

Video Games in the Classroom: The Teacher Point of View

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ABSTRACT

Games in the classroom are no longer played just for fun, but instead seen as learning tools that can engage students interest and immerse them in subject knowledge. As a result, educators have been experimenting with these gaming environments to examine their place in the elementary and secondary classroom. This study sought to examine both pre- and in-service teachers' perceptions of gaming the classroom. Based on the literature review a Likert-scale survey was developed to coincide with traits of gaming on student learning and classroom use. 1704 participants (1048 In-service and 656 Pre-service teachers) completed the survey and open-ended questions. Of these participants 110 In-service and 42 Pre-service teachers were interviewed in follow-up sessions. Findings from this study revealed that gaming is a good use of technology for engaging motivating students in classroom learning. However, less than half of the in-service teachers use gaming in their teaching while over 75% of pre-service teachers said they would like to know more about using games in the classroom. Nevertheless, a majority of both pre- and in-service teachers felt that gaming the classroom was a value-add to students and should be used in certain situations such as classroom demonstrations or for special needs students.

Keywords

Video Games, Learning, Teacher Perspective

1. INTRODUCTION

The use of video games in the classroom has increased exponentially over the course of the last twenty years [1, 2, 3]. Computer games can engage students in virtual worlds where they can apply content knowledge, practice skills, and enhance thinking in a fail-safe environment. They have the ability to engage students in virtual worlds where they can apply their knowledge and skills. Games make learning fun and capture learner attention as they explore content [4]. Video games are a billion dollar a year industry that counts some 183 million users [5] as daily members of communities dedicated to gaming. Moreover, gaming is no longer a fringe society, but an accepted part of daily life that counts up to 97% of US adolescents age 12 to 18 as users [6]. According to the Entertainment Software Association (ESA), across all age groups, video games generate

an estimated \$25.1 billion in direct sales in 2010 up from \$10.3 billion in 2006 -a 143% growth over four years. We live in a technology driven society that affects how we learn [7, 8, 9]. As technology becomes more sophisticated and popularity of games grows so do claims about what affordances games can add to enhance learning in and out of the classroom [10, 11, 12].

This explosion of the gaming industry has driven games into classrooms in increasing numbers. Many studies on the promise of games to increase learning in the classroom have occurred over the past twenty years. In 2001, researchers found that video games could be effective as tutorials and drills for transfer of learning while improving motivation and efficiency [13]. Additionally these experiences were safe, convenient, and more controllable than real experiences. Squire found that games can capture students' attention and teach them in a manner that they find enjoyable [14]. In 2008 Ke conducted a case study on computer games aimed at math learning and found that over the course of five weeks students developed more positive attitudes toward math learning but there was no significant effect on test performance compared to traditional methods [2]. Moreover, Tuzun, Yilmaz-Soylu, Karakus, Inal & Kizilkaya examined how video games could be used to teach 5th and 6th grade students world continents and countries[15]. The study found that the game led to student learning and increased motivation. Moreover, gaming technologies have potential in the classroom and are being used more and more by teachers [16].

As gaming becomes more prevalent in K-12 education, research on how teachers perceive its uses, successes, and pitfalls has not followed suit [17]. Training of teachers in teacher education institutions has also become a staging area for games in education with little research conducted to examine it's growing role in future classrooms [18]. Understanding what pre-service teachers perceive the role of games in the classroom to be as well as current in-service teacher attitude towards gaming in the classroom could prove beneficial, accordingly, there is an urgent need for research on this topic.

2. GAMES AS CLASSROOM TOOLS FOR LEARNING

Recent studies suggest that computer games can be effective for teaching and learning [19, 7] while past research and a meta-analysis [2] regarding the effects of gaming on learning show inconsistent results. For example, Funk cites studies which found that gaming could be used to teach domain knowledge while Mitchell & Savill-Smith found that exploratory interactive games are useful for instruction in math and science [20, 21]. Another example is an empirical study with realistic games found that students problem-solving skills and pattern recognition increase [22].

The inconsistency in the gaming and learning research can be explained by the multitude of variables that are related to both

games and learning, making this a wide but shallow field in its infancy. However, researchers and academics continue to advocate games for learning [1, 4, 11] arguing that the current status of the research is expanding exponentially. The integration of games in formal and informal learning environments has been an active field of research at a theoretical, as well as practical level.

