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Abstract

In examining the complexity of how higher education institutions integrate and adopt classroom technology, this study explores literature regarding classroom technology integration and acceptance that appears in research articles published from 2012 – 2018. The literature review of 148 articles was centered on a deeper understanding of faculty perceptions regarding classroom technology integration and acceptance. The evidence suggests that there is not a simple model when it comes to augmenting classrooms with classroom technology. Additionally, for the appropriate adoption of technology tools, it is important to understand how faculty perceive the integration of classroom technology tools.

Introduction

Higher education institution’s primary goal is to educate students. However, to accomplish that goal, faculty need to understand the needs of learners. Kriek and Coetzee (2016) stated that faculty members are often focused on the content and less on the methods of teaching. With increased use of technology across all professions, and in people’s personal lives, the availability of educational technology in the classrooms is expected by faculty, students, and administrators. Despite increased technology access both in and outside of the classroom, technology is often not being used to support student learning in a meaningful manner (Li, Worch, Zhou, & Aguiton, 2015; McKnight et al., 2016). Faculty might be reluctant to think about the methods of teaching by utilizing technology in the classroom (Kriek & Coetzee, 2016; Saine, 2012). In addition, students like to multitask and quickly access information on their laptops or simply start researching the topic out of curiosity (Saine, 2012). The type of technology does not determine its successful integration in the classrooms, but how the technology is used can influence teaching and learning (Li et al., 2015; McKnight, et al., 2016).

In this article, we examine the literature about classroom technology integration and acceptance from the recent research articles published from 2012 to 2018. The literature review was centered on understanding faculty perceptions regarding technology integration and acceptance in the realm of exploring active learning technology tools. After reviewing 148 articles, we found that there is not one simple model when it comes to augmenting classrooms with appropriate technology as necessary in the transition to active learning technology tools. In addition, for the appropriate adoption of technology, it is important to understand how faculty perceive the adoption of active learning technology tools. It is essential that faculty, who implement the technology are key drivers of instructional technology adoption, provide insight into the barriers and benefits of instruction technology, so administrators can effectively guide the implementation of technological changes in classrooms.

Synthesis of the Literature Review

The concept of integrating technology to support classrooms in the higher education system is a difficult topic. As the world experiences rapidly changing technology, newer applications and programs are evolving every day for needs other than educational purposes to meet the growing demands of student learning. There are always different ways of learning and teaching with technology (Dolenc & Abersek, 2015). In order to fulfill the educational goals of the students, it is important to continuously update and evaluate educational technology (Dolenc & Abersek, 2015).

In examining the complexity of how larger institutions of higher education adopt technology, Singh and Hardaker (2014) revealed the ability to manage the adoption of technology is a complete and engaging process. University leaders need to be involved in strategic development to be able to attract and engage key stakeholders from the academic side to make sure there is ownership by faculty members. There needs to be a clear vision communicated to academic faculty and departments who are reluctant to engage in these innovative initiatives. Without the management support and commitment, the adoption of technology is useless (Singh & Hardaker, 2014).

Higher education institutions that want to integrate technology face numerous challenges, such as resistance to change (McKnight et al., 2016), low self-efficacy beliefs about technology integration (Li et al., 2015), and faculty buy-in (Skiba, 2016; Mueller, Wood, Pasquale, & Cruikshank, 2012). In addition, to define the fast-growing *digital native* phenomenon, a survey of 90 students and 10 teachers revealed the results that students do not use technology more than instructors do; students do, however, exhibit the typical *digital native* characteristics of early adopters (Gu et al., 2013). These different patterns were explained by different influence factors such as classroom setting and learning materials that were supported by technology. The Gu et al. (2013) study echoed what other studies reported as barriers to integrating technology: teachers typically had a strong desire to integrate technology into the classrooms but did not have adequate confidence and competence which posed significant barriers.

It is worth mentioning that the need for the systemic change of educational technology has also been one of the important barriers that caused delays in upgrading existing technology systems. Technology trends affecting higher education were reported in the study conducted by Skiba (2016). This study measured short- and long-term impacts of redesigning learning spaces. The comparison of 2015 and 2016 yearly trends revealed a growing trend in addressing the basic requirements to make sure that students had the knowledge and skills to meet the requirements of the job market. Skiba (2016) described that these challenges were solvable if there was enough faculty support for the integration. Further, Gikas and Grant (2013) and Venkatesh et al. (2014) indicated that students in higher education had positive perceptions of increased learning when courses were augmented with technology. Skiba (2016), therefore, suggested that higher education institutions need to convey technology awareness in the classroom setting with faculty support.

