Perceptions of the Value of Digital Mini-Games: Implications for Middle School Classrooms

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Abstract

This research examined the change in the perceptions of preservice teachers regarding the use of digital mini-games to support middle school level social studies learning. The results of a Wilcoxon Signed Ranks Test for matched pairs revealed that participants' (N = 18) perceptions were positively modified by participation in a series of digital mini-games [T = 5.5, p <.01 (two tailed)]. Results also indicated that the majority of preservice teachers agreed that digital games do have the potential for promoting learning in an educational setting. Recommendations for further research are provided.

Computer technology, in the form of digital mini-games, has recently expanded potential ways of learning within the social studies classroom. Digital games, including mini-games, support the concept of learning by doing (Gee, 2003; Prensky, 2006). This method of instructional delivery can occur on a grand scale via complex digital gaming, or on a more manageable scale via digital mini-games that support state and district social study standards. Mini-games differ from more complex games in that they require less time to play, provide a limited set of challenges, and are mastered quickly (Prensky, 2006). Mini-games can be linked more effectively to standards than can their complex cousins. Mini-games can also include video, computer, and Internet-based role-play, simulation, and strategy games. Unlike the more complex games, which can take a longer time to master and have extended play across numerous sessions, mini-games are quickly mastered, and sessions can

be completed within a short time period, thus making the games more appealing to teachers and more relevant to an instructional setting.

Most digital mini-games are located on the Internet. This is particularly advantageous for teachers because they do not have to install, upgrade, or troubleshoot gaming software. The games located on the Internet also do not require additional memory or tech support. It is important to note the category of mini-games described above does not include "edutainment" games, such as trivia or drill-and-practice games. It also does not include adult, violent, or sexually explicit games such as Doom or Grand Theft Auto. Finally, a wide variety of digital mini-games are available for use in social studies classrooms (Liu, 2007).

Because of the difficult task teachers and others face in providing meaningful instruction for technologically savvy middle-schoolers, the issues of whether digital games promote student learning and whether they can be used in a classroom environment must be considered during teacher preparation. Even though many of the claims made about the efficacy of digital games as learning tools do not yet have research support (Mishra & Foster, 2007), the writings outlined below, coupled with an emerging research base, suggest that carefully selected digital games can support authentic and other meaningful learning experiences, motivation to learn, and positive socialization in middle school and other classrooms (Gee, 2003; McFarlane, Sparrowhawk, & Heald, 2006; Mishra & Foster, 2007; Prensky, 2006).

A Framework for Understanding

Theoretically, the use of digital mini-games in a classroom combines learning theory and technology to support meaningful learning experiences and

outcomes. Three broad areas are examined within this framework

- Historical context
- Authentic learning and active engagement
- Motivation

Research supporting this theoretical framework is provided as well.

Historical Context

The topic of games, or simulations, to support academic goals and outcomes, including knowledge of facts, strategies for problem solving, and change in student perceptions and attitudes, has appeared in educational literature since the 1960s (DeKock, 1969). According to Gratch, Kelly, and Bradley (2007), simulations are models that recreate events, issues, or phenomenon that provide complex systems or scenarios in order to allow learners to engage in reasoning or problem-solving processes. The major questions for educators and researchers during the latter part of the 20th century were whether the use of games in classrooms increased student learning and/or motivation (Heitzmann, 1973). During this period, only a few empirical studies examined the use of games in the classroom to achieve academic goals. That past research had mixed findings. For instance, Baker (as cited in Heitzmann, 1973) conducted an experiment involving eighth grade students who participated in an American history simulation. He found that the use of the simulation successfully communicated historical facts and concepts. On the other hand, Livingstone (as cited in Heitzmann, 1973) reported research in which students' use of the game Trade and Develop showed no significant differences in learning between the simulation group and a control group. In addition, Heitzmann (1973) detailed

a study conducted by Fennessey et.al. (1972) that involved 47 schools, 87 teachers, and 4,539 students and showed that the experimental simulation group and control group were equally effective in learning facts and relationships. Finally, Heitzman (1973) reported studies that examined the retention of information and transfer of learning by students who participated in games or simulations. Games did not appear to contribute to greater retention, but transfer of learning did increase. The early research regarding games to support academic goals did not suggest that the use of games was any more effective than the use of traditional teacher-centered methods. Therefore, many teachers failed to buy into the promise of gaming to support skills and strategies that were already learned. Teachers also did not see the potential for the development of new knowledge, active engagement, and linkage of knowledge to a real-world setting. Teachers were not sold on the use of games as a learning tool.