Theoretical and empirical research on the use of videogames and the learning process range from how games support the learning process to obstacles for implementing games in the classroom [3, 9, 19]. Case studies evaluating the effectiveness of video games as teaching and learning tools are also prevalent in the literature [15, 16].

Learning in games within a specific subject area has been the most widely studied with empirical research focusing on knowledge gain. Washbush & Gosen found that there was no relationship between learning and simulation performance in far transfer in their five-year longitudinal study with college students examining the effectiveness of a business enterprise simulation game [23]. Conversely, Abbey found that using a simulation game with college students as a stand-alone or complementary pedagogical instrument to measure cognitive strategy in near and far transfer led to gaming promoting a far transfer significantly more than the conventional instruction, however the same did not hold true for near transfer [24]. Moreover, in 2007, Alkan & Cagiltay conducted a mixed-method study with college students to explore game-based cognitive processes using a puzzle game and concluded that in an informal learning situation trial-and-error strategies were mostly used with cognitive gains being seen in the near transfer [25]. Another study, Barab, Sadler, Heiselt, Hickey, & Zuiker used a mixed-method quasi-experimental and case study method with 4th grade gifted students to evaluate the effectiveness of a massive multiplayer online game that focused on science education [26]. Findings suggest statistically significant gains in near-transfer performance test but not far-transfer standards based academic achievement tests. This demonstrates at least a short-term increase in conceptual knowledge and problem solving.

An early gaming study by Paperny & Starn evaluated the effectiveness of action games dealing with health issues by the influence of learner characteristics ($n=718$) in a high school with students ages 13-18 [27]. The findings suggest that games produced significant knowledge gain and positive attitude change towards the game as opposed to traditional instruction. Students with low SES enjoyed and learned from games more than other students. Another affective learning study by Van Eck had 7th and 8th grade students play one 50-minute gaming session using a math simulation/model game [28]. Students were randomly assigned to one of five groups, with treatment groups playing either a game that focused on competition or a game that focused on the process of getting the right answer using advice.

Using games in the classroom to demonstrate concepts or as a reward for completing work are widely accepted uses of this interactive technology. As the above studies indicate, students can learn from using games in educational settings. However, the role of the teacher, widely recognized to be the single greatest indicator of academic success for individual students has yet to be explored in the context of video games in the classroom.

3. PERCEPTIONS OF GAMES

Although the literature base on teachers' perceptions of gaming in the classroom is scant, there have been several studies that have

attempted to delve more deeply into the topic. Schrader, Zheng and Young surveyed 203 pre-service teachers and found that while they value games in the classroom they feel that current video games, such as massive multiplayer online games, are not good learning tools [18]. Similarly, Can and Cagiltay examined 116 pre-service teachers' perceptions of gaming in the classroom in Turkey [16]. By surveying the participants the researchers found that the pre-service teachers believe that games have value and purpose in the classroom. Moreover, they found that most participants planned on utilizing gaming in their teaching. In another aspect of the survey participants highlighted some disadvantages of using games in the classroom, including poor classroom management and questions about effectiveness of current video games as learning tools. Both of the previous studies suggest that further study of teachers actually in the classroom is needed to confirm findings. Pastore and Falvo conducted a survey of 98 in-service and pre-service teachers to determine how games can efficiently and effectively support learning [22]. Their findings confirmed the Can and Cagiltay study and revealed that teachers are using games in the classroom and see them as being implemented more in the future.

Much is known about how to design games for learning and the process that student's go through to learn with games, however little research has examined pre- and in-service teachers' perceptions of gaming in the classroom aside from the studies discussed above. Thus, we propose that the question still remains: What are pre-service and in-service teachers' perceptions of games in the classroom? While the Pastore and Falvo study confirm the findings of Can and Cagiltay more research is needed to determine how games can support learning [16, 22]. Teachers, as the comptrollers of the classroom, decide what technology is used in their classrooms; it is important to understand their attitudes and perceptions about games and learning [16, 18, 22].

