An interactive peer-assessment criteria development approach to improving students' art design performance using handheld devices

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ABSTRACT

Engaging students in higher order thinking such as evaluation and analysis has been recognized as being an important strategy for helping them develop knowledge and skills, in particular, in creativeness-oriented learning activities such as artwork design. In this paper, an interactive peer-assessment criteria development approach is proposed to help students develop assessment criteria, learn from viewing peers' work, and make reflections in artwork design activities using mobile devices. To evaluate the effectiveness of the proposed approach, an experiment was conducted in an elementary school art course. A total of 103 students participating in the experiment were assigned to an experimental group and a control group. The students in the experimental group learned with the proposed approach, while those in the control group learned with the conventional peer assessment approach. From the experimental results, it was found that the proposed approach significantly improved the students' learning achievement, learning motivation and meta-cognitive awareness, suggesting the effectiveness of engaging students in assessment criteria development in an interactive manner.

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1. Introduction

Scholars have for decades emphasized the importance of conducting higher order thinking activities in school settings (Lin, Yeh, Hung, & Chang, 2013; Piirto, 2011; Yang & Cheng, 2010). In creativeness-oriented courses such as art and design courses, fostering students' knowledge of the criteria for evaluating artwork has been identified as the key to improvement in their knowledge and development of their artwork skills (Bonsignore, Quinn, Druin, & Bederson, 2013; Groenendijk, Janssen, Rijlaarsdam, & van den Bergh, 2013; Halverson et al., 2014). Among various learning strategies, peer assessment has been considered as effective for helping students understand teachers' assessment criteria and make reflections during the learning process (Auttawutikul, Wiwitkunkasem, & Smith, 2014; Lin, Hong, Wang, & Lee, 2011). In the past decade, several studies have reported the effectiveness of conducting peer assessment activities in school settings (Tsai & Liang, 2009; Wen & Tsai, 2008). For instance, Nicolaidou (2013) conducted a one-year peer assessment activity that engaged students in developing their own e-portfolios, examining peers' portfolios, and providing feedback to peers, while Hwang, Hung, and Chen (2014) conducted a peer assessment activity for game development in a natural science course.

On the other hand, scholars have pointed out several problems of applying the peer assessment approach. For example, students might not be able to fully understand the meaning of the peer assessment or of the rubrics provided by the teacher. They could also feel frustrated when facing complex review tasks (Hovardas, Tsivitanidou, & Zacharia, 2014). Moreover, some students might ignore the assessment criteria and the feedback from their peers (Cho & MacArthur, 2010; Tsivitanidou, Zacharia, Hovardas, & Nicolaou, 2012). Furthermore, some limitations of conventional peer assessment have also been identified. For example, it lacks effective approaches to engage students in developing, examining and modifying the scoring rubric during the evaluation process; that is, students merely follow the criteria provided by the teacher without thinking why they have been adopted (Ng, 2014; Tsai & Liang, 2009).

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Therefore, to foster students' evaluation ability in art or design courses, it is important to involve them in assessment criteria development. In this study, an interactive peer-assessment criteria development approach is proposed. A learning system has been implemented based on the proposed approach to enable students to develop assessment criteria, share artworks, review peers' work, and make reflections based on peers' comments using mobile devices. An experiment has been conducted to evaluate the performance of the approach in terms of learning achievement, motivation, meta-cognitive awareness and cognitive load.

2. Literature review

2.1. Peer assessment

Peer assessment has been noted as a potential learning strategy for engaging students in knowledge construction and skill development via comprehending teachers' assessment criteria, learning from viewing peers' work, and making reflections (Boud, Cohen, & Sampson, 1999; Carlson & Berry, 2008; Matsuno, 2009; Tseng & Tsai, 2010). Topping (1998) defined peer assessment as a learning strategy whereby students evaluate or comment on the value or the quality of the work or the learning outcomes of their peers who learned with the same learning content.

The objectives of conducting peer assessment activities are to improve the students' learning outcomes, stimulate their higher order thinking (e.g., meta-cognitive awareness), and increase their autonomy (McMahon, 2010; Xiao & Lucking, 2008). For example, several studies have reported that peer assessment activities are effective in terms of enhancing students' autonomous learning ability (Chen, 2010; Yang, Badger, & Yu, 2006). Moreover, the effect of engaging students in the role of a reviewer on their reflections has been pointed out (Prins, Sluijsmans, Kirschner, & Srijbos, 2005; Xiao & Lucking, 2008). On the other hand, the benefit of receiving feedback from peers in improving students' learning outcomes has also been reported (Miller, Topping, & Thurston, 2010; Tsuei, 2012). For instance, Nicolaidou (2013) found that students' feedback could gradually become more comprehensive and correct by inspecting peers' comments in the learning process. Other researchers have also found that assessment training can result in a significant decrease in the discrepancy between student and instructor ratings of example projects; that is, the students' meta-cognitive awareness might be improved (Liu & Li, 2014).