Research about the efficacy of the use of games in the classroom seemed to have been placed on the backburner for some time after the initial interest, but questions regarding the contribution of games to education have recently re-emerged as a result of the explosion of technology and the growth of the gaming industry. The questions and the controversy regarding simulations and games are now relevant, especially since the advent of digital mini-games within society, particularly its technology-assimilated youth. Although there is still little empirical research and resulting evidence regarding the efficacy of digital mini-games used in the classroom, researchers and practitioners are recognizing the emerging new interest and are drawing upon past studies and upon theories of instruction to develop a commonsense approach to the use of digital gaming for supporting learning as well as motivating students, especially those in middle school. For this reason, it is probable that digital games will become commonplace in the academic setting even without an abundance of empirical evidence supporting the efficacy of the games.

Authentic Learning and Active Engagement

Content learning. The software industry, specifically the gaming industry, has made great strides in the development of its product. Simulations have been recently created not only to entertain but also to teach. One of the past criticisms of the use of games in educational contexts was that, although games often could provide reinforcement of knowledge and skills that had already been acquired through traditional methods of instruction, there was little academic value in the form of new learning that was meaningful beyond what had been taught previously. In addition, the traditional methods often transmitted and reinforced the information more reliably and at a quicker rate than did various games and simulations. In fact, the underlying controversy centered upon whether students in an academic setting learned more through discovery or through a more direct instruction type of model. However, with the emergence of the gaming industry, Gee (2003) noted that, in relation to games, the dilemma was resolved between overt telling versus immersion in practice, thus incorporating two types of learning that are often polarized and politicized (p. 114). Gee found that the solution within the gaming industry was to "give information in context and to couch it in ways that make sense in the context of embodied action" (p. 119). It is possible that the differences in today's games, in that they are much more based upon learning theory than games developed in the 1960s, render those games more efficacious for academic outcomes than games of the past. The structure of the games today, combined with the degree of enthusiasm of middle school students for games, could have much broader implications for learning outcomes than games have had in previous years. This suggests the possibility that teachers and others will embrace digital mini-games even without supporting empirical evidence of value.

Differences in learning. Middle school students learn "effectively in the context of authentic, real-life activities yet have

difficulties with the more artificial tasks required in school" (Bransford, Derry, Berliner, & Hammerness, 2005, p. 55). Technology, such as digital games "…can act as bridges for helping them learn in school" (Bransford et al., 2005, p. 55). Digital games promote active engagement in the learning process (Gee, 2005; Liu, 2007; Prensky, 2006; Shaffer, Squire, Halverson, & Gee, 2005). In particular, the learning promoted by digital games is the same learning needed for success in our global society (Greenfield et al., 1994; Prensky, 2006; Shaffer & Gee, 2005). Digital games engage middle school learners in authentic tasks that mirror the way professionals identify and solve problems (FAS, 2006; Prensky, 2006; Shaffer et al., 2005). Use of digital games allows middle school learners to use the same or similar tools as those used by professionals in the world of work (Edelson, Gordin, & Pea, 1997; Gee, 2005). Since game playing comes naturally to children and teens (Piaget, 1962), use of digital games can be viewed as a vital method of promoting authentic learning at the middle school level (Franklin, Mayles, Liu, & Chelburg, 2007).

Digital games also force students to learn about failure and success (Gee, 2005; Simpson, 2005: Squire, 2005; Squire et al., 2005). There are always consequences for choices and actions within digital gaming environments (Pensky, 2006). As Recesso and Orrill (2007) wrote, "[Digital] games offer players the opportunity to fail in ways that are congruent with failure in life" (p. 270).

