Examining the effects of learning in dyads with computer-based multimedia on third-grade students' performance in history

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A R T I C L E   I N F O

A B S T R A C T

The research examined the impact of multimedia within the context of collaborative dyadic learning on students' performance in a third-grade history lesson, taking into consideration students' individual collaborative skills and dyad collaboration level. Participants were divided into a control group and an experimental group. The same learning materials were used for both groups, with the difference that the learning materials for the experimental group were delivered via a computer. Students in the control group worked in dyads with print materials, whereas students in the experimental group worked in dyads with a multimedia computer application. After considering the effects of learners' individual collaborative skills and dyad collaboration level, the results showed that the experimental group outperformed the control group exemplifying the positive influence of the dyadic collaboration around a computer on learning outcomes.

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1. Introduction

The teaching of history has been traditionally lecture-based emphasizing the memorization of facts and the chronological sequence of events (Barton & Levstik, 2003; Timmins, 2006; Waring, 2007; Yilmaz, 2009). This focus on information delivery, without making connections with people's real life, has unfairly promoted the belief that history is a boring subject (Russell & Pellegrino, 2008). While computers have created and continue to create new realities and opportunities in education (Crook, 1994; van Driel & van Boxtel, 2003; McCormick, 2004; Prangsma, 2007; Veletsianos & Russell, 2013), the integration of computers in the teaching of social studies, and in particular history, is still a field in its "*adolescence*" (Berson & Balyta, 2004, p. 148), and to a great extent "*research lite*" (Friedman & Hicks, 2006, p. 251) in terms of systematic empirical studies examining the impact of computers on learning outcomes (Beck & Eno, 2012; BECTA, 2004; Hicks & Doolittle, 2009). Despite of this, according to Hicks and Doolittle (2009), there is some research on the use of multimedia in teaching and learning history (e.g., Beck & Eno, 2012; Brush & Saye, 2008, 2009, 2014; Hammond & Manfra, 2009; Kingsley & Boone, 2006; Poitras, Lajoie, & Hong, 2012; Saye & Brush, 2005, 2006, 2007; Voss & Wiley, 2000; Wiley & Ash, 2005).

Multimedia learning, according to Wiley and Ash (2005), usually refers to the electronic delivery of materials via computer-based tools in which pictures, text, animation, movies, and sounds are all combined in the presentation of the information. Interestingly, Wiley and Ash (2005) also stated that in the case of history, traditional textbooks or even classroom

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instruction can also be considered multimedia, because history textbooks and teaching combine "*texts of historical narratives with maps, charts, timelines, pictures, diagrams, and paintings to convey the historical facts or events*" (p. 375). Thus, according to these authors, the notion of multimedia has a broader meaning, because "*the study of history, as the historian knows it, is essentially a multimedia experience as the historian compares and contrasts information across multiple sources, even when all sources might be of the same medium*" (Wiley & Ash, 2005, p. 376). For the purposes of this paper, the authors adopt the view that multimedia learning is the presentation of material using multiple sources (e.g., textbooks, biographies, newspapers, etc.), and/or multiple modes of communication (e.g., text, sound, pictures, animation, maps, graphs, charts, etc.).

Early accounts on the use of multimedia in teaching history involve efforts by Holt (1990) and Wineburg (1991) who gave their students materials from multiple source documents in order to approach a historical problem and develop their own historical interpretations. The results showed that students in a multiple source environment learned better than students in a single text environment. These research outcomes were replicated in the early 2000s by other researchers (e.g., O'Neill & Sohbat, 2004; Saye & Brush, 2005, 2006; Wiley, 2001). Additionally, research by Swan and Locascio (2008) and Hofer and Swan (2014) also showed that multimedia learning is most effective when it is integrated in a learning environment with clear instructional goals, objectives, well-defined learning tasks, such as, writing tasks for which students are asked to write opinions, descriptive essays or interpretations, and student-centered integration strategies where learners are at the center of the knowledge construction process.