In the past, despite many researchers' focus on various barriers influencing technology integration in the classrooms, Hur, Shannon, and Wolf (2016) examined a gap in the major factor that related to perceived benefits. This clearly showed the effects of teachers' technology use in classrooms as well as their perceived benefits in connection with their confidence in using technology. The findings of this study revealed that to use technology in the classrooms, higher education institutions should approach instructional technology in more organized and systematic ways. For example, the transition to technology-enhanced classrooms must be supported at all levels; however, for appropriate adoption, it was important to understand how said faculty perceive adoption of active learning technology tools.

Role of Classroom Technology

Many forms of technology are available and used throughout higher education institutions of learning (Black & Lassman, 2016). Generally, classroom technology may consist of one of the following: computers, laptops, projectors, cell phones, social media and networks, software applications, and the Internet (Anderson & Horn, 2012; Black & Lassman, 2016; Davison & Lazaros, 2015; Mueller et al., 2012; Shao & Seif, 2014). In addition to these widely known technology tools, active learning technology tools such as smart whiteboards and the audience response system tools such as clickers (Chan, Borja, Welch, & Batiuk, 2016; Daniel & Tivener, 2016; Eichler & Peebles, 2016; Freeman et al., 2014; Park, 2014) are being introduced as instructional strategy to improve instruction (Finkel, 2012; Onder & Aydin, 2016; Siegel & Claydon, 2016). Moreover, video-based learning (VBL) multimedia instructional tools (Ifenthaler & Schweinbenz, 2016; Mikalef et al., 2016) and social media tools for student learning (Nykqvist & Lee, 2013; Romero, 2015) are also being utilized as effective tools to increase student engagement in classrooms.

Active learning technology tool integration is a process of combining different pieces of technology to support student-learning environment (Chan et al., 2016; Daniel & Tivener, 2016; Eichler & Peebles, 2016; Freeman et al., 2014). Knowing what type of technology is available for classroom integration is helpful; however, when it comes to active learning technology integration development, such as smart whiteboards (Park, 2014) and clickers (Chan et al., 2016; Daniel & Tivener, 2016; Olson & Winger, 2013), operations are carried out in a

variety of electronic formats that allow and facilitate students' interaction with a professor in real time. According to Chan et al. (2016), an intermediate level of the computer skills is enough to know how active learning technology tools can assist instructors in teaching. Understanding how to use the smart whiteboards requires appropriate training materials and support (Park, 2014). In most cases, an administration will need to understand what tools are required and invest appropriate resources to introduce faculty to key features and capabilities of these active learning technology tools.

Students learn differently; some are visual and can understand the material by the show-and-tell while others prefer reading first and then illustrating (Truong, 2016). To gain insights into different learning styles, Truong reviewed 51 research studies and concluded that by using technology institutions could take advantage of these different learning styles and help students to optimize their learning experiences. Anderson and Horn (2012) found that 4-year university students showed a direct correlation between using technology and their self-reported educational gains. Researchers supported the claim that there was a need for a connection between instruction and technology. The use of digital instructional technologies was aimed to enhance and transform student learning. After interviewing and observing classrooms in seven schools across the United States, McKnight et al. (2016) reported a learner-centered approach that influenced the adoption of technology to support the student learning process. In this multisite case study, the researchers stated that influencing aspects such as leadership, technology use, and instructional systems were necessary to the adoption of instructional technology. Integration of active technology tools such as smart whiteboards and clickers can contribute to an increased student engagement and better learning outcomes (Chan et al., 2016; Daniel & Tivener, 2016; Freeman et al., 2014; Li et al., 2015; Park, 2014).

Use of Active Learning Technology in the Classrooms

Technology has become an important part of learning (Siegel & Claydon, 2016). In exploring faculty members' perspectives on using the active learning technology tools, Siegel and Claydon (2016) reported that nine out of 30 professors used various technologies to redesign class materials to utilize the innovative technology. In their qualitative case study, Siegel and Claydon (2016) suggested that the uses of technology are not solely for instruction, but they contribute to the teaching and learning dynamics in which students are become actively engaged.