Several studies have further emphasized the advantages of involving students in peer-assessment activities, including stimulating the self-reflection and higher order thinking of students (Dkeidek, Mamlok-Naaman, & Hofstein, 2011; Prins et al., 2005; Yu, Liu, & Chan, 2005). In addition, other benefits of engaging students in peer-assessment, such as promoting their learning performance (Maas et al., 2014; Xiao & Lucking, 2008), learning motivation (Jenkins, 2004; Llado et al., 2014), and facilitating their self-reflection and communication abilities (Brader, Luke, Klenowski, Connolly, & Behzadpour, 2014) have been reported. For example, Yu (2011) stated that involving students in peer-assessment activities could not only engage them in making reflections, but could also improve their higher order thinking and communication abilities.

On the other hand, researchers have pointed out the problems of the conventional peer-assessment approach. One of the problems is that students might have difficulty fully comprehending the assessment criteria provided by the teacher (Juwah, 2003; Tsivitanidou et al., 2012). Therefore, Juwah (2003) suggested that researchers and educators might consider involving students in determining the assessment criteria. However, to the best of our knowledge, despite the recommendations, none of these previous studies have involved students in developing their own peer-assessment criteria; instead, they merely asked the students to assess their peers' work based on the criteria provided by the teachers (Segrist & Schoonaert, 2006; Yu & Wu, 2013). Another problem encountered in most peer-assessment activities is that teachers are usually unable to provide instant comments or feedback owing to the lack of effective tools or strategies (Denton, Madden, Roberts, & Rowe, 2008; Wu, Hwang, Milrad, Ke, & Huang, 2012). Students are likely to feel frustrated and lose interest during the learning process if their learning difficulties cannot be resolved immediately (Chen & Huang, 2010; Hwang, Wu, & Ke, 2011).

Therefore, the aim of this study is to overcome these problems by proposing an interactive peer-assessment criteria development approach, and implementing a learning support system based on the approach to improve students' learning outcomes.

2.2. Mobile technology-enhanced learning

Mobile technology has been regarded as a potential medium for engaging students in learning in the classroom or in the field (Hwang, Tsai, & Yang, 2008; Hwang, Tsai, Chu, Kinshuk, & Chen, 2012). The popular handheld devices, such as smartphones and tablet computers, not only enable students to access learning materials without being limited by time or space, but also provide teachers with opportunities to develop learning activities from new perspectives (Chen, 2010; Hwang et al., 2011; Looi et al., 2010).

Moreover, many researchers have reported the benefits of using mobile technologies in school settings, such as the provision of personalized learning objectives and schedules (Chen & Li, 2009; Sandberg, Maris, & Hoogendoorn, 2014; Sung, Hwang, Liu, & Chiu, 2014), the access to learning facilities (Hyewon, MiYoung, & Minjeong, 2014), and the provision of learning support (Chang, Lan, Chang, & Sung, 2010) anywhere and at any time.

The presence of mobile technologies has brought criteria development to a new stage (Ogata, Saito, Paredes, San Martin, & Yano, 2008; Yang & Lin, 2010). With the help of mobile technologies, students are able to observe real artwork developed by their peers, acquire new knowledge via access to online resources, share their artwork and opinions, reorganize their knowledge, create assessment criteria, and make reflections on their own work (Chen & Huang, 2010; Jones, Ramanau, Cross, & Healing, 2010). Moreover, the facilities of providing personalized feedback can help students identify their shortcomings in the criteria they develop as well as realize their possible misunderstandings of the learning objectives provided by the teacher (Corbalan, Paas, & Cuypers, 2010; Jordan, 2012; Yu & Wu, 2013). The knowledge sharing and instant interaction facilities provided by mobile and wireless communication technologies further enable students to receive immediate feedback from teachers and peers (Chu, 2014; Lin, Wu, Hung, Hwang, & Yeh, 2009; Shih, Chuang, & Hwang, 2010).

Therefore, in this study, an interactive peer-assessment criteria development approach is proposed for developing mobile learning systems for the poster design unit of an elementary school art course. Moreover, several research questions are investigated to evaluate the effectiveness of the proposed approach: