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# Using mobile phones in college classroom settings: Effects of presentation mode and interest on concentration and achievement

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ABSTRACT

How to trigger and maintain the concentration of learners in their learning activities through mobile devices has become an important issue. Research on learning concentration and information presentation mode can provide new insights into the design and selection of m-learning materials and activities. This study used a quasi-experimental design to investigate the interaction effects of interest and presentation mode on the concentration and achievement of learning conceptual knowledge through mobile phones in the classroom setting. A total of 258 Chinese education majors participated in this study. Through correlation analysis, regression analysis, and ANOVA (one-way, two-way, and three-way), the three following major results were obtained: 1) significant correlations existed between interest and concentration as well as between concentration and achievement, 2) no interaction effects on concentration existed between presentation mode and interest while interest alone had a significant effect on concentration, and 3) interaction effects on learning achievement existed between presentation mode and interest as well as between concentration and presentation mode. The research findings imply that visual presentation (e.g., video) is not always the best choice for m-learning, and the factors of concentration, interest, and presentation modes must be fully taken into consideration when selecting m-learning materials. The limitations and directions for future research were also presented.



## 1. Introduction

Wireless and mobile technologies can motivate young people to learn, sustain their interest, and improve their learning and development (Attewell, 2005; Liu et al., 2003). Learning through mobile devices has recently become popular across different levels and fields of education (Hwang & Chang, 2011; Hyman, Moser, & Segala, 2014; Motiwalla, 2007). A Pearson survey revealed that most students expected to use mobile devices in their classrooms (Pearson Group, 2014). Given that mobile devices (e.g., mobile phones and tablets) have gradually entered the classroom setting, several studies have explored the feasibility, benefit, and strategies of using these devices in classrooms (Echeverría et al., 2011; Moredich & Moore, 2007; Zhang, 2013).

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Mobile learning (m-learning) is a new, promising field (Trifonova & Ronchetti, 2003) that refers to the use of mobile technologies for educational purposes (Chen, Chang, & Yen, 2012). Learning with mobile devices is highly contextualized and experiential within specific domains (Kukulska-Hulme & Traxler, 2005). Mobile devices enable students to participate in learning activities and instant interactions within real contexts (Chen et al., 2012).

Many studies suggest that m-learning positively contributes to student engagement (Huizenga, Admiraal, Akkerman, & Dam, 2009), learning achievement (Hwang, Wu, & Ke, 2011), motivation (Schwabe & Göth, 2005), interest (Tan & Liu, 2004), attitude (Hwang & Chang, 2011), and critical thinking skills (Cavus & Uzunboylu, 2009). Some researchers (Freitas & Schlemmer, 2013; Hwang & Wu, 2014) also argue that the negative effects and limitations of using mobile devices in educational settings (e.g., loss of learning concentration and incensement of cognitive load) need to be further investigated. How to trigger and maintain the concentration of learners in their learning activities through mobile devices has become an important issue in m-learning research. Given the limited screen size of mobile phones, the adaptive presentation of learning materials has also become an issue that needs to be explored (Chen, Hsieh, & Kinshuk, 2008).

Research on learning concentration and information presentation mode can provide new insights into the design of m-learning materials and activities. Here the presentation mode refers to the types of information presenting, such as text only, text + graphic, text + graphic + audio, etc. However, extant studies on m-learning largely ignore learning concentration and its relationships with other factors (e.g., interest, achievement, and information presentation mode). This study focuses on the learning concentration and outcome of college students who use m-learning materials with different presentation modes.

## 2. Literature review

### 2.1. Classroom learning with mobile devices

Some m-learning studies are conducted in outdoor environments (e.g., museums, botanical gardens, and temples) (Charitonos, Blake, Scanlon, & Jones, 2012; Chen & Huang, 2012; Hwang, Wu, Zhuang, & Huang, 2013; Lai, Chang, Wen-Shiane, Fan, & Wu, 2013). Mobile devices can support flexible learning in a variety of educational contexts. Traditional classrooms can also be transformed into new learning spaces with mobile devices (Chen et al., 2012).

Several studies (Edens, 2008; Gauci, Dantas, Williams, & Kemm, 2009; Lu, Pein, Hansen, Nielsen, & Stav, 2010) have explored the use of the student response system (SRS) in classroom teaching. Through SRS, each student with a mobile device can instantly and anonymously respond to classroom surveys and the questions of their teachers (Davis, 2003), while instructors can instantly assess the performance of their students and align their instructional techniques. SRS can enhance classroom interactivity, student engagement, and motivation (Davis, 2003; Moredich & Moore, 2007; Siau, Sheng, & Nah, 2006).

Given the popularity of mobile phones with large screen among college students, many instructors have begun to allow their students to use mobile phones to view coursewares, browse the Internet, download educational materials, and finish their classroom quizzes and surveys. Mobile phones have a huge potential to promote active learning in the classroom (Lindquist et al., 2007).

Compared with laptops, mobile phones are more portable and mobile, which can facilitate the creation of a one-to-one learning environment. Moreover, the abundance of mobile applications (commonly called mobile apps) for learning increases the possibility of designing a variety of micro-learning activities in the classroom, such as quick grouping, random questions, peer rating, and self-reflection. Echeverría et al. (2011) investigated how mobile phones could support face-to-face collaborative learning in physics classes. Seol, Sharp, and Kim (2011) argued that mobile phones could promote student inquiries in the elementary classroom. Williams and Pence (2011) explored the application of mobile phones in chemistry classes and found that these devices were powerful tools in retrieving information immediately and performing simulation experiments. Zhang (2013) used mobile phones to enhance student engagement in EFL classes. Other studies have investigated the adoption of mobile phones in classroom teaching and learning (Mittal, 2014; Thomas, O'Bannon, & Bolton, 2013).

Overall, mobile phones have enormous potential in promoting classroom teaching and learning, especially in higher education, because of their popularity among students. Mobile phones may become popular devices for learning and interaction in college classrooms. This study explores the self-learning of conceptual knowledge using mobile phones in college classrooms.

### 2.2. Learning concentration in e-learning and m-learning

Concentration refers to the ability of an individual to direct his/her thinking toward whatever directions he/she intends (Paget, 2010: P99). This ability is vital for processing information efficiently and successfully, and has become a prerequisite for effective learning (Ge, 2006). Learning concentration refers to the attention of an individual learner toward a learning task (Lin, Huang, & Cheng, 2010). The level of learning concentration may also significantly influence the learning outcome.

Given its time and space flexibility, e-learning requires a higher level concentration than traditional classroom learning to obtain better results (Kydd & Ferry, 1994). Learners who focus their attention on learning can easily find themselves in a state of flow, which in turn will positively affect their attitude toward and promote their usage of e-learning (Lee, 2010). Concentration is essential for learners to remain in the flow state (Ho & Kuo, 2010; Koufaris, 2002). Many studies have revealed