Black and Lassman (2016) offered evidence of various forms of technology used in English classes. Rather than focusing on why administration or academic leaders thought technology was necessary for learning, their study was a literature review focused on analyzing students' perceptions of using the technology. While there was convincing literature in the Black and Lassman's (2016) study regarding the success of technology use in English classes, the ease of access to information, and students' abilities to multitask, were identified by the authors as factors that added pressures on faculty to change their approaches to teaching.

Kriek and Coetzee (2016) investigated, in their exploratory, descriptive, and explanatory case study, how faculty members needed to align their teaching methods with students that have learning difficulties by using relevant technology. The participants of the study were lecturers and students. The research revealed how to use relevant technology to address those special learning needs of students and ultimately improve their learning. However, the important part of Kriek and Coetzee's study was their recommendation to develop productive and efficient work processes in learning with technology for students as well as to design and create a knowledge base for teachers to use instruction with technology.

The advancement of active learning technology tools has started shaping all aspects of teaching in the classroom. For example, clickers have drastically improved the quality of class discussions (Chan et al., 2016). A quantitative study at one southeastern university conducted by Chan et al. (2016) revealed that one of the main factors that influenced the acceptance of the clickers in the classrooms was that the faculty needed to be given an opportunity to try the clickers prior to implementation. Allowing faculty members to try before implementation required substantial amount of time and financial resources before they could experience the benefits of the clickers (Chan et al., 2016). A quantitative study conducted by Daniel and Tivener (2016) compared the use of clickers based on individual use versus a small group that shared one single clicker. The results of the study indicated that clickers can be an effective active learning tool to use in small groups and achieve positive outcomes associated with active learning (Daniel & Tivener, 2016).

Active learning technology tools increased students' performances in science, engineering, and mathematics (Freeman et al., 2014). Freeman et al. (2014) analyzed 15 studies reported that average examination scores

increased by 6% in active learning classroom environment as well as students in traditional classes were 1.5 times more likely to fail exams than the students in active learning classrooms (Freeman et al., 2014).

Several researchers studied unique technological novelties such as iPad tablets, multimedia teaching sources, and VBLs to coordinate students' learning environments (Ifenthaler & Schweinbenz, 2016; Mikalef et al., 2016; Yuan, 2017). The researchers suggested that students, who used iPads on a daily basis, were keen on continuing on using the tablets in the classrooms. In addition, students anticipated that the iPads would help them with learning, which has resulted in an overall positive behavior towards using the iPads in the classrooms (Ifenthaler & Schweinbenz, 2016). At the same time, multimedia teaching is an easy and creative way for instructors to use digital media in order to improve the quality of teaching (Yuan, 2017). The role of multimedia was primarily to help faculty with creative and personalized multimedia teaching courses. In Yuan's report, multimedia materials included text, sound, video, chart data, and various animations. This particular study suggested that offering effective application of teaching resources improved education and the teaching environment (Yuan, 2017).

In addition to multimedia materials, VBL is emerging as an educational tool in flipped classrooms and online learning (Mikalef et al., 2016). A questionnaire administered to approximately 1,500 individuals from various universities revealed that the role of VBL is to optimize and extend education with the intent of removing geographical limitations. The added benefit of VBL has been to contribute to the growing trend and demand to accommodate education related to "lifelong" and "on-demand" necessities (Mikalef et al., 2016, p. 10).

Social media has been trending with a growing interest around the world that it can be a part of the learning process in higher education. Romero (2015) analyzed the use of social media tools by students between two countries, Mexico and South Korea. Mexico was one of the countries that had about 46% of its population as Internet users and South Korea was the leading country in social media usage that reportedly reached 81.6% of its population (Romero, 2015). The comparative analysis of social media in a classroom setting revealed a "participatory culture" that promoted social belonging and public awareness (Romero, 2015). For example, social media technologies served as a platform to engage students in collaborative learning. Technology integration created socio-emotional benefits to students and gave them space to collaborate and exchange concepts by using a computer as a mediator. The results of the Romero's study revealed several social media tools that could be useful in the classroom learning environment. As an example, South Korean universities used participation, openness, conversation, community, and connectedness in implementing concepts and new ways to teach with technological tools.

