in-person interviews.

LITERATURE

Establishing a strong sense of community in online courses can benefit students and can be especially helpful for those students in teacher education programs (West, Jones & Semon, 2012). A sense of community refers to the interdependence with others and the belief that someone is a member of a defined group (Sarason, Davidson & Blatt, 1986). Furthermore, Rovai (2002) found that a sense of community could also contribute to the successful completion of an online course. There are several characteristics, which can result in a successful and positive online learning experience for students. One important characteristic is the development of relationships that help to connect students through engaging online activities and assignments. Specifically, the simple exercise of an introduction forum can add to a student's sense of community (Blasi & Broad, 2002; Zhang et al., 2017). Zhang et al. (2017) observed that when students increase their engagement in their online courses, they experience an increase in quiz completion rates and course grades. Environments that integrate opportunities for engagement and building relationships are critical factors in successful online courses (Paloff & Pratt, 2007).

While there are a number of unique challenges with creating social presence in online learning environments, scholars have noted several methods that attempt to address the issue through increasing engagement among students as well as with the instructor. Low student and instructor participation, isolation, and procrastination are some of the most commonly cited issues raised by students in online courses (Rabe-Hemp, Woollen & Humistan, 2009). However, some online students do possess a desire to make connections and interacting with others (Mays, 2016; Wickersham & Dooley, 2006). These social connections are not limited to peers and often include teaching faculty. For some students, the social connections built with faculty benefitted them during their time in college, and many have expressed a desire to continue these connections after graduation (Mays, 2016).

Scholars suggest several processes and practices to encourage engagement and the development of social presence in online courses. For instance, Lehman & Conceição (2010) recommend incorporating a welcome email, scavenger hunt, regular announcements, assessment feedback, and discussion forums to help build social presence. Dunlap and Lowenthal (2014) suggest sharing teacher and student biographies, conducting peer reviews, and including "no jeopardy" group work where students are not penalized if group members do not complete their part of the assignment. Richardson et al. (2012) also suggest group projects, but also suggest chat and web conferencing, blogs, and student-generated content.

One of the most commonly used teaching techniques to develop social presence are discussion forums. However, poor design and facilitation can impede the development of social presence (DeNoyelles et al., 2014). When employing discussion forums, instructors should consider how students are asked to engage in the forum. Often, following the prompt, response, and reply approach leads to less than substantive results (Darabi et al. 2011). Group assignments can be especially challenging to develop and complete in an online course, but cooperative group assignments can encourage students to work together interactively (Menchaca & Bekele, 2008). Collaborative tools, such as forums and chat rooms, are critical for reflecting and discussing course content in an online course. Students are more apt to comment on their peer's work and participate in discussions when collaborative tools are provided. Haythornthwaite and Bregman (2004) describe three aspects of persistent conversation that should be present in online collaborative or group activities. Visibility is how the participants will be "seen" by others. Visibility can be accomplished through any of the available means of communication provided within the course (e.g., email). The timing of students' communication can also influence how group members interact and can be an opportunity for conversations between students. Finally, the method of how students express themselves can affect group communication.

The human element can sometimes be lost or masked with online instruction. Intimacy and immediacy are two components that are instrumental in constructing a conceptual framework used to understand the relationship between online interaction and social presence (Tu & McIsaac, 2002). Intimacy is often conveyed through speech and verbal and nonverbal cues (Walther & Burgoon, 1992). Body language and the topic of conversation are two factors that can affect the level of intimacy in online course discussions (Ozenc & Farnham, 2011). For example, a controversial topic in an online discussion can influence the level of intimacy among a group of students. Immediacy pertains to the psychological distance between individuals (Mehrabian & Wiener, 1968; Dixson, Greenwell, Rogers-Stacy, Weister, & Lauer, 2017). Additionally, online courses should focus intently on embedding interaction and engagement opportunities rather than solely content and knowledge acquisition (Jonassen, 2007). Ensuring that students and faculty make connections and engage with one another should be a crucial aspect of all courses, whether they are offered face-to-face or online.

The researchers adopted the concept of social presence as described in the Community of Inquiry (CoI) framework presented by Garrison, Anderson, and Archer (2000). Within the CoI framework, social presence is defined as, "…the ability of participants in the community of inquiry to project their personal characteristics into the community, thereby presenting themselves to the other participants as 'real people' (Garrison et al., 2000, p.89). The perception of connectedness, awareness of others, and a sense of community are all characteristics used to describe social presence. The context of communication is another aspect of social presence that is shaped through a variety of factors such as familiarity, motivation, and commitment to learning. The literature on learning includes many examples of where a focus on student-student and student-instructor interaction can benefit student outcomes. Online teacher education programs, specifically those focused on developing pre-service teachers, pose another dimension to online learning and need for social presence discussion.

METHOD

Setting

This study involves two online courses in the Prekindergarten Associate of Applied Science degree program at the regional campuses of a public Midwestern university. The University's Institutional Review Board exempted the study. The first course, EDT 273: Prekindergarten Integrated Curriculum I prepares students for work in a variety of professional childcare environments with children ages birth to five years old. The course also includes a 24-hour practicum in a preschool or childcare setting. The second course, FSW 283: Introduction to Child Care Administration focuses on the administration and management of childcare programs. The course also focuses on leadership and management skills in the field of early childhood education.