4. METHODS

In total, 1704 participants completed the survey. The population consisted of 1048 in-service and 656 pre-service teachers. The in-service teachers were pooled from across a mid-western state and the pre-service teachers were pooled from six universities and colleges across the United States. Of those that responded to the gender question there were 395 males and 1216 females. The mean number of years teaching for in-service teachers was 14.6 years with a minimum of 2 months and a maximum of 40 years experience. The mean age range of pre-service teachers was 18-22 with a relatively even spread of freshmen to seniors responding. Additionally, in-service teacher participants were asked if they used games in the classroom- 46% responded yes. Pre-service teachers were asked if they would take a class on how to teach gaming in the classroom- 73% said yes.

4.1 Materials and Procedures

A survey was developed to help answer the important question uncovered during a literature review on gaming: What are pre-service and in-service teachers perceptions of games in the classroom? To explore this question we collected both qualitative and quantitative data. This mixed methods study is meant to explore the experiences of individuals who are currently experiencing pre-service teacher education courses and in-service teachers.

In this study, we used a purposive sampling in order to identify and select those individuals in teacher education programs or employed as in-service teachers. Purposive sampling makes sense in this case because the research questions require participants

with specific characteristics [29]. These participants were identified by their enrollment in a teacher education class as well as with snowball sampling where we asked current principals to recommend qualified participants who fit the criteria (full time teachers) of the study. 656 pre-service teachers from six teacher education institutions across the country were surveyed as well as 1048 in-service teachers from across a Midwestern state. The follow-up interviews were conducted both in person and via email with 110 in-service teachers and 42 pre-service teachers.

In order to accomplish this, a phenomenological approach was used, which Johnson and Christensen note is meant, “to describe one or more individuals’ experiences of a phenomenon” (p. 394). This required an in-depth interaction with the participants [30]. A survey tool, Qualtrics, was used as a first pass for both sets of participants. Two online surveys using the online Qualtrics survey tool were created. The participants were asked 4 questions, and asked to enter their contact information if they were willing to be interviewed. Their answers were then analyzed and grouped into themes. Interviews were recorded and transcribed, then coded for themes as well.

Questions for Pre-Service and In-Service Teachers

Survey Questions

1. Do you use or plan on using games in the classroom?
2. How do you use or plan to use games in your classroom?
3. What does or what would gaming look like ideally in an educational setting?
4. How should games be used in the classroom? (7 point Likert with five categories)

Interview Questions

1. What are the positive aspects of using games in the classroom?
2. What are the negative aspects of using a game in the classroom?
3. What is your role or what would your role be when using a game in the classroom? Tell me how you would facilitate your class using a game.

The research design for this study was based on triangulation and expansion of data [30]. Concurrently, two surveys were run that asked both quantitative and qualitative questions in nature. After the survey round was complete a sequential process moved to the forefront in which interviews were conducted. This process was cyclical in which rounds of surveys were collected followed by interviews until saturation had been attained. Data was collected and analyzed for trends. After the survey data was collected interviews were conducted with both sets of participants to gain a deeper look at their experiences.

5. RESULTS

Descriptive statistics for each group (pre-service and in-service teachers) were calculated via STATA for question 4: How should games be used in the classroom? The descriptive statistics are displayed in Table 1. This question was aimed at analyzing

participants’ perception of games on the classroom procedure and design of curriculum using games.

Results of the descriptive analysis revealed that 21% of in-service teachers think that computer games should never be used as a reward for getting work done whereas only 8.9% of pre-service teachers do. 22% of both groups agreed that games should be used with students who have special needs 2-3 times a week and approximately 9% of both groups agreed that games should only be used as a demonstration of a topic once a month. One fifth of both groups said that using games as the main instructional activity should happen 2-3 times per month and only 2% of both groups agreed that games should be used for assessment on a daily basis.