Dede (1999; 2000) provided insight into how virtual worlds, such as immersive virtual worlds and multi-user virtual environments, including simulations and role-plays, can promote learning across time and space. Liu (2007) argued that digital games can support standards-based learning in social studies and other content areas at middle school and other levels. In addition, Recesso and Orrill (2007) cited the value of digital games for supporting meaningful learning in all content areas. They argued for the use of digital games to promote learning and the application of previous learning. They even noted their usefulness as assessment tools for

demonstrating knowledge and application of knowledge along with skills development. However, Recesso and Orrill (2007) also highlighted the critical role of the teacher in assuring that any learning occurs. They wrote that teachers must "scaffold the gaming experience to help…students make sense of it" (p. 273) and that good practice is still good practice even when digital games are used as educational tools. Likewise, McFarlane et al. (2002) recommended similar methods for successful use of digital games in the classroom. Therefore, teachers' knowledge of digital games and how to integrate them into instruction is imperative to their curricular success.

Although the research on the use of digital games for content learning is in its infancy, some early studies suggest that carefully selected digital games can support content learning at middle and secondary school levels (McFarlane et al., 2002). For example, Whelan (2005) reported that students playing the online game, Quest Atlantis, demonstrated greater gains in social studies, language arts, and science content knowledge than did students in the control group who did not play the game. Similarly, research conducted in the United Kingdom (McFarlane et al., 2002) using Age of Empires demonstrated that digital games can support content learning. In particular, the researchers found that "children using [the game] develop[ed] a knowledge of the historical context" even as they improve their planning and strategy skills (p. 2). Squire (2005) reported that digital games promoted vocabulary acquisition, a better understanding of content via interacting with the content in a gaming environment, and a better conceptual understanding of that content.

Critical thinking and reasoning. When considering the value of digital games for supporting critical thinking and reasoning skills among middle school learners, Jonassen's (2000; 2006) work is informative. Jonassen (2006) focused on the use of computer and multimedia environments as mind tools for learning. He viewed computers, etc., as "constructivist, higher-order, critical thinking…" tools (Jonassen, 2000, p. iv).

According to Gee (2003), digital games promote critical thinking, reasoning, and problem-solving skills along with decision-making and strategizing skills. Via experimentation, digital games teach important thinking and reasoning skills (Federation of American Scientists, 2006; Pillay, 2003; Prensky, 2000; Prensky, 2006). The promise of digital games for learning is such that the Federation of American Scientists (FAS) supports the use of educational digital games to teach academic content, sharpen critical-thinking skills, and assess student learning (FAS, 2006).

Research conducted using off-the-shelf educational games demonstrated that digital games can promote critical thinking among middle school age users (McFarlane, et. al., 2002). In particular, the research demonstrated that digital simulation and strategy games can develop strategic thinking and planning skills. Additionally, players master "complex concepts without losing the connection between abstract ideas and the real problems they can be used to solve" (Shaffer et al., 2005, p. 4). Other researchers report similar findings suggesting that digital games can support the growth of logic and problem solving among young users (Higgins & Packard, 2000; Whitebread, 1997). However, recent research conducted by Kirriemuir and McFarlane (2006) suggests a more cautious approach to interpreting these findings. Researchers "question…whether children are in fact able to move from intuitive problem solving in the game to an understanding of effective processes for identifying problems and generating hypotheses and solutions in other contexts" (p. 14). Clearly, more research is needed to resolve these concerns.

Motivation

Motivation is another consideration for the middle school educator. Digital games provide clear roles for learners to assume, thus motivating students to learn (Cordova & Lepper, 1996; Halverson, 2005; Simpson, 2005; Squire, 2005; Squire et al., 2005). Degenhart and Keengwee (2007) agreed, stating, "Computer games have the ability to improve

learning in the classroom by creating hands on experience for the learner… facilitat[ing] motivation and enthusiasm" for learning (p. 1968). Additionally, digital games provide meaningful learning choices (Squire, 2005).

In a case study examining the use of digital game modules in middle school science classrooms, researchers reported positive student motivation to learn (Franklin et al., 2007). Batson and Feinberg (2006) concurred, as students in their study reported being motivated to play the games. They also reported that this motivation to play resulted in a positive learning experience.

On the other hand, Whitton's 2007 study found that many students who play digital games do not see them as motivational tools. The author further reported that there is no evidence to suggest that recreational game play results in an interest in using games as learning tools. Furthermore, Livingstone (as cited in Heitzmann, 1973) demonstrated that there was no change in student motivation to learn subject matter material beyond what was provided through the simulation. In fact, Heitzmann stated that game designers theorize that some students who excel in traditional classroom settings will not enjoy a competitive game environment where they may not excel, and that they may, in fact, suffer from a decrease in motivation. Whitton's (2007) findings suggest this issue remains relevant today.

One finding that Heitzmann (1973) reported relates to underachievers. It appeared that underachievers have excellent results when using simulations and that disadvantaged students increased their rate of school attendance by 17%. If this was true in the 1960s and 1970s, it is possible that motivation is even higher for this group due to the increasing sophistication of today's digital mini-games.

A Call to Research

Heitzmann (1973) pointed out the confusion and contradiction regarding the effectiveness of games and simulations to further academic goals and outcomes several decades ago. He stated that there was no clear line of research because of

the inherent research design difficulties in studying this field. A scarcity of empirical research on the efficacy of digital games suggests that these issues remain problematic for researchers. However, although the research on digital gaming remains in short supply, the theory supporting them is plentiful. Therefore, it is time for research to accelerate the process of empirically supporting, refuting, or clarifying the efficacy of these digital games in educational contexts. In the meantime, however, because of anecdotal support, it is possible that digital mini-games will become commonplace in the classroom.

One area of research that is most needed, and cannot be separated from the design of the game itself, is how the game is presented, supported, and integrated into the classroom. The field of education has known for a long time that even the best method of instruction will not have an effect upon learning if the method is not used in the manner that it is intended. In support of this, Caftori (1994) examined how games were used in one middle school. The middle school set up a learning lab where students played computer games for 20 minutes at a time. The lab was staffed with personnel who provided students with computer assistance but did not instruct. Caftori concluded that "children do not utilize educational software as intended by its designers" (p. 6). She indicated that there was little value in educational software without the support of knowledgeable teachers. Kirriemuir and McFarlane's (2006) results support the validity of this assertion. The researchers concluded that teachers are central to the successful integration of games and that they must scaffold learning throughout the experience even as they make the links from the game to the curriculum it is intended to support.

Purpose of the Study

Whether digital mini-games support learning outcomes among middle school students remains unknown. However, Recesso and Orrill (2008) stated, "As a category, [digital games] are some of the most promising tools

for educational use, from early elementary grades to the adult level" (p. 272). Potential for successful use of digital mini-games rests with teachers and other instructional leaders. The time has come to re-examine the use of games for academic outcomes. However, no examination is complete without input from those expected to use the games. Because teachers are the ones who will help students make sense of the digital gaming experience, they remain a necessary part of the process (Halverson, 2005, ¶ 19). How teachers perceive the value of games and how games can be incorporated into their classroom will affect whether they choose to avail themselves of this new technology. The perceptions of teachers, including preservice teachers, regarding the use of digital mini-games to support learning are currently unknown. This is especially important considering the rise in interest in gaming beyond the classroom, in the world of business and work. Therefore, the question for this particular study is not whether games contribute to academic learning but whether teachers perceive them to do so. This exploratory study was guided by two research questions:

1. What are preservice teachers' perceptions of digital mini-games as learning tools in middle school classrooms?
2. To what extent does that perception change as a result of their in-class participation and discussion of selected digital mini-games?

Methodology

Participants

The 18 participants ranged in age from early 20s to mid-50s (12 between the age of 20 and 29, 4 between 30 and 39, 1 between 40 and 49, and 1 who was 50 or older). Of these, 16 were female (15 = White/non-Hispanic, 1 = Hispanic) and 2 were males (1 = White/non-Hispanic, 1 = Hispanic). All participants were preservice teachers working toward licensure at the elementary and middle school levels.

Setting

The setting was an elementary/middle school social studies method course at a doctoral granting research university in the intermountain western United States. The course content included diversity and social justice as well as how to teach social studies content, including history, civics, and geography. The course also included methods of teaching for active student involvement, including an examination of role-plays and simulations. The class examined learning theories foundational to these instructional methods as well.