One of the researchers in this study was also the instructor for the two courses used in this study. Opportunities for instructor-student engagement were provided through weekly announcements, informational emails, and feedback provided on assignments and papers. There were multiple opportunities for student-student engagement using a wide variety of discussion forums, including twelve forums for EDT 273 and nine for FSW 283. The courses included a variety of assignments and activities to promote community building and social presence, especially in the introduction Modules. One example of a community-building activity was a scavenger hunt, in which the students had a document with a list of qualities, values or characteristics. The students had to find someone in their course who possessed each of the characteristics. For example, a characteristic might be, "Find someone that has provided childcare in his/her own home." The students would then chat or email with each other to find a classmate who fits the description. By the time the assignment was completed, the students had interacted with each other multiple times. The introduction module in each of the EDT and FSW courses also include icebreaker activities, which were created for having students share information about themselves (unrelated to course content). For example, in one of the courses students were asked to find something in their purse, wallet, or backpack that has significant meaning to them. The goal was to learn something about their peers based on an item that they possess. Providing self-disclosure about life outside the class is an effective way for instructors to incorporate a human social presence (Wise et al., 2004).

Participants

The participants include students in the fully online Prekindergarten Associate of Applied Science degree program. A total of nine students from EDT 273 and 43 students from FSW 283 successfully completed the survey. Three responses from FSW 283 were incomplete and removed from the dataset leading to a total of 52 participants (n=52) and a response rate of 43%. In addition, four students were randomly chosen to conduct follow-up interviews. The four students interviewed were females ranging in age from 23 to 46 years old and were all sophomores. Table 1 lists the interview participants' demographic information.

Table 1: Interview participants

Pseudonym	Age	Gender	Rank
Deanna	24	Female	Sophomore
Elaine	23	Female	Sophomore
Saniya	46	Female	Sophomore
Joanna	29	Female	Sophomore

Data Collection and Analysis

This study employed both quantitative and qualitative data collection and analysis to gain a fuller understanding of the student social experiences in the two courses. The researchers adapted the Community of Inquiry instrument, which was initially developed and tested by Arbaugh et al. (2008). Specifically, items related to social presence were incorporated in a new survey that also included open-ended questions. The CoI framework describes a student's learning experience in online courses, and it involves teaching, social, and cognitive presence. Teaching presence "…includes the selection, organization, and primary presentation of course

content, as well as the design and development of learning activities and assessment" (Garrison et al., 2000, p.90). Cognitive presence is "…the extent to which the participants in any particular configuration of a community of inquiry can construct meaning through sustained communication" (Garrison et al., 2000, p.89). Lastly, social presence is "the ability of participants in a community of inquiry to project themselves socially and emotionally, as 'real' people (e.g., their full personality), through the medium of communication being used (Garrison et al., p. 94)." Within social presence, three factors are found including affective expression, open communication, and group cohesion (Arbaugh et al., 2008). The instrument included ten Likert Scaled items grouped into three categories: affective expression, open communication, and group cohesion. The five-point scale ranged from strongly disagree (1) to strongly agree (5). Students in the EDT and FSW courses were invited to complete the survey at the end of the semester (see Table 2). Descriptive statistics were calculated based on the responses.

Table 2: Survey Items – Social Presence

Affective expression

1. Getting to know other course participants in the beginning module gave me a sense of belonging in the course.
2. I was able to form distinct impressions of some course participants after completing the discussion board activity, three truths and a lie or identification exercise, in Module 0).
3. I was able to form distinct impressions of some course participants after completing the discussion board activity, learning from experience or the best team, in Module 0).
4. Online or web-based communication is an excellent medium for social interaction

Open communication

5. I felt comfortable conversing through the online medium.
6. I felt comfortable participating in the course discussion boards in Module 0.
7. I felt comfortable interacting with other course participants.

Group cohesion

8. I felt comfortable disagreeing with other course participants while still maintaining a sense of trust when completing the discussion board questions in Module 0.
9. I felt that my point of view was acknowledged by other course participants.
10. Online discussions help me to develop a sense of collaboration.

Note. Instrument items adapted from Arbaugh et al. (2008).

Semi-structured interviews were conducted with four randomly selected students enrolled in either the EDT or FSW course (n=4). Each interview was conducted by phone and ranged from 30-40 minutes. Participants were asked five interview questions (see Table 3). The interview questions were developed based on a literature review and the interviewer's professional experiences working in the field of teacher education. The method reflected that of Merriam and Tisdell's (2016) Basic Qualitative approach, which seeks to discover "how people make sense of their lives and their worlds" (p. 25). In this study, the researchers focused on the participant's online learning experiences in either of the included two courses. The interviewer made detailed written notes during the interviews, and the data were coded and analyzed for emergent themes.

Table 3: Student Interview Questions

1. Did you develop relationships or friendships with one or more of the students in your online EDT 273/FSW 283 course this semester?
2. Can you describe the connections or relationships you developed with fellow students in your online EDT 273/FSW 283 course this semester?
3. What are some ways that would have helped you to get to know the other students in the online course better?
4. What types of activities or assignments might foster relationships in online Prekindergarten courses?
5. What are the advantages or disadvantages of taking online Prekindergarten courses in regard to social interactions with fellow students?