A second affordance of multimedia learning in the teaching of history is related to the use of videos and films in order to engage students in a learning environment that is more vivid, interesting, and or relevant to them. Initial work toward this direction includes the research by Barton (1995), Seixas (1994), and Swan (1994) who integrated films and movies into the teaching of history. More contemporary work by Masterman and Rogers (2002), Berson and Berson (2009), and Harris and Hofer (2011) used online archives, graphics, photographs, video, text, and audio, within a computer-based multimedia system, to enable students to create their own digital portfolios and publish their podcasts and vodcasts in order to share their own historical artifacts and narratives.

Beck and Eno (2012) stated that a third significant aspect in regards to technology integration in the teaching of history is the affordance of computers to enable collaboration among students. While, according to these authors, this line of research in social studies is still in its infancy, there is some evidence within the context of collaborative activities in history lessons with handheld devices (e.g., Lundin & Magnusson, 2003; Zurita & Nussbaum, 2004) showing that collaborative multimedia learning helps to overcome several weaknesses of face to face collaborative learning, namely, organization of material and flow of learning experience. Another major weakness, according to Beck and Eno (2012), is that most of the studies examining the use of multimedia in history are design studies and only a small number of them adopt the methodology of experimental research to measure the effects of multimedia instruction on learning outcomes.

To this end, the present study assumed a quasi-experimental methodology in order to examine the effects of computer-based multimedia on third-grade students' performance in a history lesson. Specifically, the authors designed and developed a computer multimedia application about life in ancient Egypt with an emphasis on the social hierarchy and the differences among the various social classes. The software followed a problem-solving approach engaging students in inquiry-based activities in order to solve a mystery. In doing so, the students were immersed in an environment where they met people from ancient Egypt, learned about the different social classes, constructed the social pyramid, and reflected and proposed ways of how life in ancient Egypt could change for the better, especially for the lives of the people belonging to the lower social classes. Within this context, the study described herein examined the extent to which dyads of third-grade students who collaborated around a computer, via the means of a multimedia application, outperformed dyads of third-grade students who collaborated together without a computer but with the same materials in order to complete the same learning task as the dyads who used the multimedia application.

Crook (1994) sees two ways in which computers affect collaborative learning: (a) collaboration through computers (interacting through computers), and (b) collaboration around computers (interacting around computers). In collaboration through computers, students interact via communication networks. In collaboration around computers, computers are used to facilitate face to face communication between two or more students. According to Crook (1994), in collaboration around computers, computers help students to focus on a common goal through the use of a shared screen, and provide an interactive and dynamic environment within which students can manage information collectively and engage in face to face communication to resolve disputes.

Collaborative learning involves teams or dyads of learners engaged together in a process of knowledge construction through discussion, problem solving, debate, reflection and or argumentation (Bereiter, 2002; Fransen, Kirschner, & Erkens, 2011). Team effectiveness is one major factor affecting students' learning performance when they work together to complete a task. Team effectiveness can be characterized as a multilevel construct, which depends on several factors, such as, the individual team members' abilities and collaborative skills, attitude toward collaborative work, role assignment within a team, as well as team leadership and interdependency (Baroudi, 2007; van den Bossche, Gijselaers, Segers, & Kirschner, 2006; Cantwell & Andrews, 2002; Johnson & Johnson, 1994, 2004; Johnson, Johnson, & Holubec, 1994; Katz-Navon & Erez, 2005; Tongdeelert, 2004).

In regards to the importance of the individual team members' collaborative skills, Baroudi (2007) proposed a framework consisting of five skills, namely, (a) contribution to the team, (b) problem-solving strategies, (c) attitude, (d) focus on the goal, and (e) collaboration with others. She defined contribution to the team as the individual's ability to contribute usefully to the team by offering his or her ideas on a frequent and regular basis. She referred to problem-solving strategies as the individual's