Digital Games: A Motivational Perspective

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ABSTRACT

Information technologies have improved dramatically in the last decade, enhancing the potential of digital games to create realistic and engaging environments where players use different cognitive approaches to solve problems, such as, thinking outside of the box, collaborating in groups and searching for information. Unfortunately not all genres of digital games have taken advantage of the new technology and game design knowledge now available. Commercial and educational games have evolved in different ways. For instance, while the commercial game market has experienced continuous growth, the educational game market is almost non-existent. Users' preference for commercial games indicates that people have different motivations for playing commercial games and for playing educational games. Motivation theories provide a framework to study how users engage with these games, so that designers can apply the best features of both computer applications to create powerful learning tools.

Keywords

Motivation, digital games, learning, intrinsic motivation, interest, self-determination

Computer games have been identified by several scientists [1,2,3,4] as one of the most appropriated computer applications to produce strong motivation in computer users. This media keeps people playing the game even in the presence of failure; in other words, games encourage persistent behaviors in players to master the game they are engaged in. These persistent behaviors are enhanced by adding engaging stories in the game, good quality graphics, appropriate challenge, novelty, and feedback; also it is important to provide a sense of control, curiosity and ownership [5,6,7].

Because persistence is one pre-requisite for learning [8] it is appropriate to explore how different

digital games engage students in such a way that promotes perseverance and success in the tasks presented in the game. Moreover, it would be beneficial to explore how motivation, learning, and digital games are related.

The purpose of this literature review is to explore the differences and similarities between commercial and educational games, using motivation theories. This will be accomplished by examining experiments where users interact with this type of games. Some of the questions this paper explores are the following: What are the differences between educational and commercial games from a motivational standpoint? How are players' motivations for playing commercial games different from players' motivation for playing educational games?

MOTIVATION THEORIES

This section introduces the current state of interest, intrinsic motivation and self-determination theories, and briefly relates them to digital games.

Interest Theory

There are three general definitions of interest proposed by Krapp, Hidi, and Renninger [9] these are: Personal interest, situational interest, and interest as a psychological state.

Personal interest is considered to be an individual's predisposition to attend to certain stimuli, events, and objects. While *Situational interest* refers to the likelihood that particular subject content or events will trigger a response in the moment, which may or may not "hold" over time. Thus, it refers to elicited attention in the sense of enjoyment, curiosity, and so forth, but no assumptions can be made about the level of content knowledge. And finally, *Interest as psychological state* refers to the level of interest triggered when a specific topic is presented, and seems to have both individual and situational aspects [8].

Because educators cannot easily have control over students' personal interest, Mitchell's [4] model of situational interest helps educators to understand how situational interest work. His model establishes a distinction between the triggering conditions that capture the attention of the students (CATCH) and the conditions that ensure the continuation of this attention (HOLD).

> Situational
> Interest

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                              ┌─────────────┐          ┌─────────────┐
                              │    CATCH    │          │    HOLD     │
                              └─────────────┘          └─────────────┘
                          ┌───────┬───────┐          ┌───────────┐
                   ┌────────┐  ┌──────────┐  ┌────────┐
                   │ Group  │  │ Computer │  │ Puzzle │
                   └────────┘  └──────────┘  └────────┘
                                           ┌──────────────────┐
                                           │  Meaning-fulness │
                                           └──────────────────┘
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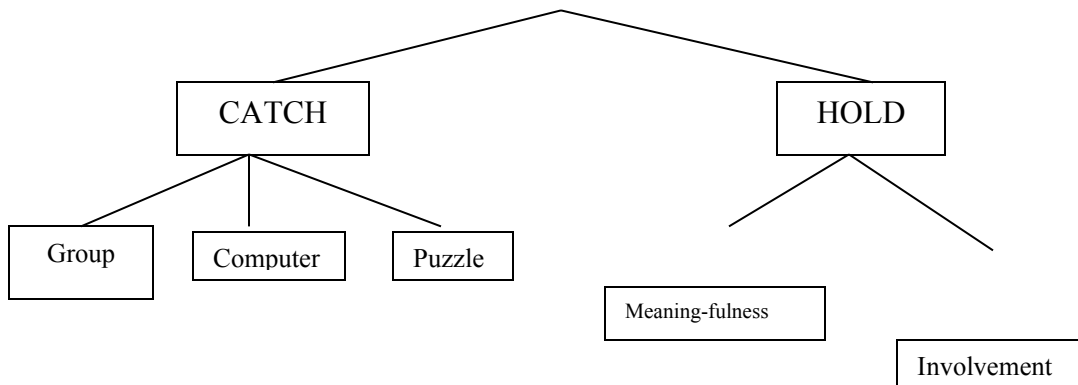
Figure 1: Mitchell's model of Situational Interest (SI)

Interest theory alone has not been used to explain motivation produced by games, although Cordova and Lepper [10] combined aspects of interest theory with intrinsic motivation theory.