RESULTS

Affective Expression (*M*=4.1), Open Communication (*M*=4.4), and Group Cohesion (*M*=4.2) all scored above 4.0. Regarding individual survey items, the highest score was for *I felt comfortable participating in the course discussion boards in Module 0* (*M*=4.5). The lowest score was in *Online or web-based communication is an excellent medium for social interaction (M*=4.0). Table 4 provides descriptive statistics as well as the totals for respondents somewhat and strongly agreeing, and somewhat and strongly disagreeing with each statement.

Table 4: Survey Descriptive Statistics and Selected Results

	M	*SD*	Somewhat Agree and Strongly Agree	Somewhat Disagree and Strongly Disagree
Item 1	4.1	1.1	76.9%	9.6%
Item 2	4.2	0.9	84.6%	3.8%
Item 3	4.1	0.9	80.8%	5.8%
Item 4	4.0	1.0	78.8%	9.6%
Item 5	4.3	0.9	84.6%	5.8%
Item 6	4.5	0.6	92.3%	0.0%
Item 7	4.4	0.8	88.5%	3.8%
Item 8	4.2	1.0	84.6%	7.7%
Item 9	4.3	0.8	80.8%	1.9%
Item 10	4.1	1.0	78.8%	9.6%

Affective Expression

Survey items one through four pertained to affective expression. Responses to item 1 indicated that 76.9% of the participants agreed or strongly agreed that the beginning modules in the courses gave them a sense of belonging, while 9.6% somewhat disagreed or strongly disagreed. Item two asked if students were able to form distinct impressions of some course participants. Responses showed 84.6% somewhat agreed or strongly, while 3.8% of the participants somewhat disagreed or strongly disagreed. Item 3 asked participants about their ability to form distinct impressions of some course participants after completing an activity and discussion board in the beginning module. Responses showed that 80.8% of participants somewhat or strongly agreed, and 5.8% somewhat or strongly disagreed. Item four asked if online or web-based communication is an excellent medium for social interaction. Responses showed that 78.8% of participants somewhat or strongly agreed, and 9.6% somewhat or strongly disagreed.

While the survey responses for Affective Expression were very positive, the interview responses less so. One participant commented, “I was not interested in knowing the other students or in them knowing me.” The participant continued. “Again, not interested in course participants. In fact, the opinions that I did form, even if inadvertently, were mostly negative.”

During an interview, Elaina, a self-described nontraditional student, stated, “I did not feel super connected since I am coming from a different background. I have much more experience since I already work in a childcare center.” Joanna described similar difficulties but regarding communication challenges. “It can be harder to communicate [in an online course], but people that are more interested will put in the effort. However, once you get into the courses in your major, you get to know the group of people better.”

Open Communication

Survey items five through eight were related to open communication. Item five asked participants about their comfort when conversing through an online medium. The responses showed 84.6% somewhat or strongly agreed, and 5.8% somewhat disagreed. Item six asked about feeling comfortable participating in the course discussion boards. The responses showed 92.3% somewhat or strongly agreed, while no participants responded somewhat or strongly disagree. Item seven asked if participants felt comfortable interacting with other course participants in the online courses. The responses showed that 88.5 % somewhat or strongly agreed, and only 3.8% somewhat disagreed.

There were several responses to the open-ended survey questions, all of which reflected a hesitancy to post online. “I felt a little like I didn’t want to leave my conversations ‘out there’ without the option to delete them later,” noted one participant. Another participant wrote,

> I’m not really comfortable because there is too much offense taken to the written word these days. Gone are the days of constructive criticism. Now, it’s straight to shaming dissenting opinions [generally speaking, not specific to this course]. There is too much room for misunderstanding when not face-to-face.

One participant wrote about not wanting to socialize with others in online courses. "I'm comfortable online, but I don't want to 'socialize' – I just want my degree. I have experience making friends and teamwork, and I don't need it here."

The interviews revealed additional perspectives on Open Communication. Deanna said, "I emailed with them [classmates], but I did not develop relationships with anyone." Deanna continued stating, "I like online courses for the flexibility, but you can't communicate with others as much. If you have questions about an assignment, you have to wait before getting the information." While Elaina expressed concern regarding posting ideas online, she also described an advantage.

> One advantage is that you aren't sitting in a classroom with all eyes on you. You can be more open on social media, and you can express yourself more. However, there is also the risk that someone can take something you say wrong or misinterpret what you are saying (in discussion boards). I sometimes wonder if I need to filter what I say

Group Cohesion

Items eight through ten pertained to group cohesion. Item eight asked about feeling comfortable disagreeing with other course participants while still maintaining a sense of trust when completing the discussion board questions. The responses showed that 84.6 % somewhat or strongly agreed, and 7.7% somewhat or strongly disagreed. Item nine asked about how participants felt about other course participants acknowledging their point of view. The responses showed that 80.8% somewhat or strongly agreed, and 1.9% somewhat disagreed. Item 10 asked whether online discussions helped students to develop a sense of collaboration. The responses showed that 78.8 % somewhat or strongly agreed and only 9.6% somewhat or strongly disagreed

One participant commented, "I'm too busy to care if other people acknowledge me." The same participant continued:

> I absolutely loathe this push for "socialization." Just give me the assignment and the reading and let me go about my day already. I will collaborate when it is real instead of this "being nice because it's recorded in digital archives." It is all hot air. I mean, I do it because it is required, but I think it is a waste of time. Nothing personal. It's just not my style.

