Student Engagement and ICT: A Meta-Analysis
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Abstract:
Computer-based technology has infiltrated many aspects of life and industry, yet there is little understanding of how it can be used to promote student engagement, a concept receiving strong attention in higher education due to its association with a number of positive academic outcomes. The purpose of this article is to present a critical review of the literature from the past 5 years related to how web-conferencing software, blogs, wikis, social networking sites (Facebook and Twitter), and digital games influence student engagement. Our findings suggest that digital games provide the most far-reaching influence across different types of student engagement, followed by web-conferencing and Facebook. Findings regarding wikis, blogs, and Twitter are less conclusive and significantly limited in number of studies conducted within the past 5 years. Overall, the findings provide preliminary support that computer-based technology influences student engagement, however, additional research is needed to confirm and build on these findings. We conclude the article by providing a list of recommendations for practice, with the intent of increasing understanding of how computer-based technology may be purposefully implemented to achieve the greatest gains in student engagement.

Keyword: ICT, Social Media, Internet, Education, Student Engagement

Introduction:
The use of computers, mobile devices, and the Internet is at its highest level to date and expected to continue to increase as technology becomes more accessible, particularly for users in developing countries. Integrating technology into teaching and learning is not a new challenge for universities. Since the 1900s, administrators and faculty have grappled with how to effectively use technical innovations such as video and audio recordings, email, and teleconferencing to augment or replace traditional instructional delivery methods. There is a growing number of people who are smartphone dependent, relying solely on smartphones for Internet access (Anderson & Horrigan, 2016) rather than more expensive devices such as laptops and tablets. Greater access to and demand for technology has presented unique opportunities and challenges for many industries, some of which have thrived by effectively
digitizing their operations and services (e.g., finance, media) and others that have struggled to keep up with the pace of technological innovation (e.g., education, healthcare).

Many organizational barriers to technology integration arise from competing tensions between institutional policy and practice and faculty beliefs and abilities. For example, university administrators may view technology as a tool to attract and retain students, whereas faculty may struggle to determine how technology coincides with existing pedagogy. Surveys suggest that two-thirds of students use mobile devices for learning and believe that technology can help them achieve learning outcomes and better prepare them for a workforce that is increasingly dependent on technology.

The purpose of this paper is to provide a literature review on how computer-based technology influences student engagement within higher education settings. We focused on computer-based technology given the specific types of technologies (i.e., web-conferencing software, blogs, wikis, social networking sites, and digital games) that emerged from a broad search of the literature, which is described in more detail below. Computer-based technology (hereafter referred to as technology) requires the use of specific hardware, software, and micro processing features available on a computer or mobile device.

Our review aims to address existing gaps in the student engagement literature and seeks to determine whether student engagement models should be expanded to include technology. The review also addresses some of the organizational barriers to technology integration (e.g., faculty uncertainty and skepticism about technology) by providing a comprehensive account of the research evidence regarding how technology influences student engagement. One limitation of the literature, however, is the lack of detail regarding how teaching and learning practices were used to select and integrate technology into learning.

We chose to focus on technologies for which there were multiple studies published, allowing us to identify areas of convergence and divergence in the literature and draw conclusions about positive and negative effects on student engagement. In total, we identified 69 articles relevant to our review, with 36 pertaining to social networking sites (21 for Facebook and 15 for Twitter), 14 pertaining to digital games, seven pertaining to wikis, and six pertaining to blogs and web-conferencing software respectively.
Student engagement

Student engagement is a broad and complex phenomenon for which there are many definitions grounded in psychological, social, and/or cultural perspectives (Fredricks et al., 1994; Wimpenny & Savin-Baden, 2013; Zepke & Leach, 2010). Review of definitions revealed that student engagement is defined in two ways. One set of definitions refer to student engagement as a desired outcome reflective of a student’s thoughts, feelings, and behaviors about learning. For example, Kahu (2013) defines student engagement as an “individual psychological state” that includes a student’s affect, cognition, and behavior (p. 764). Other definitions focus primarily on student behavior, suggesting that engagement is the “extent to which students are engaging in activities that higher education research has shown to be linked with high-quality learning outcomes” (Krause & Coates, 2008, p. 493) or the “quality of effort and involvement in productive learning activities” (Kuh, 2009, p. 6). Another set of definitions refer to student engagement as a process involving both the student and the university.

Many existing models of student engagement reflect the latter set of definitions, depicting engagement as a complex, psychosocial process involving both student and university characteristics. Such models organize the engagement process into three areas: factors that influence student engagement (e.g., institutional culture, curriculum, and teaching practices), indicators of student engagement (e.g., interest in learning, interaction with instructors and peers, and meaningful processing of information), and outcomes of student engagement (e.g., academic achievement, retention, and personal growth) (Kahu, 2013; Lam et al., 2012; Nora et al., 2005). In this review, we examine the literature to determine whether technology influences student engagement. In addition, we will use Fredricks et al. (2004) typology of student engagement to organize and present research findings, which suggests that there are three types of engagement (behavioral, emotional, and cognitive). The typology is useful because it is broad in scope, encompassing different types of engagement that capture a range of student experiences, rather than narrower typologies that offer specific or prescriptive conceptualizations of student engagement.

