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Prezi versus PowerPoint: The effects of varied digital presentation tools on students' learning performance

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ABSTRACT

This study investigated the effect of varied digital presentation tools (PowerPoint and Prezi) on the learning performance of students. The research focus was to evaluate how different presentation technologies used by class instructors affect the knowledge acquisition of students. A quasi experimental pre- and post-test control group design was adopted to fulfill the research purpose. The educational experiment was completed within 4 weeks. The participants were 78 fifth-grade students from a public elementary school in Taiwan. Students from three classes were divided into three treatment groups: PowerPoint instruction, Prezi instruction, and traditional instruction. Two quizzes (formative evaluation) directly related to learning units were administered to assess the immediate learning outcomes of the students after class. A learning achievement test (summative evaluation) was developed to measure the basic geographical knowledge of the students in a social science class. Two weeks after the summative evaluation was completed, the same learning achievement test with different item numbers (delayed summative evaluation) was employed to assess the long-term learning effects of the students. The results showed that Prezi was a more effective instructional medium for knowledge acquisition compared with traditional instruction. PowerPoint demonstrated instructional effectiveness on only the long-term learning retention of the students compared with traditional instruction. However, no significant difference was observed among the three types of tests in Prezi and PowerPoint instruction.

1. Introduction and literature review

1.1. PowerPoint use in the classroom

PowerPoint, developed by Microsoft, is a computer application used for displaying specific digital content to target audiences. School instructors widely adopt PowerPoint for classroom instruction because of its instructional effectiveness (Pippert & Moore, 1999). From an instructor's perspective, PowerPoint enables instructors to expend additional time on teaching content displayed on slides and the learning interaction of students by avoiding writing lengthy imparted

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knowledge on blackboards (Daniels, 1999). Regarding the learning performance of students, Roblyer and Doering (2010) asserted that multimedia elements such as video, audio, and hyperlink documents embedded in PowerPoint slides efficiently present learning materials, which attracts the attention of learners and stimulates their thinking process (Clark, 2008).

The PowerPoint design principle establishes an organizational structure in slides, in which a bulleted presentation of instructional material summarizes the main ideas of instructors in a well-ordered manner (Susskind, 2005, 2008). However, such a systematic feature yielded several negative comments from school educators. For example, Tufte (2003) fervently criticized the use of PowerPoint in classroom, arguing that the cognitive style of PowerPoint transformed instructors into authoritarians who completely controlled and presented students with limited content condensed into slides. During this linear-based presentation, crucial information is scattered on different slides (Tufte, 2006), and thus, forming concept relationships is difficult (Reed, 2006). However, robust experimental research has yet to confirm this claim.

Previous empirical studies evaluating the effects of PowerPoint on student learning have reported two divergent findings. In the first research camp, Bartsch and Cobern (2003) investigated the effects of three types of instruction presentation (overhead transparencies, PowerPoint consisting of text only, and PowerPoint consisting of multimedia elements) on the learning performance of students and observed no significant difference among three experimental groups. Apperson, Laws, and Scepansky (2008) examined the instructional effectiveness of two types of instruction (traditional instruction and PowerPoint) and reported that PowerPoint instruction did not improve the learning achievements of students. In another research camp, Erdemir (2011) compared the instructional effects between traditional instruction and PowerPoint presentations and indicated that student participants who received PowerPoint instruction enhanced their learning achievements in physics. Although inconsistent results have been reported in those studies, compared with traditional instruction, students assigned to PowerPoint groups showed learning preferences for PowerPoint.

1.2. Prezi use in the classroom

Constructed on cloud computing technologies, Prezi is a Web 2.0 tool that enables users to create online presentations. Prezi was launched in 2009, and is regarded as innovative freeware for potentially replacing the role of PowerPoint, which has dominated the presentation market. The major features of Prezi are an infinite canvas and nonlinear presentation style. The infinite canvas is a large blank workspace in which various concept blocks form presentation slides. The nonlinear presentation style is a function of user-defined paths for illustrating the relationship among slides by zooming (Good & Bederson, 2002) and panning screen animations (Bean, 2012). As a web-based application, Prezi provides users with a learning opportunity to collaboratively edit slides online with their peers (Perron & Steaens, 2010).

From an educational perspective, the Prezi design principle can be explained using two instructional theories. First, the scenario of user-established relationships among various slides (or concept blocks) is extremely similar to concept maps, which systematically organize different graphic concepts by linking words or phrases (Novak & Gowin, 1984). Second, the nonlinear presentation style precisely depicts the essence of elaboration theory (i.e. one of instructional design principles), which provides a detailed guidance for instructional sequences. In general, presentation sequences in learning materials, which may influence student learning, can be topical or spiral sequencing (Reigeluth, 1999). For example, depending on the preferences and experiences of users, user-defined paths in Prezi can display slides in topical or spiral sequencing. In addition, slides can be presented in a holistic (all slides) or specific (one slide) angle of view. However, most studies on Prezi topics have tended to focus on innovative parts and have disregarded theoretical foundations.

Because Prezi is an emerging learning technology, few empirical studies have evaluated the instructional effectiveness of Prezi. However, the findings of previous studies show positive outcomes for Prezi use in the classroom. For example, Ballentine (2012) instructed students to use Prezi to document their game design and indicated that Prezi might benefit students in game planning. Conboy, Fletcher, Russell, and Wilson (2012) interviewed students on their opinions regarding Prezi use. Most of the students reported that Prezi was an effective learning tool for enhancing their learning process. Brock and Brodahl (2013) conducted a cultural comparison between the United States and Norway regarding Prezi application in group projects and determined that Prezi changed the traditional thinking process of students in preparing presentation slides. Virtanen, Myllärniemi, and Wallander (2013) surveyed the experiences of college students in using Prezi in the classroom and indicated that students reported that Prezi might improve their learning outcomes. Although Prezi instruction yields positive outcomes, lacking experimental reports is a major weakness in previous research.

1.3. PowerPoint versus Prezi on student learning

A major difference between PowerPoint and Prezi is the slide presentation style. User-defined sequencing (nonlinear) in Prezi challenges the linear-structured format of PowerPoint. Nevertheless, both PowerPoint and Prezi are technology hubs in which several multimedia elements can be embedded (Perron & Steaens, 2010). According to Mayer's (2005) cognitive theory of multimedia learning, when students receive those two types of digital presentation (PowerPoint and Prezi), multimedia functions combining text with pictorial components may enable students to acquire class knowledge in an efficient manner. In the current study, slides designed in PowerPoint and Prezi both share this theoretical assumption.

The cognitive theory of multimedia learning asserts that learners may actively select limited information through two sensory memories: verbal and pictorial models (Mayer, 2009). Multimedia technologies serve as effective learning tools that enable learners to meaningfully organize and integrate received information with prior knowledge between working