From the interviews, both Joanna and Deanna described problems with group projects in online courses. Joanna said, "You are always going to have issues with group projects – that is just the reality." More specifically, regarding EDT 273, Deanna stated, "Discussions went well, but group projects were hard due to everyone having different schedules. People don't always respond to emails when working on a project together."

Elaina described not having made any friends in the course. "There were a couple people I emailed with, but I did not develop any relationships or friendships through my online courses." However, Sonya described having a friend in FSW 283, and Joanna discussed having previously known students in her class, EDT 273. "I had already met people in my other face-to-face classes, so it was easier to connect with them online. I didn't build new friendships, but I just got to know people better."

DISCUSSION

The first research question asked if and how social presence was a high priority or an important factor for students (pre-service teachers) taking online courses. According to the survey responses, most student participants believed that social presence was, indeed, an important aspect of online learning. For example, question four asked participants to rate the following question, "Online or web-based communication is an excellent medium for social interaction." The mean was 4.0, which indicates that most students agreed that social communication could be successfully achieved through online communication. However, a small number of students felt that social presence was not necessary and that they had no interest in socializing or getting to know their classmates in their online course(s). For example, one student stated, "I was not interested in knowing the other students or in them knowing me."

The second research question inquired if online teacher education courses in the current study promoted social presence. Even though the lowest score on the survey was well above the neutral response selection, the interview data suggest that the online course environment did not always foster the development of relationships. Interestingly, while 78.8% of students somewhat or strongly agreed that "online or web-based communication is an excellent medium for social interaction," one participant commented during the interview that she was "not interested in course participants. In fact, the opinions that I did form, even if inadvertently, were mostly negative." Another participant who was a self-described nontraditional student, stated, "I did not

feel super connected since I am coming from a different background. I have much more experience since I already work in a childcare center."

One of the ideas to emerge from this study is the recognition of a student's perspective as well as their goals and intentions when completing online courses. For example, a set of students enter an online course not knowing the other participants. Within this set are subsets of students, including those who may want to develop relationships with fellow students and those students who do not wish to interact. Another set of students enter the course with previously established relationships, and these relationships are strengthened throughout the term. Of the interview participants, one made a new friend in the online course during the term, one already had a friend in the online course and reported that the relationship was enhanced, and the other two participants reported making no friends during the term.

Several of the participants stated that some of their favorite online course activities were related to assignments involving social media (i.e., Twitter, Pinterest, etc.). During the student interviews, several participants mentioned the assignments that used Twitter and Pinterest were uniquely engaging since they were already using these two types of social media outside of class. Research has shown that students who report using media tools such as Twitter have a more positive learning experience and stay more engaged with class assignments (Lin, Hoffman, & Borengasser, 2013). However, research on this topic is limited concerning its application in education (Veletsianos, 2012). Using media tools for learning, which are already familiar to students, can make a difference in promoting engagement.

CONCLUSION AND IMPLICATIONS

It is crucial to ensure the quality and rigor of online courses continue to be evaluated, especially with the constant changes in the field of early childhood education. Research has consistently shown that better educated early childhood professionals working with young children provide a higher level and quality of education and care (Burchinal, Cryer, Clifford, & Howes, 2002; Sachs, 2000). Therefore, the positive outcomes of having better educated early childhood teachers is a strong argument to provide courses which provide social engagement with peers and instructors.

The researchers recommend that more work be conducted with larger populations of pre-service teachers since this topic has not been thoroughly explored in the literature. Perhaps researching the differences between fully online and hybrid (or blended face-to-face and online) teacher preparation courses may be helpful to discern student preferences. Another critical area for research is with student intentions in online courses concerning interaction and developing relationships. If engagement is deemed vital in education, specifically with education students, then how do we address those students who resist efforts to promote engagement?

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STUDENT WORKSHEETS BASED ON DISCOVERY LEARNING COMBINED WITH ASSESSMENT FOR LEARNING HIGHER ORDER THINKING SKILLS (AfL HOTS) TO FOSTERING HIGH LEVEL THINKING SKILLS OF STUDENTS

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ABSTRACT
This study aims to describe the effectiveness of student worksheets based on discovery learning combined with assessment for learning higher order thinking skills in fostering high-level thinking skills of students especially in human circulatory system material. True experimental research design is a type of pretest-posttest control group with subjects consisting of two groups of eighth grade students of junior high school taken by random sampling. The research instrument in the form of student worksheets based on discovery learning combined with assessment for learning higher order thinking skills results of development with the feasibility of having guaranteed expert team validation and limited trials. Data collection research was conducted using observation sheets of high-level thinking skills and higher order thinking skills oriented cognitive test questions. The research data were analyzed descriptively qualitatively and quantitatively using t test. The results of data analysis showed the results of observations student behavior in the experimental class 1 and experimental class 2 which corresponded to the indicators of high-level thinking skills categorized as "very high" that is 80,83% analyzing, evaluating 81,90% and creating 82,33% while the results of the analysis response data of students' answers to higher order thinking skills cognitive test questions using the t test obtained sig (2-tailed < 0,05), namely sig (2-tailed) = 0,000. Thus the student worksheets based on discovery learning combined with assessment for learning higher order thinking skills in learning specifically on human circulatory system material is declared to be effective in fostering students' high-level thinking skills.
Keywords: student worksheets based on discovery learning, assessment for learning higher order thinking skills, high-level thinking skills.

