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# Computer Games As Learning Tools: Teachers Attitudes & Behaviors

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## Abstract

Most of the research in the field of educational game design has been focused on the effectiveness of games in learning and the engagement gains. Very little research has been done to study how teachers use games in the classroom and how this interaction impacts the game development process to end up with an effective learning tool. More information is needed on how teachers can design connecting activities to go with games. This paper highlights the author's studies examining how teachers behaviors and attitudes impact educational game design and its classroom implementation.

## CCS Concepts

•**Human-centered computing** → **Field studies; Participatory design; Ethnographic studies; Applied computing** → **Computer games; Interactive learning environments;**

## Author Keywords

Educational computer games; Interactive Learning; Participatory design.

## Introduction

Technology has played an important role in education, providing both teachers and students with more options and flexibility in their teaching and learning practices. With new

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trends of technology, a different paradigm of learning, constructivism [7, 35, 14], asserts that learners acquire knowledge through active direct experience and advocates the construction of knowledge through engaged experimentation. As part of this learning paradigm, “active learning” [15] analyzes how children that have been engaged in play experiences are more likely to have well-developed memory skills and language development.

With the inclusion of technology in the classroom, the teacher is no longer the source of all knowledge. Teachers can use different technology resources to provide learning and create the optimal conditions of learning in their classroom [20]. Technology can also provide access to sources beyond the classroom and the textbooks where the teacher becomes the facilitator of learning, incorporating various strategies to guide learners [14].

The increasing use of computer and video games by a wider section of the population provides many investigation topics. Among the study topics are their attractiveness, complexity, and playability. Within this research discussion, we find the incursion of video games into the life of school classrooms. Research discourse has been connected mostly to the positive impacts [10, 11, 13, 15, 26]. Negative impacts of video games as learning tools, though real, are less discussed [1, 11, 12, 31].

To successfully infuse video games into schools, we need good design models, positive player experiences, and strategies to integrate games into curricula. The last factor demands teachers to have competent technology skills to effectively implement some technology in their classrooms [24]. The research statement points out the need to understand the interaction of the teacher with educational video games before, during and after their integration in a classroom environment. For game designers, the impact of this research

will be in the design and development process while educators and policy makers will benefit from findings that can enhance the educational environments.

## **Research Themes**

Over the past three years, I have examined three areas within this game design space. My interests focus on the insights for game design implications in classroom implementation settings, the effects of video games as a learning experience, and how teachers' behavior and interaction impact the game implementation.

### *Game Design Implications*

For the last three years, I have been part of a game development team called *Math Snacks* at New Mexico State University. The team intends to apply web-based games, embedded tools, and additional support materials to create resources and models in early algebra topics. The group has been developing multimedia math modules and testing and incorporating them in classrooms for the past five years.

In 2015, the research team began the process for a new suite of algebra games. We reviewed more than 20 off-the-shelf algebra games to identify effective design components and used the results to inform the development of the new games and related tools. Through this process, which served to enhance our existing Learning Games Design Model [2], we were able to articulate our theoretical framework for future development, identifying specific recommendations that should yield effective games [36].

### *Effects of Video Games as a Learning Experience*

Most of the findings in the field are optimistic about the effect that video games can make in students' learning experience (e.g, [5, 13, 26, 30]). Using video games in the classroom has proven to have a significant impact on students'

cognitive skills for topics such as math and science [5, 22, 23, 25, 32, 33]. General study findings suggest that computer games are engaging and can embed mathematical concepts that may be hard to grasp with concrete materials [29]. Other positive effects of games are attributed to the state of flow that students can achieve when playing games [18, 34].

On the other hand, some case studies show that with some games learning gains have not been seen [6, 19, 27, 38]. Findings from some of these studies can be referred to the no effect on learning with the use of video games, but some others can be involved to methodological research issues. As Egenfeldt-Nielsen [9] stated, we need to be cautious about several studies that show flaws related to researcher bias, short exposure time, no control group and lack of integration with previous research.