As Dotterer et al. (2016) described, an overwhelming number of teachers and parents voiced that the educational system should integrate technology in teaching by "giving young people the tools" (p. 59). However, the authors stressed that successful integration of technology in the classroom required more than just providing students with access or computers. Therefore, the researchers urged the higher education community to engage students in critical thinking activities in the classroom setting if they wanted to integrate appropriate technology effectively. Evolving from the use of laptops and computers, personal technology such as smartphones simplified student learning by allowing immediate access to information. Mueller et al. (2012) argued that mobile technology in higher education can be used as a portable handheld device for immediate access to information. A feedback from a total of 108 graduate student participants revealed that the mobile technology tool was "most useful" as a "learning tool" (Mueller et al., 2012, p. 49). Moreover, several other studies described teachers' beliefs about technology integration by revealing that mobile devices were one of the most preferred technologies that teachers would have liked to see in classrooms (Mueller et al., 2012; Woodcock, Middleton, & Northcliffe, 2012). In unfolding the reasons of why mobile devices were the most desired technology revealed that these devices were engaging and interactive (Hodges & Prater, 2014) and it gave students a sense of belonging (Nykvist & Lee, 2013) while having immediate access to information (Shao & Seif, 2014). The "future of ever-evolving hardware" enabled students to have access to information at their fingertips by taking "education" anywhere (Hodges & Prater, 2014, p. 5).

It is also widely known that smartphones come equipped with social media applications. The utilization and impact of mobile devices by first-year students were analyzed in a mixed methods study conducted by Nykvist and Lee (2013). The study revealed that 51.8% of the students felt a sense of belonging while using social media technologies and "kept them up to date" with other students (Nykvist & Lee, 2013, p. 3). Nykvist and Lee's study brought up the importance of using mobile devices in the classrooms because these technologies were a part of students' everyday lives and had changed the way they communicated and interacted with each other. In addition, Nykvist and Less cautioned that some students felt lost if they could not use their cell phone in the classrooms. For the social media to work, therefore, mobile devices will need to be used by students.

In a cross-sectional quantitative study, the use of mobile smartphones with the utilization of mobile learning (mLearning) technology has shown a growing trend in a higher education field (Barreto, 2013; Davison & Lazaros, 2015). After surveying over twenty thousand graduate and undergraduate students, the results of Davison and Lazaros's (2015) study revealed that almost 60% of students used smartphones and 45% used tablets as the primary mLearning technology. These researchers found that students utilized smartphones for their courses. Indeed, learning when using mobile devices is a latest innovation for teaching and learning at a global scale. (Shao & Seif, 2014). Shao and Seif reported that about 42% of students used mobile devices for searching articles and references. It is implied that mobile devices could become one of the preferred choices for innovative methods of teaching and learning (Shao & Seif, 2014, p. 3). Therefore, the immediate access to information is going to undoubtedly push the use of mobile technology in classrooms.

Barriers and Challenges of Technology Integration

Technology integration is increasingly happening in classrooms (Hilton, 2016). Hilton (2016) followed a year-long integration of iPad by conducting a qualitative case study in the hopes of gaining insights of successful technology integration in social studies classrooms. The study's results showed that teachers should approach new technology integration in a systematic and reflective way. In viewing integration in a systemic and reflective way, many researchers stated there were barriers to successful technology integration. The common tangible barrier that was identified was the access to resources when technology became outdated or were sometimes limited (Vann et al., 2015; Williams et al., 2014). The most frequently mentioned barrier was inadequate professional training (Araujo & Luiz, 2015; Bleakley & Mangin, 2013; Merc, 2015; Petersen, Finnegan, & Spenser, 2015; Singh & Hardaker, 2014).

There have been transformational changes in four key areas in higher education - systems, privatization, academic work, and technology (Tierney, 2014). As Tierney indicated, when it comes to technology, higher education will continue transforming how faculty do their work in the future. Tierney (2014) argued that although most traditional universities were challenged by the inability to change, some universities tried to adapt to the rapid technological changes to meet the demands of students by adopting a 'sustainable' technology. Sustainable technology was supposed to replace and improve the current technology (Tierney, 2014). The simplest example of the sustainable technology is when "typewriter companies moved from manual to electric" (Tierney, 2014, p. 1423). However, not all technological improvements were successful as there were challenges that cost time, money, and focus (Tierney, 2014). The study, therefore, provides information about shifts that are likely to occur in higher education that might not only impact administrative and overhead costs but also might influence the technology integration process.