INTRODUCTION

Improving the 2006 curriculum into the 2013 curriculum is a strategic step by the government in preparing student competencies to face the challenges of the globalization era and the demands of life in the 21st century. The implementation of the 2013 curriculum in the learning process adheres to the principle that knowledge cannot be transferred directly from the teacher to students. Students in the 2013 curriculum are seen as students who have various basic abilities and knowledge to achieve teaching goals. In this regard the teacher needs to facilitate learning experiences for students so that various potential basic abilities can develop into high-level thinking skills.

High-level thinking habits can arise in students when they are often trained in high-level thinking skills patterns (Saido, et al., 2015: 14). High-level thinking encourages students to be able to connect and apply a variety of knowledge into concepts that have not been thought of and have never been taught (Brookhart, 2010: 5) and involve complex thinking beyond the ability to remember facts to enable students to store information as a solution to problem solving (Ramos, et al., 2013: 49). High-level thinking process skills need to be applied in teaching Natural Sciences (Salbiah, et al. 2015: 1340) which can be developed through active and meaningful learning involving a variety of hands-on and minds-on activities (NRC, 2003: 2).

The fact reveals the success of Indonesian State Junior High School students in applying high level thinking skills is not satisfactory. As released by the data analysis of the International Mathematics and Science Learning Tendency (TIMSS) study on the 2015 mapping revealed that scientific literacy of Indonesian students ranked 45th out of 48 participating countries with a gain of 387 (Mullis, et al. 2015: 127). This data indicates that with science learning that has been done so far shows the results of junior high school students in Indonesia have not been skilled in solving TIMMS questions which generally require high-level thinking process skills, contextual characteristics, require analysis, argumentation, and creativity.

To grow high-level thinking skills in students, it is necessary to design an appropriate and sustainable learning process (Suyatna, 2017: 49). But when designing the learning process of course the characteristics of science

subjects that are more seeking understanding of natural phenomena through the process of finding facts and building concepts must be the focus of the teacher's attention (Tawil & Liliasari, 2014: 7). In connection with this, one of the efforts that can be done by the teacher is to provide learning media that are able to meet the needs of students in the process of finding and thinking at high levels through the implementation of student worksheets based on discovery learning combined with assessment for learning higher order thinking skills in science learning activities which is then abbreviated as student worksheets based on discovery learning combined with AfL HOTS.

But so far based on the results of the analysis of literature studies it has been revealed that there are no studies that have implemented student worksheets based on discovery learning combined with AfL HOTS in learning. Most of the research that has been carried out is more focused on implementing students worksheets based on discovery learning and is not concentrated in developing high-level thinking skills (Susanti, et al., 2017: 12; Maulana, et al., 2017: 6; Estuningsih, et al., 2013: 30; Nurhayati & Angraeni, 2017: 124). High-level thinking skills include life skills competencies that must be possessed by someone facing the complexity of competition and challenges in changing life patterns in the 21st century era so that it is deemed necessary to develop high-level thinking skills in learning through implementation of student worksheets based on discovery learning combined with AfL HOTS.

The presentation of learning materials in the student worksheets based on discovery learning combined with AfL HOTS is not displayed in the final form so students are expected to organize (Mc Donald, 2011: 5). AfL HOTS which is integrated in the student worksheets based on discovery learning is not focused on the final results of the assessment but rather is aimed at understanding the concept of knowledge, the application of doing something, and understanding how to achieve learning goals (Stiggins, 2002: 5). In order to optimize the successful implementation of AfL HOTS which is integrated in the student worksheets based on discovery learning the teacher uses the strategy of giving feedback directly so that potential strengths and weaknesses of student learning can be immediately known (Black & Wiliam, 2009: 2). Through student worksheets based on discovery learning combined with AfL HOTS a variety of information is compared, categorized, analyzed, integrated, and organized by students to be able to make learning conclusions (Kemdikbud, 2014: 36).

Student worksheets based on discovery learning combined with AfL HOTS is able to direct student learning through activities and high-level thinking processes. The learning process of implementing student worksheets based on discovery learning combined with AfL HOTS can encourage students to identify things they want to know through the process of finding, build construction of understanding with observations and experimental activities based on their own initiative, and develop thinking skills up to the level of analysis (C4), evaluate (C5), and creative (C6) (Narayanan & Adithan, 2015: 2). Student worksheets based on discovery learning combined with AfL HOTS implies physical and mental activities of students so it is very possible to create science learning that is characterized by students-centered. The implementation of student worksheets based on discovery learning combined with AfL HOTS in science learning is believed to be able to fostering high-level thinking process skills of students.

Based on the background above a study on the implementation of student worksheets based on discovery learning was combined with AfL HOTS in science learning to foster high-level thinking skills in junior high school students.

METHOD

This research was conducted in the odd semester of the academic year 2017/2018 at SMP Negeri 16 Bandar Lampung, one of the schools in Lampung Province of Indonesia. Research subjects including 2 groups of students from 10 groups of class VIII by random sampling. The study design used true experimental type pretest-posttest control group (Creswell, 2012: 307). The research design is shown in Table 1.