Intrinsic Motivation Theory

According to Malone and Lepper [3] the elements to enhance intrinsic motivation are; individual balance between skills and challenge, goals whose attainment is uncertain, also presenting surprises or attracting users' attention to stimulate their curiosity. Malone and Lepper also consider three rules to provide control for the learner; contingency, choice, and power. Finally, they propose to create fantasy situations to encourage learners to imagine themselves in imaginary contexts or events using vivid realistic images.

Intrinsic motivation theories have been used in several empirical studies to analyze the motivation factor when people play games, although this theory does not consider some other important factors in motivation such as the sense of autonomy and relatedness. There is a theory called self-determination that explores the influence of these factors in motivation.

Self-determination Theory

This theory explains how three psychological needs (competence, autonomy, and relatedness) affect self-motivation and personality. Thus it explains variability factors in Intrinsic Motivation [11].

The human need for competence refers to the sense of feeling that a person can do something well, autonomy refers to the freedom to make choices and relatedness refers to the sense of security, caring, and empathy a person experiences, the need to feel that one belongs to a group or place and is connected with others.

Self-determination refers to the process of utilizing one's will to choose how to satisfy one's needs. To be self-determining, people have to decide how to act on their environment [12].

Nevertheless, this theory has not been used to study motivation in digital games. Self-determination theory has several implications in the study of motivation and learning, and can be very useful to understand how learners relate to the environment where they learn.

To analyzed how the differences between educational and commercial games explained above affect users' motivation to play commercial games more eagerly than educational games, the most relevant motivation theories will be associated with empirical research on games.

MOTIVATION, LEARNING AND DIGITAL GAMES

The most relevant studies of the past two decades related to engagement and digital games are presented in this section.

Malone

Malone and lepper [3], and Seymour Papert [14] conducted extensive empirical research with children to figure out what they learn from playing games and how motivated they were when playing.

The first study on learning, motivation, and games was conducted by Malone [13]. As part of his dissertation, he used eight versions of a game called "Darts" to teach fractions, and observed how different versions of the game were encouraging or discouraging the way children played with these games and learned with them. Malone was one of the first researchers to point out possible gender differences in how boys and girls relate to "fantasy like" elements in digital games, and differences in the way girls and boys play games. Malone used an arrow popping metaphor in the game "Darts". This metaphor seemed to have triggered the sense of relatedness with the game only in boys, but not in girls.

For the math game "Darts", Malone also noticed that students who considered himself good in math liked the game better than those who considered themselves poor in math. In this case, a sense of competence in math increases the enjoyment of playing the game for students who were good at the topic.

Historically, the previous study contributed to the development of what is known now as, Malone intrinsic motivation theory. The importance of this study is that it reveled and explained the three most important elements to create enjoyable computer games, challenge, fantasy, and curiosity. Before Malone we knew very little about how to provide enjoyment with technology. His findings also inspired other scientists to do research on motivation and technology.

Although, Malone's [13] study identified fantasy as the most important element of motivation games, he did not provide enough explanation about what kind of fantasy stimulates learning and why.

Lepper and Cordova

Lepper and Cordova [10] completed Malone's theory and gave a fresher view to what motivates people, considering interest and adding a fourth element to Malone's model, the control element. These researchers used three parallel versions of a computer game designed to teach arithmetic and problem-solving skills, and tested the games with elementary school children. The three versions of the game varied in the fantasy and choice elements presented in the game.

This study measures the effects of the game conditions on: intrinsic motivation, task involvement, learning and perceived competence and level of aspiration. Some of the most remarkable findings are explained below:

Overall, Lepper and Cordova [10] observed that participants in the fantasy conditions, as well as in the choice conditions reported significant positives results about how much they liked the computer game, more willingness to spend extra hours playing it, and more similarities among the computer game they played in the classroom, their favorite board games, and their favorite subjects in school, than the results showed by the no fantasy group. Additionally, students in the personalized fantasy (fantasy related to users' interest) group used complex mathematic operations more often than the rest of the groups being observed, From the results of written post test, students in the fantasy condition learned more than the ones in non fantasy condition. Choice condition was beneficial for learning compare to no choice

In analyzing this study, according to Mitchell's situational interest model (See figure 1), the personalized fantasy produced the best learning results, because it could both CATCH and HOLD the attention of the students over time.

The importance of this experiment is the findings about how personalized fantasy affects motivation in a positive way, even though Malone [13] identified fantasy as an important motivational element, in Lepper and Cordova's [10] study, a more direct link showed how personalized fantasy affects motivation.

Amory

Another study on games was conducted with college students in South Africa [15] to explore what games genres offer the best benefits for learning. It was found that among four different types of computer games (strategy, shooting, simulation, and adventure), the adventure and strategy games showed better potential for learning.

Students preferred to play this adventure games because of the mental skills needed to play; good quality and engaging graphics (cut scenes, real actors), sound effects, and story line.

This study was not focused on motivation, although it is consistent with Malone and Lepper [3] studies, where challenge and skills are important motivators to becoming involved in playing a game.

Amory et al., [15] did some of the initial research about learning from commercial games with college students. Before that, most of the studies were focused on children and educational games. He also gave new insights about the type of game genre that might help in learning (strategy and adventure games) and verified that the same conditions that motivate children to learn from educational games were motivating college students using commercial games.