A detailed look at environmental pressures that higher education institutions face today emerged from Hoffman's (2013) policy report. In order to provide quality, efficiency, and value to the educational process, universities were being pushed to meet global requirements for their students' preparation. The results of Hoffman's (2013) report revealed the importance of updating the classrooms by providing technology access to the students mainly because of the "upsurge of social changes" (p. 49). Higher education institutions were caught between the requirements of the accreditation while also needing to rapidly innovate to meet the demands of new emerging technologies for learning. Therefore, examining the current change environment of higher education is one step that institutions could do by looking at the design of active and engaging learning environments, which ultimately could help build and extend knowledge of technology integration in the classroom.

Similar to environmental pressures, it is important to be aware of the philosophy of technology assumptions. In a qualitative study, Webster (2017) examined the philosophical assumptions of educational technologies in leadership and how these assumptions might influence technology decision making. In his critique of the claim of the digital natives, Webster (2017) defined a theme titled "technological determinism" (p. 26) to examine influences of assumptions on how technology served as a dominant force for social change. With over 20 participants that held leadership positions in the educational technology, the study provided convincing findings to support that technology be a critical component to achieving educational goals.

In reviewing the results of a case study, MacKinnon and MacKinnon (2013) identified a "digital divide" between developed and less developed countries such as in one Jamaican university (p. 50). The digital divide, as explained by the researchers, is "the haves and have-nots" of computer ownership and it is only the beginning of the digital divide. The study provides an understanding of different perspectives on the digital divide among faculty members from different countries. The study illustrated that regardless of the level of faculty struggles

with the integration of technology in classrooms, it is more significant when this type of struggle occurs in a well-developed environment such as in the United States. The digital divide across developed and underdeveloped countries is similar to the divide at the local level. For example, Cook (2016) also argued the digital divide happens when it comes to students who have access to the latest technology and those who do not. Furthermore, Cook stressed that there was a growing gap between savvy students and their schools. Linking technology use in academic programs could have a positive impact on learning (Cook, 2016).

When it comes to the concept of innovation in higher education, Williams' (2016) article revealed that those universities that attempted an innovative process of technology integration had to take a step back because of the costs. Furthermore, Williams described the feeling of "24/7" in which technological devices consumed our lives. This reverberated in American universities that went through "a chain of perceptive shocks" causing "a continuous disequilibrium" and anxiety (p. 114). To add to these side effects, the researcher emphasized a fundamental flaw that the structure of higher education should not solely depend on students' needs and desires but should instead focus on what the society collectively already knows and what was essential to innovative technology integration.

Identified Gap in the Research

From the review of the recent scholarly publications, it can be concluded that there is not one simple model when it comes to augmenting classrooms with appropriate technology, as is necessary in the transition to active learning technology classrooms. Technology integration and its use require hands-on experience, and a gap exists between higher education administrators who see instructional technology as a key element of 21st century learning and faculty who have been slow to adopt and continuously use classroom technology, as is indicated by the continuing needs identified in many research articles. There is a need for a connection between teaching and classroom technology. Student learning can be supported through an active learning technology tool adoption only if faculty are brought into the process. By doing so, it can also potentially alleviate the reluctance of faculty to use innovative tools in the classrooms.

Moreover, technology is emerging at a faster speed than people can adapt to them (Ahalt & Fecho, 2015). Some emerging technologies in instructional strategies that had been reported by Ahalt and Fecho (2015) included tools such as electronic grading, textbooks, flipped classrooms, and learning management systems. As newer technology becomes available, there will always be new and modified ways of learning and teaching on a continuous basis. This in itself creates a new kind of digital gap in the educational system because of the complexity of staying up-to-date on a rolling basis. This observation holds for classroom technology integration and adoption in many higher education institutions. Perhaps this is the time to involve faculty in the process in order to better align and facilitate the implementation of classroom technology tools.

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