Table 1. Study Design Pretest-Posttest Control Group Design

Group	Total of Students	Pretest	Treatment	Posttest
Experimental 1	29	O_1	X	O_2
Experimental 2	29	O_3	X	O_4

Description: O_1 = pretest experimental class 1; O_2 = posttest experimental class 1; X = treatment; O_3 = pretest experimental class 2; O_4 = posttest experimental class 2

The research instrument consists of learning devices and data collectors. Instrument learning devices include learning implementation plans and student worksheets based on discovery learning combined with AfL HOTS while data collection instruments in the form of observation sheets of high-level thinking skills and cognitive test questions oriented HOTS.

The student worksheets based on discovery learning instrument combined with AfL HOTS used in this study is the result of development research with guaranteed feasibility through the stages of material, media, and language validation by three expert teams and first has been tested on a limited basis to students. The instrument student worksheets based on discovery learning combined with AfL HOTS has an average achievement of expert team validation of 97,99% with the criteria of "very adequate" and the achievement of student learning responses by 95,50% with the criteria "very interesting and very practical". For this research activity the instrument student worksheets based on discovery learning combined with AfL HOTS was implemented in five learning meetings.

The instrument of data collection in the form of a high-level thinking skill observation sheet is a likert scale observation list including five answer choices. This observation instrument adapted from the indicators of high-level thinking skills Krathwohl (2002: 216). Filling out the observation sheet is done by the observer teacher by giving a checklist (√) to the answer choices as shown in Table 2.

Table 2. Sheet Observation of Higher Level Thinking Skills

Indicator	Observation Aspect	Scoring Scale				
		VL (1)	L (2)	M (3)	H (4)	VH (5)
Analyze	Analyze the information entered and divide or structure information into smaller parts to recognize patterns or relationships					
	Able to recognize and distinguish the causes and consequences of a complicated scenario					
	Identify and formulate questions					
Evaluate	Provide an assessment of solutions, ideas and methodologies using suitable criteria or existing standards to ensure the value of effectiveness or benefits					
	Make hypotheses, criticize, and test					
	Accept or reject a statement based on predetermined criteria					
Creative	Make a generalization of an idea or perspective on something					
	Design a way to solve problems					
	Organizing elements or parts into new structures that have never existed before					

Note= VL (very low), L (low), M (medium), H (high),VH (very high). (Source: Modification of Krathwohl, 2002: 216)

Analysis of high-level thinking skills observation data was carried out descriptively with a qualitative approach. The results of the analysis data are then interpreted using percentage price interpretations as shown in Table 3.

Table 3. Criteria for Higher Level Thinking Skills

The Interval	Criteria
81,00 – 100,00	Very High
61,00 – 80,00	High
41,00 – 60,00	Medium
21,00 – 40,00	Low
00,00 – 20,00	Very Low

(Source: Modification of Arikunto, 2011: 245)

The research data collection instrument in the form of HOTS-oriented cognitive test questions was used to measure the value of the pretest and posttest of high-level thinking skills of students in terms of cognitive understanding aspects. This HOTS cognitive-oriented test instrument is a HOTS question from the development research whose feasibility as a HOTS assessment instrument has been tested through the expert team's theoretical validity test and empirical validity involving 174 junior high school students (Khoiriah, et al., 2018: 19).

RESULTS AND DISCUSSION

The results of the study in the form of observation data of high-level thinking skills were obtained from analyzing the data on the observation sheet instruments of high-level thinking skills of students. Observation activities are carried out during the learning process by observing behaviors that arise in students according to indicators of high-level thinking skills. The results recapitulation observation data high-level thinking skills of students in the experimental class 1 and experimental class 2 are shown through Table 4.

Table 4. Results Recapitulation of Observation Data High Level Thinking Skills of Students in Experimental Class 1 and Experimental Class 2

Indicator	Observation Aspect Sub Indicator	Observation Averages High Level Thinking Skills of Student (%)		Average
		Exp. 1	Exp. 2	
Analyze	Analyze the information entered and divide or structure information into smaller parts to recognize patterns or relationships	82,00	80,20	81,10
	Able to recognize and distinguish the causes and consequences of a complicated scenario	81,60	78,60	80,10
	Identify and formulate questions	79,20	83,40	81,30
Evaluate	Provide an assessment of solutions, ideas and methodologies using suitable criteria or existing standards to ensure the value of effectiveness or benefits	80,40	81,40	80,90
	Make hypotheses, criticize, and test	83,20	84,20	83,70
	Accept or reject a statement based on predetermined criteria	80,80	81,40	81,10
Creative	Make a generalization of an idea or perspective on something	81,40	82,60	82,00
	Design a way to solve problems	81,60	81,80	81,70
	Organizing elements or parts into new structures that have never existed before	82,80	83,80	83,30
Average Observation of Higher Level Thinking Skills (%)		81,44	81,93	81,69
Observation Criteria High Level Thinking Skills		Very high	Very high	Very high

Based on Table 4, it can be seen that the average observation of the behavior of students in the experimental class 1 and experimental class 2 which corresponds to the indicators of high-level thinking skills is categorized as "very high" (Arikunto, 2011: 245). Referring to Table 4, it can be seen also the results of the analysis of observation data in students of the experimental class 1 and experimental class 2 for each indicator of high-level thinking skills as shown in Table 5.