Table 1: How Games Should Be Used in the Classroom

Statistic	Reward for getting work done	The main instructional activity	For assessment	As a demonstration of a topic	For students with special needs
Pre-service Mean	3.79	3.36	3.19	3.80	4.90
Pre-service SD	1.56	1.55	1.50	1.35	1.57
In-service Mean	3.31	3.45	3.00	3.95	4.58
In-service SD	1.79	1.76	1.65	1.58	1.77

* Likert-scale ranged from 1-7 (1= Never, 2= Less than Once a Month, 3= Once a Month, 4= 2-3 times a Month, 5= Once a Week, 6= 2-3 times a Week, 7= Daily)

Three quarters of pre-service teacher respondents are not being taught to use computer games in the classroom and the majority of in-service teachers (94%) reported that they did not learn to teach with games during their pre-service teacher education classes. A part of this is a symptom of the age. The mean years teaching for in-service teachers is approximately 15 years. Given the state of technology integration 15 years ago this statistic is explained. When we look at only the teachers with less than five years teaching experience one fourth of them report to learning about computer games in their pre-service teacher education classes.

As reported earlier only 46% of in-service teacher participants use games in the classroom. If we aggregate the data above to only show in-service teachers who use games in the classroom the descriptive statistics change.

Table 2: How Teachers Use Games in the Classroom

Statistic	Reward for getting work done	The main instructional activity	For assessment	As a demonstration of a topic	For students with special needs
Mean	3.41	3.73	3.09	4.16	4.71
SD	1.82	1.69	1.72	1.52	1.68

*Likert-scale ranged from 1-7 (1= Never, 2= Less than Once a Month, 3= Once a Month, 4= 2-3 times a Month, 5= Once a Week, 6= 2-3 times a Week, 7= Daily)

Only 12% of in-service teachers who use games in their classrooms report that games should never be used for the main

instructional activity and quarter of the group report that games should be used with students who have special needs 2-3 times per week. Both teachers (14%) who use games and those who don't feel that games should be used daily for students with special needs but 5.6% of teachers who use games feel that games should never be used with special needs students whereas 9.6% of teachers who don't use games feel this way.

Approximately 13% of both groups feel that games can be used as the main instructional activity once a week. The biggest difference between teachers who use games in the classroom and those who do not was reported in using games as a demonstration of a topic. The average teacher who use games in the classroom feels that using games as a demonstration of a topic should happen 2-3 times a month whereas the average teacher who does not use games feels that using games as a demonstration should only happen once a month.

Table 3: How Often Should Games Be Used in the Classroom?

For teachers that use game in the classroom- How often should games be used in the classroom? (5-point likert scale with seven categories)*								
Question/Percent of teachers who agree with statements	Never	Less than once a month	Once a month	2-3 times a month	Once a week	2-3 times a week	Daily	Mean
Reward for getting work done	19.51%	17.68%	15.85%	15.55%	18.29%	7.01%	6.10%	3.41
The main instructional activity	12.50%	13.41%	17.99%	23.48%	13.41%	15.85%	3.35%	3.73
For assessment	23.31%	20.25%	17.48%	15.03%	13.19%	8.28%	2.45%	3.09
As a demonstration of a topic	4.32%	8.64%	21.30%	26.85%	16.06%	16.98%	5.86%	4.16
For students with special needs	5.64%	6.90%	9.09%	21.32%	17.87%	25.08%	14.11%	4.71

5.1 Open-Ended Questions

The open-ended questions were designed to help qualify findings from question 3: How should games be used in the classroom? A research group was responsible for using open coding to examine emergent themes. We had previously open-coded all of the survey data and interviews and used the group as a reliability check to ensure we were all seeing the same themes. When new themes appeared that we had not previously identified we would check the other group members and either seek clarification or see if we could find data to support it. Quantitative data was assessed using Qualtrics and used to support findings from the initial surveys and interview process.

From the initial analysis we moved into the critical analysis phase by nesting the initial open coding of 76 codes down into 9 codes for axial coding process. Axial coding was done by three people, ensuring inter-rater reliability. After all the data was coded according to the axial codes we began to organize specific examples into different subsections (strength testing) to identify which statements would best support the themes.

Results of the open-ended questions helped confirm the findings from the literature review and the descriptive statistics revealed in question 3.

5.1.1 Survey Questions

Question 1: How do you use or plan to use games in your classroom?

