



Impact of mobile technology on student attitudes, engagement, and learning



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ABSTRACT

Mobile devices and collaborative learning environments are common tools in education but not all collaborative learning is structured the same. This study evaluated student learning in three different collaborative learning environments, both with and without mobile technology, to assess students' engagement, critical thinking, and attitudes toward collaborative learning. The results indicate that mobile technology is associated with positive student perceptions of collaborative learning but with increased disengagement by students during class. In addition, the level of students' critical thinking was more closely associated with the tools used to construct written responses than with the collaborative learning environment style. Students constructing paragraph responses on a mobile device demonstrated significantly less critical thinking than those who used a computer keyboard or wrote responses by hand.

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1. Introduction

1.1. Mobile devices

As the use of mobile devices has proliferated, so has the concept that such devices may be useful in the process of teaching and learning (Khaddage, Muller, & Flintoff, 2016; Eppard, Nasser, & Reddy, 2016). The use of mobile technology in education provides educators with the opportunity to reimagine teaching and learning. This creates a more flexible learning model that gives both faculty members and students access to multiple information sources and a shift from an authority based learning structure to a structure based upon the concept of a community of learners (Hamm, Saltsman, Jones, Baldrige, & Perkins, 2013; Peters, 2007). As educators consider the best ways to use mobility to promote learning, it is important to examine strategies of both mobile learning and collaborative learning, and the best ways to blend the two to create effective learning experiences for students.

1.2. Mobile learning and collaboration

With the onset of ubiquitous handheld technology, teachers are also exploring opportunities to combine mobile devices with collaborative learning environments in order to enhance learning. The challenge is that some educational uses of mobile devices result in negative experiences for students who have difficulty with the tools being used (Ting, 2012). Students may

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also be distracted by multitasking on devices and distract fellow students by their technology use (Bellur, Nowak, & Hull, 2015; Dietz & Henrich, 2014; Junco, 2012; Ravizza, Hambrick, & Fenn, 2014; Sana, Weston, & Cepeda, 2013). Conversely, others report mobile technology improves students' perceptions of collaborative learning (Lai & Wu, 2006). In whatever ways they are employed, mobile devices and educational applications should not “complicate the learning process, but facilitate mobile learners' learning” (Jeng, Wu, Huang, Tan, & Yang, 2010). To this end, teachers are using mobile applications and classroom response systems that permit student replies to instructor questions based on course content. This has been shown to improve student perceptions of learning, engagement, and actual assessment scores (Denker, 2013; Jones, Crandall, Vogler, & Robinson, 2013). The use of these applications provides teachers with the opportunity to use mobile technology to promote significant learning. Although many teachers are using technology in their classes, a 2013 review of research on computer-supported collaborative learning revealed a dearth of sufficient studies on current mobile technology and small groups (Hsu & Ching, 2013). A 2016 meta-analysis of 110 experimental and quasi-experimental studies published between 1993 and 2013 that investigated the effects of integrating mobile devices on student learning indicated that the overall effect of using mobile devices appears to be better for learning than the use of desktop computers or not using devices at all (Sung, Change, & Liu, 2016). These authors suggest that the use of mobile devices and educational software in general is most effective when teachers are able to design the learning experience to match the device, program, and/or software with the learning outcome goals of the educational experience.

1.3. Model of mobile learning

Park (2011) adapted Gay, Rieger, and Bennington's (2002) model to develop a framework for understanding different types of mobile learning. This framework includes a mobility hierarchy, ranging from 1 to 4. Level 1 is content intensive and focuses on production. This level includes asynchronous applications such as calendars and grading. Level 2 focuses on flexible physical access and includes local databases and interactive prompting. Level 3 uses mobility applications that capture and integrate data. These include network databases, data collection, and mobile libraries. Level 4 mobile learning applications allow for communication and collaboration. These applications include real time chat, email, group use applications, and social media. Level 4 applications of mobile learning allow for intense communication and synchronous group work.

1.4. Model for creating significant learning

This model of mobile learning provides a structure to choose the best types of mobile applications for different types of learning activities. It integrates well with Dee Fink's (2003) taxonomy for creating significant learning. Fink's model goes beyond the cognitive taxonomy of learning provided by Bloom (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956) and considers aspects of learning such as helping students learn how to learn and develop life skills that impact communication, interpersonal relationships, and the ability to adapt to change (Fink, 2003). Fink's taxonomy of significant learning includes six kinds of learning. The first type of learning is foundational knowledge, which includes understanding and remembering information and ideas. Application is the second type of learning, and involves developing particular skill sets, critical, creative, and practical thinking, and managing projects. The third type of learning is integration, which encompasses connecting people, ideas, and realms of life. As students learn about themselves and others, they are engaged in the fourth type of learning, the human dimension. Developing new feelings, interests, and values is a part of caring, which is the fifth type of learning. Finally, the sixth type of learning involves learning how to learn as one becomes a better student, inquires about a subject, and becomes more self-directed.

In order to fully realize the impact of mobile learning, activities must be carefully developed to use the strengths of mobility to promote significant learning. As teachers develop learning experiences that encourage students to communicate and collaborate, understanding these two models allows them to choose mobile applications that promote their chosen learning objectives. Students who engage in activities that allow them to collaborate with one another in the process of learning instead of being isolated in interacting with content are more likely to experience significant learning.

1.5. Student engagement, collaboration, and mobile learning

Student engagement can be understood using Cole & Chan, 1994 definition (p. 259) as “the extent of students' involvement and active participation in learning activities.” Student engagement through active classroom participation is an important ingredient for learning that has many educational benefits for students (Berman, 2014; Kuh, 2009; Lippmann, 2013; Rocca, 2010). Collaborative learning environments, or small groups, are recognized by faculty and students as one effective strategy for promoting student engagement and learning (Lumpkin, Achen, & Dodd, 2015). In one study, students' overall satisfaction with small groups was greater than their satisfaction with full-class or online discussions (Hamann, Pollock, & Wilson, 2012). These students reported that small groups were more likely to “stimulate interest” and help them engage the material (p.72). While there are many strategies teachers can employ in pursuit of student engagement, highly structured small groups “with accountability measures built in” have a good chance of engaging more students than large group discussion (O'Connor, 2013). Some of these accountability measures include assigning roles to each student and requiring a written response from small groups based on their discussion so that students are actively engaged during the collaborative learning time (AlKandari, 2012).

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