Instrumentation

The researchers developed a questionnaire to determine preservice teachers' perceptions of the value of digital games in a classroom setting. The questions were based on the theoretical writings of leading theorist including Gee (2005), Jonassen (2000), Piaget (1962), and Prensky (2006). The categories of questions included learning/learning theory, instructional practice, and motivation to learn.

The questionnaire had two parts. The first part was a holistic pre- and post-assessment of value or worth. The scale included from "no value/worthless" (1), "somewhat worthless" (2), "neutral" (3), "somewhat worthwhile" (4), and "great value/worthwhile" (5). Researchers used pre- and postassessment results from this section to determine change in perception among participants and to determine whether that change was statistically significant.

The second part of the questionnaire contained 15 items administered as a part of the postassessment. This section required participants to indicate simple agreement or disagreement with a declarative sentence regarding the participants' perceptions of digital games. In addition, the postassessment included a set of open-ended questions that asked the participants to clarify their responses in a narrative format (see Appendix, p. 100).

To establish content validity, two experts provided feedback during the questionnaire development process. One, a teacher education and instructional technology

professional, taught at the middle school level for 12 years. The second expert teaches graduate-level courses in learning theory. The first expert assisted by confirming the legitimacy of the indicators for preservice teachers, whereas the second expert confirmed the links to learning theory.

Procedures

The instructor selected games to be used in the course according to the goals of the social studies methods course, state knowledge, skill and dispositional standards for teachers, and appropriate K–12 social studies standards.

The instructor presented participants with the pre-assessment at the beginning of the semester. They marked the appropriate responses indicating their initial perceptions about the value of digital games in an educational context. During the semester, the instructor presented the regular topics of the course, instructional methods that teachers use in the classroom to teach key social studies concepts and skills, and an examination of underlying theories. The instructor linked various digital games to course topics and gave a rationale for why each game might be effective in a middle school classroom setting. The participants then played the games. Finally, participants debriefed the games with the instructor. For instance, when social justice was the topic of the course, the instructor assigned Darfur is Dying (http://www.darfurisdying.com). This game is about the ongoing genocide in the Darfur region of the Sudan. As a role-play simulation, the player assumes the character of a child or adult living in a refugee camp in Darfur. Throughout the game, players make high-stakes decisions that can result in the capture, injury, or death of the chosen character. The game also includes links to information about genocide, Darfur, and the international effort to stem the genocide in Darfur. After playing the game, the participants discussed the appropriateness of teaching the concept of genocide through a game format and the perceived value for learning of the game in a middle school classroom setting.

Darfur is Dying, as well as other role-play/simulations (e.g., Oil God, Food Force, and Viking Quest), was used to support the goals of the methods course. Near the end of the semester, after all the participant had played all the games and discussed about them in class, the instructor gave the participants the post-assessment to complete.

Data Analysis

Data were primarily quantitative, with some qualitative data derived from open-ended questions. Participants' perceptions of the overall value of digital mini-games were assessed pre and post using a 5-point scale. The researchers used a Wilcoxon Matched Pairs Signed Rank test to examine the change in perception from the pre- to the post-assessment (Bland, 1995). The results below report an analysis of the sum of the ranks before and after treatment (playing the games), as well as simple descriptive statistics for the remaining items. Researchers analyzed qualitative data using a general inductive method (Thomas, 2006), and read and reread the narrative data. Researchers noted emergent themes and patterns independently, then compared them for cross-validation and used them to further explicate the study's quantitative findings.

Results

This study queried preservice elementary/middle school teachers' perceptions of, and experiences with, digital gaming. Here we examine the findings and report the study's limitations.

Change in Perception:
Pre- and Postassessment

This study assessed participants' perceptions of the overall value of digital mini-games pre/post using a 5-point scale. The scale included "no value/worthless" (0), "somewhat worthless" (1), "neutral" (2), "somewhat valuable" (3), and "great value/worthwhile" (4).

The Wilcoxon Signed Ranks Test for matched pairs was used to assess whether N = 18 preservice teachers perceptions' were modified by participation in a series of digital mini-games based on the ranked-

order magnitude of the change between their before and after responses. The results revealed a statistically significant difference in perception after the preservice teachers played the games (T = 5.5, p <.01 [two tailed]). The sum of the ranked increases totaled 72.50, and the sum of the ranked decreases totaled 5.50. Because higher scores indicated more positive perceptions, the results revealed that participation in the digital mini-games modified preservice teachers' views by positively improving their perceptions regarding their efficacy.