In-service teachers use games in the classroom for content reinforcement, problem solving, and simulating authentic learning situations. Example responses from the in-service teachers included, "After teaching the content I use the simulation to give the students the experience of 'being' there", "Students role play to simulate a concept usually accompanied by a writing prompt", and "Students are encouraged to log onto math games website and practice. Occasionally we spend time in class, but they are also encouraged to log on at home for additional practice. The website keeps track of students' progress so that teachers can share with students who is 'winning' in terms of problems worked." Pre-service teachers plan on using games in the classroom for differentiating instruction and engaging students. For instance, one respondent said, "I plan on using technology games that provide various learning activities for children who learn in different ways."

Question 2: What does or what would gaming look like ideally in an educational setting?

In-service teachers emphasized the idea that with gaming one size does not fit all and that gaming ideally is subject, topic, grade, and student specific. One key response that many other in-service teachers echoed was, "Gaming should look like an enhancement to instruction but time constraints and lack of programs that can provide information to teachers on the leaning progress for individual students hampers this". Another response that feeds back into how games should be used was, "I think games play a roll, but not an integral role. Gaming should be used to continue to master standards, or problem solving standards, that have already been taught. This gives students motivation to work while also encouraging and developing their problem solving skills." While gaming in the classroom 'looked' different in every response one example response exemplifies the overall tone of the in-service teacher respondents, "Gaming looks resourceful, but I guess this would really be dependent on what type of classroom you have."

Approximately four-fifths of pre-service teachers consistently reported that gaming in an education setting would be hands-on, fun but informative, and motivational. Responses included, "It would be full of educational material but at the same time be a fun game to play" and "It would be a collaboration with students to help them learn different concepts with the help of their peers". One fifth of pre-service teachers reported that games did not belong in an educational setting. Responses included, "Gaming, to me, would look unprofessional in the educational setting" and "I am not interested in gaming in the classroom, kids get too much of gaming at home".

5.1.2 Interview Questions

Question 1: What are the positive aspects of using a game in the classroom?

In-service teachers agree that games are motivating and immersive. Students are able to play games by using their knowledge from concepts gained in the classroom, and as one respondent said, "Games create learning that enhances understanding of key concepts." Games motivate in different ways according to in-service teachers, one respondent said, "I use games as a reward for getting work done correctly, not speedily. I think this teaches students that gaming is an extra bonus," while another in-service teacher said, "Gaming is controlled chaos in the classroom but it sparks conversation and allows students new ways of understanding and manipulating the concepts we are working on."

Pre-service teachers consistently indicated that the positive aspects of games were that they are fun and can increase participation in the subject matter. Responses included, "Games let students make the choices and decide how to work through a problem" and "Games are fun, you can use them to motivate your students to learn in new ways." Approximately half of the pre-service teachers mentioned competition as a positive aspect of using games in the classroom. Example responses included, "Competing in a game teaches real life skills and that winning is important" and "competition in a game is a good way to teach students about losing and trying again."

Question 2: What are the negative aspects of using a game in the classroom?

In-service teachers stress that lack of time, lack of assessment, and pressure from state tests are negatives to using games in the classroom. One respondent said, "Pressure on reading more during school pushes teachers to have students read more when students get done with assignments early. With pressure from state government to pass ISTEP programs games will have to provide measurable proof that they promote learning and back it up with printable data that teachers can present as evidence for individual students. ISTEP drives everything in schools." Pre-service teachers indicate that a disadvantage to using games in the classroom was that they were a distraction to students. Sample responses included, "Everything is connected now, if you assign a student to play a certain game it might have ads or pop ups, they can link to Facebook or go and play a different game, so instead of staying on task they may go off on a completely different site" and "some students get so focused on the game, winning the game or getting to the next level, that they aren't learning the material- they are just trying to beat the game."

Question 3: What is your role or what would your role be when using a game in the classroom? Tell me how you would facilitate your class using a game.