Table 5. Results Recapitulation of Data Observation High Level Thinking Skills in Students Experimental Class 1 and Experimental Class 2 for each Indicator

No.	Indicator	Observation Averages High Level Thinking Skills of Student (%)				Average	Criteria
		Exp. Class 1	Criteria	Exp. Class 2	Criteria		
1.	Analyze	80,93	Very High	80,73	Very High	80,83	Very High
2.	Evaluate	81,47	Very High	82,33	Very High	81,90	Very High
3.	Creative	81,93	Very High	82,73	Very High	82,33	Very High

Based on Table 5, it can be seen that the results of the average behavioral observation of students in the experimental class 1 and experimental class 2 which correspond to each indicator of high-level thinking skills are categorized as "very high" (Arikunto, 2011: 245).

The quantitative testing hypothesis in the study includes: (1) H_0 = student worksheets based on discovery learning combined with AfL HOTS is not effective in fostering students 'high-level thinking skills and (2) H_1 = student worksheets based on discovery learning combined with AfL HOTS effectively fostering students' high-

level thinking skills. The quantitative testing criteria include: (1) If the results of t-test parametric statistics are obtained sig (2-tailed) > 0,05 then the test can be concluded as accept H_0 while (2) If the results of t-test parametric statistics are obtained by price sig (2-tailed) < 0,05 so the test can be concluded reject H_0.

Data from quantitative research results obtained from the pretest and posttest values of students' high-level thinking skills were measured using HOTS-oriented cognitive test questions. Analysis of pretest and posttest data on high-level thinking skills was carried out using t-test parametric statistics or the independent sample t test using the SPSS version 21.0 software program. But first the data normality test was carried out using the Shapiro Wilk test and data homogeneity test with Levene test (Creswell, 2012: 187). The data recapitulation of the results of testing the normality and homogeneity of pretest and posttest data on high-level thinking skills is shown in Table 6.

Table 6. Recapitulation of Data on Test Results for Normality and Homogeneity of Pretest and Posttest Data at High Level Thinking Skills for Students in Experimental Class 1 and Experimental Class 2

Data group	Class	Normality Test		Homogeneity Test	
		N	Sig	Levene Statistic	Sig
Pretest High Level Thinking Skills	Experimental 1	29	0,069	0,224	0,638
	Experimental 2	29	0,118		
Posttest High Level Thinking Skills	Experimental 1	29	0,114	0,546	0,463
	Experimental 2	29	0,144		

Based on Table 6, it can be stated that the pretest and posttest data of students' high level thinking skills in the experimental class 1 and experimental class 2 were normally distributed and had the same variance (with sig normality and homogeneity test > 0,05).

While the recapitulation of the test data from the independent sample t test (t test) data on the pretest and posttest high-level thinking skills of students in the experimental class 1 and experimental class 2 can be seen through Table 7.

Table 7. Recapitulation of t Test Results Data Pretest and Posttest Data High Level Thinking Skills Students Experimental Class 1 and Experimental Class 2

Class	Data group	N	Mean	Standar Deviation	t	df	Sig (2-tailed)
Experimental 1	Pretest High Level Thinking Skills	29	15,52	5,877	-40,363	56	0,000
	Posttest High Level Thinking Skills	29	81,38	6,532			
Experimental 2	Pretest High Level Thinking Skills	29	16,55	6,139	-36,748	56	0,000
	Posttest High Level Thinking Skills	29	82,07	7,382			

Referring to the data analysis in Table 7, it can be seen that from the results of t-test parametric statistics obtained the sig (2-tailed) price < 0,05 which is sig (2-tailed) = 0,000 then testing the quantitative hypothesis can be concluded reject H_0 and accept H_1. This means that the student worksheets based on discovery learning combined with AfL HOTS effectively fosters students' high-level thinking skills in the experimental class 1 and experimental class 2.

Based on the results of qualitative and quantitative data analysis revealed the implementation of the student worksheets based on discovery learning combined with AfL HOTS effectively fostered high-level thinking skills of students in the experimental class 1 and experimental class 2. This can be seen through observations of student behavior during the learning process in accordance with indicators of level thinking skills high (Table 4) and known from the pretest and posttest values of high-level thinking skills (Table 7).

Observation data on student behavior in accordance with the indicators of high-level thinking skills during the learning process in the experimental class 1 were categorized as "very high" which showed an average behavior of 80,93% analyzing, evaluating 81,47% and creating 81,93%. Meanwhile the observation of the behavior of

students in the experimental class 2 that corresponds to the indicators of high-level thinking skills also shows the category of "very high" that is with an average behavior of 80,73% analyzing, evaluating 82,33% and creating 82,73%.

The pretest and posttest of high-level thinking skills of students in the experimental class 1 had a mean value of 15,52 and 81,38 while the students of the experimental class 2 were 16,55 and 82,07. The quantitative analysis results of the pretest and posttest high-level thinking skills were obtained sig (2-tailed) < 0,05 which is sig (2-tailed) = 0,000 which means the student worksheets based on discovery learning combined with AfL HOTS effectively fostered students' high-level thinking skills.

Factors suspected of influencing the results of this study are because the student worksheets based on discovery learning combined with AfL HOTS support teachers in developing high-level thinking process skills during learning process. The implementation of the student worksheets based on discovery learning combined with AfL HOTS means the same as involving the process of discovery and high-level thinking in learning.

The student worksheets based on discovery learning combined with AfL HOTS facilitates teachers to raise issues related to learning material. Guided students play an active role in the process of finding concepts and facts of learning and finding solutions to problem solving. This learning experience is proven to be able to improve learning behavior and thought processes in students which gradually develop into HOTS.