Percentage of Participant Agreement

In addition, participants indicated agreement or disagreement with 15 statements regarding the usefulness of digital games. The statements were categorized into three broad domains: (a) learning/learning theory, (b) instructional practice, and (c) motivation. Results revealed that 89% of respondents agreed that digital mini-games had the potential to support meaningful student learning. In addition, a majority of respondents agreed that the digital mini-games were supported by learning theory, and slightly more than 83% agreed that digital games can support the needs of diverse learners (See Table 1). Furthermore, 100% agreed that digital mini-games could promote middle school students' motivation to learn. However, only 75% of respondents agreed that digital mini-games could be integrated into their own teaching methods, and just 44% agreed that the games are viable assessment tools. Finally, 72% of participants agreed that educators should be taught how to integrate digital games into their teaching.

Limitations

Eighteen (N = 18) preservice teachers participated in the case. Participants were education majors enrolled in an elementary/middle school level social studies methods course at a doctoral granting research university in the intermountain west of the United States. The sample size, based on course enrollment, was relatively low and is an important limitation to keep in mind as the findings are reviewed and discussed.

Also, it is important to note that because students participated within a

course setting, they may have responded in ways that they perceived to be academically desirable. Likewise, immersion in the gaming environment within a class setting may have resulted in only temporary changes in perception.

Finally, the ratio of males to females in the study may have had an impact on study results. Out of the 18 participants, only 2 were male. This ratio, however, is reflective of the demographics of the elementary/middle school certification program at this university.

Discussion

What are preservice teachers' perceptions of digital mini-games as learning tools in middle school classrooms?

The results for question one suggest that the majority of preservice teachers agreed that digital mini-games do have the potential for promoting learning in an educational environment. This finding is supported by an emerging research base that suggests the value of digital games as learning tools (e. g, Kirriemuir & McFarlane, 2006; McFarlane et al., 2002; Squire, 2005).

Interestingly, some contradictory results were revealed. Specifically, even as 89% of respondents agreed that digital mini-games have the potential to support meaningful learning, only 75 % agreed that digital mini-games could be integrated into their own teaching methodologies. This contradiction suggests that, like the teachers in Kirriemuir and McFarlane study's (2006), some participants may have been "worried they would be sidelined or lose control of their classes" (Ellwood, 2007, p. 11) because of the student-centered focus inherent to the digital gaming environment. This contradiction may also have been a factor of feelings of uncertainty among some participants regarding their ability to link games to specific learning objectives and to use the games as assessment tools. Again, Ellwood's (2007) analysis of Kirriemuir and McFarlane's work may provide insight into this finding: "Using a game in a meaningful way within a lesson depend[s] far more

on the effective use of existing teaching skills than it [does] on the teacher developing any new, game-related skills" (p. 12). It is possible that participants in this study did not yet feel confident in their ability to identify appropriate games and to link those games to clearly articulated objectives or standards for learning. Future research in this area may want to examine these factors and others, including teaching style and content expertise. Certainly, professional development (72% of participants agreed that educators should be taught how to integrate digital games into their teaching) and inclusion of these concerns within the methods course would be useful ways to support teachers' future use of digital games as instructional tools.

Results indicating uncertainty regarding the efficacy of using digital games as assessment tools are noteworthy as well. As preservice educators, they may have had only limited knowledge and understanding of the assessment process. To expect them to feel confident applying that knowledge to a new learning tool may have been too much for some respondents to feel comfortable doing. Ellwood (2007) recommends that educators be given support to learn how to assess learning. Identifying effective methods of assessing learning using digital gaming environments is another area of recommended research.