Both pre-service and in-service teachers indicated that games are a tool that needs to be controlled in the classroom. Pre-service teachers indicated that they would introduce the game and work from a teacher-centered instruction mode. Sample pre-service responses include, "I would go through a lesson on recycling and then as the students finished the project take them to the computer lab where they could all play a game on recycling" and "We would all play the game together as a group and I would lead the students step by step through it first and after they got the hang of it they could play by themselves." In-service teachers indicated that they would use a more learner-centered approach and act as a facilitator rather than take the central role. Sample in-service responses include, "If the game was designed to be an educational game and it matched up with my curriculum then I would give a short introduction and let the students explore it on their own. After a half an hour I would call them back to order, we would discuss what they had learned and then I would give them prompts to think about as they continued playing for the rest of the time" and "I let the students look at the game and figure out the mechanics for a few minutes, after that I talk for about five minutes and then they go back to the game play. There is usually a worksheet that they are filling out or working from as they play the game."

6. DISCUSSION AND CONCLUSION

The video game industry is currently growing exponentially [5, 31]. Moreover, the use of games as learning and training tools is increasing at a fast pace. Games, no longer played just for fun, are

seen as learning tools that can engage learners in content. Prior research has demonstrated that games support learning and increase student motivation, however little research has examined how teachers perceive these games. As a result, this study sought to explore how both pre and in-service teachers were perceiving games.

Findings from this study confirmed the results from prior research [16, 22] and revealed that teachers are using games in the classroom and see them being a bigger part of standard classroom practices in the near future. This finding was not surprising given the technology roll out in schools across the nation and the large volume of game sales. As the gaming industry continues to grow and focus more on educational applications of gaming the use of these games in schools will follow. Moreover, as the cost of development decreases and demand for standards based games increases there will be more customizable games available, covering content areas from social studies to math to meet state and national standards.

Participants indicated that gaming was useful for engaging and motivating students during learning. Similar findings were uncovered by Pastore and Falvo that teachers perceived gaming as a value-add to scholastics [22]. Ke also reported that gaming enhanced students' attitude and motivation towards math [5]. Therefore, using games in the classroom may increase motivation to learn subjects that students are often not motivated to perform well in.

From an implementation standpoint, the participants of this study felt that games should not be used as the main instructional activity, should be used as a reward for getting work done, must rarely be used for assessment purposes, should be used sometimes as a demonstration of a topic, and should be consistently used for students with special needs. Kenny and McDaniel uncovered similar findings in their study, which found that teachers value games that are easy to integrate into existing curriculum, and should address multiple intellectual levels [17]. As a result, common classroom games should focus on integration within standardized lessons and be easy to use. Simple classroom games are usually very easy to use, however, many new games on independent gaming systems have a higher learning curve and more complex interactions. These types of games may not work in classes with time constraints, moreover playing games may lead to learners using their resources on gameplay rather than learning. Thus, teachers wanting to use these games in their classrooms need to be experienced players of the games so they can adequately judge the amount of resources needed to play the game.

More than half of the participants surveyed reported that they do not nor intend to use gaming in their classroom teaching. However, the majority felt that gaming is a value-add in the classroom. Thus, there are teachers and future teachers that plan to use games in their classroom. A general consensus of, 'if it's not broken, don't fix it' pervaded the teacher responses about using games to replace face-to-face instruction. Overall, participants felt that games should not replace the teacher as the main instructional provider, nor were they currently a good fit for evaluation of a standardized lesson. The process of playing the game is thought of as being too distracting and participants reported that the balance between gameplay and actual instruction has not been demonstrated to them successfully. Rather, in-service and pre-service teachers agree that games should be used to enhance the learning process. Future studies should examine this further to discover what successful integration of gaming into classroom

lessons looks like from the teacher point of view. Nevertheless, it is important to note that both in-service and pre-service teachers felt that using games in the classroom is not a trend that will diminish in time but grow more prevalent as classroom technologies catch up with mainstream entertainment.

Demand has increased for simple computer and mobile-based games in education. Programming has become easier and games are faster to create as a result. This trend of easy and rapid development will enable teachers who are not technology experts to feel more comfortable using games in the classroom. Future research should focus on Delphi studies where teachers are implementing games in the classroom and pre-service programs where game use is modeled for incoming teachers. This would help determine successes and pitfalls from an experienced teacher's point of view and how teacher education programs are preparing future teachers to teach with games. The focus should be on implementation, the design of the curriculum around the games, and the actual classroom use of the games. This would help educators and administrators who are considering implementing games in the classroom and increase successful learning experiences.

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