Influence of technology on student engagement

We identified five technologies post-literature search (i.e., web-conferencing, blogs, wikis, social networking sites, and digital games) to include in our review, based on frequency in which they appeared in the literature over the past 5 years. One commonality among these
technologies is their potential value in supporting a constructivist approach to learning, characterized by the active discovery of knowledge through reflection of experiences with one’s environment, the connection of new knowledge to prior knowledge, and interaction with others (Boghossian, 2006; Clements, 2015). Another commonality is that most of the technologies, except perhaps for digital games, are designed primarily to promote interaction and collaboration with others. Our search yielded very few studies on how informational technologies, such as video lectures and podcasts, influence student engagement. Therefore, these technologies are notably absent from our review. Unlike the technologies we identified earlier, informational technologies reflect a behaviorist approach to learning in which students are passive recipients of knowledge that is transmitted from an expert (Boghossian, 2006). The lack of recent research on how informational technologies affect student engagement may be due to the increasing shift from instructor-centered, behaviorist approaches to student-centered, constructivist approaches within higher education (Haggis, 2009; Wright, 2011) along with the ubiquity of web 2.0 technologies.

**Blogs**

A blog, which is short for Weblog, is a collection of personal journal entries, published online and presented chronologically, to which readers (or subscribers) may respond by providing additional commentary or feedback. In order to create a blog, one must compose content for an entry, which may include text, hyperlinks, graphics, audio, or video, publish the content online using a blogging application, and alert subscribers that new content is posted. Blogs may be informal and personal in nature or may serve as formal commentary in a specific genre, such as in politics or education (Coghlan et al., 2007). Fortunately, many blog applications are free, and many learning management systems (LMSs) offer a blogging feature that is seamlessly integrated into the online classroom. The ease of blogging has attracted attention from educators, who currently use blogs as an instructional tool for the expression of ideas, opinions, and experiences and for promoting dialogue on a wide range of academic topics (Garrity, Jones, VanderZwan, de la Rocha, & Epstein, 2014; Wang, 2008).

**Social networking sites**

Social networking is “the practice of expanding knowledge by making connections with individuals of similar interests” (Gunawardena et al., 2009, p. 4). Social networking sites, such as Facebook, Twitter, Instagram, and LinkedIn, allow users to create and share digital content publicly or with others to whom they are connected and communicate privately.
through messaging features. Two of the most popular social networking sites in the educational literature are Facebook and Twitter (Camus, Hurt, Larson, & Prevost, 2016; Manca & Ranieri, 2013), which is consistent with recent statistics suggesting that both sites also are exceedingly popular among the general population (Greenwood, Perrin, & Duggan, 2016).

**Digital games**

Digital games are “applications using the characteristics of video and computer games to create engaging and immersive learning experiences for delivery of specified learning goals, outcomes and experiences” (de Freitas, 2006, p. 9). Digital games often serve the dual purpose of promoting the achievement of learning outcomes while making learning fun by providing simulations of real-world scenarios as well as role play, problem-solving, and drill and repeat activities (Boyle et al., 2016; Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012; Scarlet & Ampolos, 2013; Whitton, 2011).

**Discussion and implications**

Student engagement is linked to a number of academic outcomes, such as retention, grade point average, and graduation rates (Carini et al., 2006; Center for Postsecondary Research, 2016; Hu & McCormick, 2012). As a result, universities have shown a strong interest in how to increase student engagement, particularly given rising external pressures to improve learning outcomes and prepare students for academic success (Axelson & Flick, 2011; Kuh, 2009). There are various models of student engagement that identify factors that influence student engagement (Kahu, 2013; Lam et al., 2012; Nora et al., 2005; Wimpenny & Savin-Baden, 2013; Zepke & Leach, 2010); however, none include the overt role of technology despite the growing trend and student demands to integrate technology into the learning experience (Amirault, 2012; Cook & Sonnenberg, 2014; Revere & Kovach, 2011; Sun & Chen, 2016; Westera, 2015).

**Conclusion:**

Findings from our literature review provide preliminary support for including technology as a factor that influences student engagement in existing models (Table 1). One overarching theme is that most of the technologies we reviewed had a positive influence on multiple indicators of student engagement, which may lead to a larger return on investment in terms of learning outcomes. For example, digital games influence all three types of student engagement.
engagement and six of the seven indicators we identified, surpassing the other technologies in this review. There were several key differences in the design and pedagogical use between digital games and other technologies that may explain these findings. First, digital games were designed to provide authentic learning contexts in which students could practice skills and apply learning (Beckem & Watkins, 2012; Farley, 2013; Grimley et al., 2012; Ke et al., 2016; Liu et al., 2011; Lu et al., 2014; Marriott et al., 2015; Siddique et al., 2013), which is consistent with experiential learning and adult learning theories. Experiential learning theory suggests that learning occurs through interaction with one’s environment (Kolb, 2014) while adult learning theory suggests that adult learners want to be actively involved in the learning process and be able apply learning to real life situations and problems (Cercone, 2008). Second, students reported that digital games (and gamified elements) are fun, enjoyable, and interesting.

Reference:

- Anderson, M., & Horrigan, J. B. (2016). *Smartphones help those without broadband get online, but don’t necessary bridge the digital divide.*