The results also suggest that exposure to playing the digital mini-games and discussing their value positively affected preservice teachers' perceptions regarding their academic worth. Educators have long understood the importance of perception in forming understanding and providing a foundation for learning (Mukerjee, 1978). In addition, attitude toward any endeavor is an important component particularly, as it affects the teaching and learning processes (Silverman & Subramaniam, 1999; Tabachnick & Zeichner, 1984). In essence, perception is one of the keys to effective translation of theory into practice. Teachers need to "buy in" to new methods, including the use of emerging technologies in educational settings. Without that buy-in, teachers are not as

likely to incorporate new methods into their teaching, nor are they as likely to implement the methods effectively for the benefit of their students (Taylor & Wasicsko, 2000; Wilkerson, 2006). Furthermore, the purpose of methods courses is the development of effective teachers who understand how learning occurs (Bransford, Derry, Berliner, & Hammerness, 2005; Molebash, 2004; Owens, 1997). Methods courses result in changes in teacher behavior. The findings of this study are reflective of research that demonstrates the contribution of methods courses in introducing and exposing preservice teachers to practices that have been shown to be effective (Bransford et al., 2005). In this case, participants in the methods course were exposed to digital mini-games, practiced the games in a safe environment, and then debriefed the games in relation to the content of the course. Thus, the manner of introducing the digital mini-games to the preservice teachers through the methods course appeared to precipitate a change in perception for participants regarding the use of mini-games for educational purposes. The purpose of the study was not only to measure participants' perception regarding the value of the digital mini-games but to provide a format through the methods course for positive change in that perception. This reflects the larger issue and challenge in any development or use of technology in education, specifically digital mini-games in the classroom. The challenge for the field is not only evaluating teachers' perceptions but also changing that perception in a more positive direction, especially as research emerges to support the use of that particular technology. This is, first and foremost, important regarding digital mini-games because of the ambivalent disposition that teachers have had toward the use of games in the past.

To what extent does perception change as a result of their in-class participation and discussion of the selected digital mini-games?

This study examined the perceptions of preservice teachers regarding their

views of the value of digital mini-games and whether they themselves would embrace the technology as a teaching method. At the time of the pretest, the average score for the participants was M = 3.38, SD = 0.67. Even though this score was somewhat positive (value), the results (M = 4.11, SD = 0.67) did show a marked increase from pre to post regarding the attitude of teachers toward the use of mini-games. The change in the perceived value, demonstrating the usefulness of exposing a teaching method or strategy, and encouraging the use of that strategy to affect the change of perception, are important to note.

This change is also of interest to the authors because of the lukewarm reception to the use of games in the past. The overall results demonstrated that the change in perception was significant at the <.01 level. Comments from participants demonstrated their thinking regarding their change (or lack of change) before and after playing the digital games and are further instructive of their thinking. The results for six participants remained positive from the pre- to the postassessment. Comments from participants explained why their perceptions changed. One female in the 20–29 age range wrote the following:

> My response remained the same because I have previously been exposed to digital games that I think could be positively used in the educational environment. I think there are so many great digital games to be used; it just means teachers may have to spend a little extra time preparing and finding appropriate games [to use].

However, the majority had a positive change in perception after having played the games. As one female participant in the 30–39 age range explained, "My score changed from neutral to great because even though I knew that digital games are engaging, I wasn't aware there are so many different types to meet different content area needs."

Finally, only one participant's score decreased from the pre- to the post-assessment. She was one of the older participants. She clarified her decision with the following statement:

> My sense of value…decreased after playing the games—I do not feel that they are worthwhile. Time to teach is very limited and, yes, they do offer "simulation" [experiences] and promote visual learning, but the cost in time is too great...there are just too many other worthwhile things one could do!!!

Despite her low perception as reflected on the scale, this participant conceded in her written statement that the games can have some value for learning. She also made clear her reluctance to use them.

It is interesting to note that the younger participants could see the potential of integrating digital mini-games into their instructional methods. It is likely that because the younger preservice teachers had greater prior experience playing digital games, they were predisposed to embrace the idea of using these games in educational settings. This observation is worthy of further consideration. It would be interesting to explore teachers' perceptions based on age and gender.

Conclusions

In conclusion, how teachers perceive the efficacy of digital mini-games will determine whether the games will be integrated at all into classroom instruction, and then, if integrated, how effectively they will be used. It is left up to future research to determine the actual contribution digital games will make to student learning at the middle school and other levels. However, definitive answers may be a long time coming. In the meantime, nevertheless, the use of digital mini-games in classroom settings has a developing social validity. This validity is an outgrowth of a society that is fully integrating technology into everyday experiences. As Prensky (2006) argued, K–12 classrooms should be no exception and, in fact, must become a part of this process as well. Furthermore, as today's technology-savvy youth move into the teaching profession, it becomes more likely that technologies, such as digital mini-games, will be embraced in the teaching field.