Rosas

An additional study revealing the power of games in education took place in Chile [16]. A group of second and first graders played a video game, created by the research team, during class time. Participants used NINTENDO Gameboy devices to play the games. There were five games with content oriented towards the accomplishment of basic reading decoding skills as well as basic math skills. These students were compared with a group of students undergoing traditional instruction.

The researchers found from this experiment that children playing games in the classroom (compare to the no gaming group) developed a greater interest in learning and even a higher motivation in attending school. The video games used in the study promoted peer collaboration, responsibility, and perseverance. In addition, the group using video games in class received better scores in the math and reading posttests than the group learning from traditional instruction.

From this study, it seems like the game activity was well structure in the classroom and teachers promoted a safe and controlled learning environment where educational games can bee seem by students as fun learning tools and not just entertainment tools. From a motivational point of view the game environment promoted a sense of relatedness, and control over students learning, and caught students' attention to learn by using a game environment.

Becta and Teem

In the United Kingdom two separated studies [17, 18] found similar results about how children learn from computer games. In these studies different types of commercial computer games were analyzed both in and out classrooms.

From the reports of these studies, the researchers found adventure and strategy game genres as the most beneficial game tools for teaching and learning. Also games emphasized collaboration, interest in the topic presented in the game, more involvement with other type of computer applications and group work.

Becta and Teem's results showed how computer games encouraged the development of a well-developed interest in students, according to their findings. Students were more interested in the content they were learning with the game, they were developing a topic interest, in contrast with Malone and Rosas et al., who found increments in the general interest for learning instead of increments in topic interest.

Kurt Squire

Finally, I conclude this section with Squire et al. [19] research, using the game "Civilization III" to teach world history in a high school classroom. One of the main findings Squire found in this study related to motivation increment. In this case, when students perceived the game "Civilization III" as related to their interests the game was more easily suited for learning. When students perceived the game as an external agent, one inscribed with values different from theirs, they often ejected it. Also the teacher role and the additional non-game learning material were

very important elements of the learning process.

Squire's [19] study is one of the first studies to analyze the process of learning from games, with a broader point of view than previous studies on the topic. He observed the whole environment with students, teachers, computer games, extra material, socialization, and instruction, all at once. He not only focused on the fantasy and challenge factors of games, but also focused on the dynamic process happening around the game.

This study showed how acquiring more knowledge about the content presented by the game might produce more confidence in the students about their skills, and this sense of competence could increase the value for the content or activity. The value for the activity might predict more persistence with the content in the presence of difficulties, and students would get more involved in their learning, building more knowledge about the content.

Also, the socialization during the learning process might increase their sense of relatedness toward their classmates, teachers and maybe the school community, resulting in more enjoyment for learning.

It is important to mention that time was also an important element in Kurt et al [19] study, because only after spending long hours (around 30 hours) playing the game, students started getting more confidence on using the game for learning.

THE FUTURE OF GAME RESEARCH
Interest, intrinsic motivation, and self-determination theories proved to be very important constructs in mediating engagement in digital games. From the studies analyzed in this literature review, intrinsic motivation theory was the most mentioned motivation theory, and this theory was utilized to explain how digital games promote learning, future research should incorporate other motivation theories to study engagement and learning with games.

Even though most of the studies on digital games and engagement lean toward the learning aspects of games, two recent studies on digital games conducted by game companies proposed new alternatives and models to study a broad variety of digital game, from different points of view. A study conducted by Lazaro [20] looked at the reasons why people play games in a cross-genre study, Lazaro used qualitative methods and non-verbal communication analyses to study why and how people play games. Another research group from Microsoft evaluated how people play and engage with games using feedback gleaned via psychological testing methods

[21].These methods can bring new insights about how to measure engagement in commercial and educational games

From a learning standpoint, the impact of games in education is not always as positive as it is expected, if students already have a well developed individual interest for a topic, the game might not increase their motivation for learning the topic [10] Moreover, research about the type of content that can be learned from games is important. So far, many studies focus mostly on learning science, more specifically learning math. There are also studies on the acquisition of general skills, such as critical thinking, as well as social science, such as, history. Another important research involved studying how people learn with educational games at home and how they learn with educational games in school.

Commercial and educational games share common elements that help them to promote users motivation, such as, multiple goals, feedback, challenge and rewards. Yet they differ in other aspects that promote or undermine intrinsic motivation. Some of the main differences I identified by playing games myself and becoming familiar with the relevant literature are different purposes (commercial aimed entertainment, while educational emphasis learning), different Level of challenge and help to overcome the obstacles, different use of *new* technology, type of rewards, and use of social interaction systems.

The main difference between commercial and educational games seems to be the type of experience that provide to the users, and this experience is strongly related to the type of challenge presented in the game, options for having personalized fantasy, choices presented, options that foster social interaction, and environments where users' personal interest and situational interest can merge, so that the players would enjoy the experience of playing the game, persevere in the presence of failure, and learn the content and skills presented in the game.

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