#### *Teachers behavior and interaction with games*

According to Healy [17] the best results for all technology use for children come accompanied by a skilled adult, who she calls a “coach” who adds language, empathy, and flexibility. She agrees that the principal rule for this coaching is not to tell the child what to do but to guide them into the appropriate steps. When using video games in a classroom, the teacher plays the role of the coach. However, having an extra role in addition to teach can be an overwhelming job.

The response of educators to the use of games in the classroom has been mixed. Some have been quite enthusiastic about technology, seeing it as an important tool needed to facilitate more comprehensive knowledge. Others see it as a passing trend, more a distraction from school attentiveness than anything else. Despite the engagement that students feel when playing computer games, not all mathematics teachers opt to use them to teach in their classroom [16, 21].

Some of the main barriers for teachers integrating computer games into their classroom can be the inexperience of the teacher in playing the game, lack of guidance to the best implementation of the game, teachers’ own knowledge about computer games, and how comfortable they feel using games for teaching and learning [37].

## **Research Process**

In preparation for my dissertation proposal, my current efforts seek to uncover a common thread among these research areas: the potential impacts of user behavior and attitudes towards supplemental activities on the development of math educational games.

### *Research Question*

At this stage I see proposing the following research question for my dissertation:

**How do teacher behavior and attitudes about educational games and supplemental activities impact game development and its implementation in classroom settings.**

### *Methodology*

I plan to explore this question through observation of current teachers’ strategies for implementing math video games in the classroom and developing complimentary activities to accompany the games that have been already developed by the *Math Snacks* team. I see the initial part of the study as a qualitative research of the meaning that teachers make of using games for teaching and learning.

The timeline for this research includes a summer camp session (June 2018) in which participant teachers were introduced to the suite of *Math Snacks* games. Pre-observation in the classroom of two of the participant teachers was done in terms of how they use games, if at all, prior to this

Summer Camp. The rest of the participants will also be observed in their classroom environment once the school year starts next August of the same year. Post-observations of all the teachers who participated in the camp will be done again during next school year (August 2018–May 2019).

Using ethnographic work, I seek to examine the “lived experiences” [28] of those chosen to participate in this study. Having the classrooms as my sites of fieldwork will complement this ethnographic participant observation to interpret participant perceptions of these lived experiences. Conducted in a natural setting [3, 4] I will use semi-structured interviews in order to gain an understanding of the meaning that the participant has constructed of the situated activity [4]. The bulk of my analysis will depend on the informal interviews, observations, and recordings of in class game activity sessions, each of which require a brief note as to my approach.

I need the doctoral consortium at this stage to help me identify these technique’s capabilities and limitations and how they may be best applied to my research question. Having a discussion with other fellows will enrich my knowledge about how any part of my methodology can be modified to have better choices.

#### *Contributions*

Based on Edvardsen and Kulle’s [8] ideas about how someone who gets involved inside the game-learning experience can perfectly describe and share the acquiring understanding to those beside him, I really believe that living, in person, the experience of learning with a game can add important insights that can benefit the games design discourse.

Very little research has been done to study how math teachers use video games in the classroom or during a summer camp session. More information is also needed on how the

teachers can design connecting activities that together with the game can facilitate the implementation and leverage the learning experience. As I have been part of the *Math Snacks* development team, sharing my experiences and listening from others’ work can affect research directions of the above mentioned and more different gaps.

Results from this investigation will contribute to different research communities such as game designers, educators, policymakers, and computer-supported learning networks. This research will also develop new understanding of the integration of computer games in mathematics classrooms as they relate to teachers knowledge of gaming. It will offer new means to support the best options of teachers’ strategies for implementing educational video games in a classroom. By the end of my research, I will be able to develop a set of guidelines that these communities can use to maximize the impact of the integration of computers games in a classroom.

#### **Conclusion**

As I enter the fourth year of my doctoral studies, I am starting to write my dissertation. Participating in the colloquium in the fall of 2018 is the ideal time and opportunity to help me best refine my research question, select the most appropriate methodology, and further outline specific contributions to the research community. The contribution of my work to other students will be current comments and fresh perspectives on classroom settings from game design researchers and teachers from a near cross-border prestigious institution. I look at the doctoral consortium as a timely opportunity to share ideas with current and future leaders who promote the development of a supportive community of scholars and most important to encourage our spirit of collaborative research.

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