At present, preservice and inservice teachers rely only on anecdotal support, application of learning theory, and common sense to inform their decisions regarding the use of digital mini-games to support academic content. When, and if, there is a wealth of evidence, it will be an added incentive for teachers to embrace this new technology. Currently, even without very much supporting evidence, digital mini-games are finding their way into classrooms. For this reason, teachers, and those who prepare them, need to understand the role that perceptions play in incorporating games into the academic settings. Needless to say, this area of investigation is in its infancy.

This study provides insight into whether preservice teachers are willing to accept digital games through the actual playing of the games. The study is also instructive in informing the field about the manner in which positive changes in perception can occur. Changes occurred through a methods course that promoted the following:

- Exposure to and awareness of the possibilities for learning
- The use and modeling of the use of digital mini-games
- A safe environment in which to hone integration skills
- A positive disposition toward their use (Darling-Hammond & Branson, 2005)

The only way to set the stage for success with this technology is to encourage preservice teachers to explore and assess the possibilities that exist. If this is done, teachers, and those who prepare them, will be poised to embrace this promising teaching strategy.

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Appendix

Assessment Instrument

I. Pre-2 Assessment.
Instructions: Circle the choice below that best reflects your perception of the value of digital games in the social studies.

| 1	2	3	4	5
NO Value/ Worthless		Neutral		GREAT Value/ Worthwhile
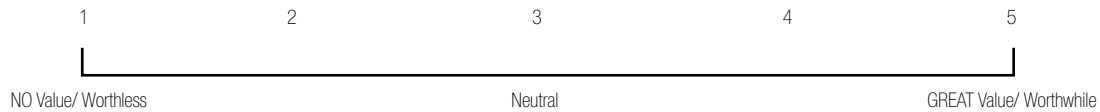
II. Postassessment.
   Part A. Instructions: Now that you have played and discussed digital games in class, fill out the short question naire below. Check the choice after each statement that best indicates your opinion. Please answer these questions honestly based on your current attitude toward the use of digital games. If you agree or mostly agree with a statement, place an X in the Agree box. If you disagree or mostly disagree with a statement, place your X in the Disagree box.

Digital Games	Agree	Disagree
1. Assist the learner in developing a positive attitude toward learning	☐	☐
2. Promote higher-order thinking skills	☐	☐
3. Promote visual learning	☐	☐
4. Promote problem-based learning	☐	☐
5. Promote inquiry learning	☐	☐
6. Are effective role play/simulation environments	☐	☐
7. Are a viable student-centered instructional practices	☐	☐
8. Support standards-based learning	☐	☐
9. Are easy to integrate into my teaching	☐	☐
10. Can be an useful instructional tool in almost all subject areas	☐	☐
11. Support the needs of diverse learners	☐	☐
12. Can be used to assess student learning	☐	☐
13. Meaningful learning experience	☐	☐
14. Teachers need to be taught how to use digital games as learning tools	☐	☐

Part B: Instructions: Circle the choice below that best reflects your perception of the value of digital games in the social studies

1	2	3	4	5
NO Value/ Worthless		Neutral		GREAT Value/ Worthwhile
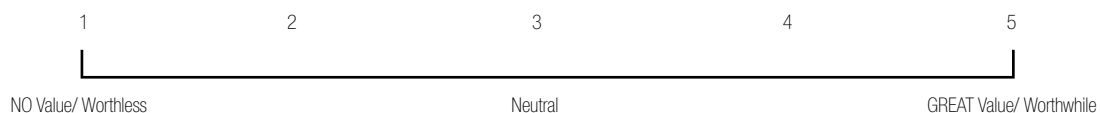
Part C: Follow-up questions

1. Did your response on the continuum change or remain the same? Briefly explain why you changed your response.

2. What concerns do you have about the use of digital games in your teaching?

3. What value do you think they may have for learning?

4. Is there anything else you would like to say?