As based on the results of this study it was revealed that 81,70% of the behaviors of students were able to design a way to solve the problem. As the results of the study of Dalgarno, et al., (2014: 18) suggest discovery learning provides freedom of exploration so that it arises the desire to investigate matter more broadly. This is in line with the results of the Suphi & Yaratan (2016: 829) that discovery learning supports teachers to carry out learning that encourages students to develop learning activities and increase cognitive levels to the categories of analyzing, evaluating, and creating. Furthermore Saab, et al., (2009: 217) asserted discovery learning has positive consequences for changes in the process and student learning outcomes.

The student worksheets based on discovery learning combined with AfL HOTS in learning trains students to ask questions related to the results of observations. Students are guided to form hypothetical questions related to learning material. Students are directed to seek knowledge from various sources of information. Learning conditions like this are proven to be able to encourage students to actively find the relationship between information that has been found so that the longer the process of thinking analysis is growing.

As based on the results of this study, it was revealed that 80,90% of behaviors appeared that students could provide an assessment of solutions, ideas, and methodologies using suitable criteria or existing standards to ensure the value of effectiveness or benefits. This is in line with the results of the study of Ardianto & Rubini (2016: 33) that discovery learning provides opportunities for students to learn analytical thinking that influences the achievement of thinking competencies and increases understanding of scientific literacy. The results of the Steuter & Doyle (2010: 76) study also reveal discovery learning encourages student involvement in building concepts, improving research skills and high-level thinking processes. Furthermore, the results of Yuliani & Saragih's research (2015: 122) reported that out of 39 students who participated in discovery learning 84,62% were interpreted as having good conceptual understanding and 76,92% categorized as capable of critical thinking.

The student worksheets based on discovery learning combined with AfL HOTS encourages students to evaluate with friends. The existence of feedback giving strategies in the implementation of student worksheets based on discovery learning combined with AfL HOTS gives the opportunity for students to immediately know the strengths and weaknesses of learning. This situation allows students to conduct evaluative thinking processes so that the longer the desire to improve learning behavior. As Hargreaves (2013: 229) affirmed that AfL with the teacher-feedback strategy is able to create interactive learning communication that can automatically become the main source of controlling student learning.

Student worksheets based on discovery learning combined with AfL HOTS invites students to actively develop skills in interpreting data so that sharpness of thinking is sharpened which certainly has a positive impact on the process of developing high-level thinking skills. This activity builds a collaborative learning climate, sharing and exchanging information, and listening to or using ideas that come from other students.

As based on the results of this study it was revealed that 81,10% of behaviors emerged students could accept or reject a statement based on established criteria. As the results of Mc Donald's research (2011: 19) discovery

learning able to bring students to the atmosphere of collaborative learning by sharing information (52%), ability to cooperate (75%), and interactive learning processes (100%). This is in line with the results of Lieu's research (2015: 152) discovery learning encourages students collaborate to discuss ideas in groups.

The student worksheets based on discovery learning combined with AfL HOTS in learning asks students to do a careful examination so that there is no mistake when proving the truth of a hypothetical question. In the event of proof of discrepancy, the student worksheets based on discovery learning combined with AfL HOTS encourages students to continuously build problem solving skills.

As based on the results of this study it was revealed that 83,70% of the students' behaviors appeared to be able to make hypotheses, criticize, and test. This fact of learning encourages students to develop creative thinking processes that can gradually become high-level thinking skills. As the results of Lubis's research, et al. (2017: 96) report students with discovery learning experience have a better average value of thinking skills (83,13) than direct teaching (60,53). Furthermore, the results of Widhiyantoro's study (2012: 97) emphasized that discovery learning significantly improved aspects of creative thinking skills including elaboration (88,05%), flexibility (86,56%), originality (86,56%), and fluency (83,25%).

The student worksheets based on discovery learning combined with AfL HOTS in learning invites students to actively compile and present the learning outcomes that have been done so that it has the potential to foster learning motivation and creativity. When compiling reports on student learning, students carry out self-construction according to the learning experience by paying attention to the principles of the results of proof to obtain a general concept as a generalization product. This fact makes students more challenged and keeps trying to show better learning performance.

As based on the results of this study, it was revealed that 82,00% of behaviors appeared to be able to generalize an idea or perspective on something. This is as confirmed by Balim (2009: 2) discovery learning encourages students to arrive at the concluding stage based on learning activities and observation activities carried out independently. Furthermore, the results of the study of Eidelman & Shwart (2016: 297) confirm that the habit of finding yourself in discovery learning results in students' efforts to realize learning progress.

CONCLUSION

Based on the results of research and discussion, it can be concluded that the student worksheets based on discovery learning combined with AfL HOTS can be declared effective in fostering high-level thinking skills of students especially in human circulatory system material. This can be known through the average observations of student behavior during the learning process that are in accordance with the indicators of high-level thinking skills and the value analysis of the posttest pretest of high-level thinking skills. The behavior that appears in students is in accordance with the indicators of high-level thinking skills in the experimental class 1 and the experimental class 2 is categorized as "very high" with an average score of 80,83% analyzing, evaluating 81,90% and creating 82,33% while the results value analysis of the posttest pretest of high-level thinking skills using the t test was obtained by sig (2-tailed < 0, 05), namely sig (2-tailed) = 0,000.

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