THE USE OF REWARDS IN INSTRUCTIONAL DIGITAL GAMES: AN APPLICATION OF POSITIVE REINFORCEMENT

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I. INTRODUCTION

This paper is part of a series of studies being conducted by a research group investigating the role of computer games in elementary school education. Instructional scholars agree that digital games have become highly interesting to educators and researchers since the last decade. Studies indicate that simple video games touting educational benefits are common in classrooms, and that educational electronic games are a new and fun way for young children to learn concepts and processes that have usually been delivered via books within the traditional classroom (Embi & Hussain, 2005). According to Green and McNeese (2007), digital game playing has changed the way students learn because it is part of their culture, and that they are comfortable with the media.

Research findings (Dickey, 2006) show that increasing numbers of females and males are now playing digital games that have typically been considered a male leisure activity. Perhaps one of the most important outcomes of digital games in education has to do with the fact that winning strategies and tactics may provide instructional designers with new methods for engaging learners. Nonetheless, despite the fact that there is enough evidence suggesting that educational games enhance students' performance in the classroom, there is a dearth of empirical data indicating that these games yield lasting interest in the subject matter. Therefore, this research discusses a possible answer to the creation of interest because the final outcome of educational digital games should have something to do with one's mastering the field of study.

II. BACKGROUND AND LITERATURE

Current literature on digital games in education indicates that there is still more to be learned from a pedagogical standpoint. Crookall (2005) argues for the need for a clear vision in educational digital games, and this vision needs to be discussed among

designers and publishers. According to Squire, Halverson, and Gee (2004), video games will change the way students learn. The authors argue for a particular view of games and of learning as activities that are most powerful when they are personally meaningful, experiential, social, and epistemological all at the same time. From this perspective, they describe an approach to the design of learning environments that builds on the educational properties of games, but deeply grounds them within a theory of learning appropriate for an age marked by the power of new technologies. The authors suggest that video games matter because they present players with simulated worlds: worlds that, if well constructed, are not just about facts or isolated skills, but embody particular social practices. Video games, they argue, make it possible for players to participate in valued communities of practice and as a result develop the ways of thinking that organize those practices. Most educational games to date have been produced in the absence of any coherent theory of learning or underlying body of research.

There is enough literature that speaks on the relationship between digital games and students' performance in the classroom. Capstick (2005) investigated the perceptions of both students and teachers at a pupil referral unit (PRU) towards a reward system. The main aims were to establish whether teachers and students perceived the same rewards as effective, as well as to determine whether teachers and students perceived that rewards changed behavior, and finally whether they perceived that rewards motivated children to learn. A total of 11 pupils and eight teachers participated in the study. All participants completed a questionnaire devised by the author to determine the aims of the study. The results indicate that both teachers and students perceive "a trip out", "a good phone call home" and "being given a treat" as effective rewards. Only teachers saw teacher-based rewards as effective. Teachers perceived that rewards change students' behavior and increase their motivation to learn, whereas students perceived the opposite.

Similarly, Cameron, Pierce, Banko, and Gear (2005) assessed how rewards impacted intrinsic motivation when students were rewarded for achievement while learning an activity, for performing at a specific level on a test, or for both. Undergraduate university students engaged in a problem-solving activity. The design was a 2 X 2 factorial with 2 levels of reward in a learning phase (reward for achievement, no reward) and 2 levels of reward in a test phase (reward for achievement, no reward). Intrinsic motivation was measured as time spent on the experimental task and ratings of task interest during a free-choice period. A major finding was that achievement-based rewards during learning or testing increased participants' intrinsic motivation. A path analysis indicated that 2 processes (perceived competence and interest-internal attribution) mediated the positive effects of achievement-based rewards in learning and testing on intrinsic motivation. Findings are discussed in terms of the cognitive evaluation, attribution, and social-cognitive theories.

It is, however, important to note that an earlier research (Simons, Dewite, & Lens 2004) found that extrinsic rewards do not yield an intrinsic motivation for learning in

adult students. The authors used the future time perspective theory and the goal theory, both known in the field of motivation and achievement to result in conflicting recommendations for enhancing students' motivation because of their differential emphasis on the task at hand and on the future consequences of a task. The aim of the study was to present a framework consisting of four types of instrumentality that combines both perspectives. In their inquiry, the researchers investigated the implications of those different types for goal orientation, motivation, cognitive strategies, study habits and performance. Researchers administered a questionnaire to 184 first-year nurse students between the ages of 18 to 45 years in order to measure instrumentality, goal orientation, and motivation, deep and surface level learning strategies, study habits, and a manipulation check.

They collected the exam scores at the end of the school year. The results of their investigation showed that students who were internally regulated and perceived the utility of the courses had a more adaptive goal orientation and higher intrinsic motivation, which led to the use of more adaptive cognitive strategies and to better study habits, which ultimately enhanced their performance. Linking performance to extrinsic rewards and not seeing the utility of the course for the future yielded the opposite pattern. The study concluded that the type of instrumentality has indeed a differential influence on motivational, cognitive, and behavioral variables in adult students. There is no evidence of such findings in elementary school students.

Okan (2003) presents a critical view on edutainment. The author argues that since the early 1990s interest has surged in developing edutainment software, namely applications that possess the allure of electronic games while achieving educational goals. The author also argues that because they are in the rush to adopt the new technology, both educators and parents overlook the long-term harmful effects on children and on learning. Okan draws attention to these effects, particularly to the inflated expectation in the learners that the process of learning should always be colorful and fun, and that they can acquire information without work and serious study. The author argues that what is essential is realizing that education is concerned with the development of cognitive structures and that educational technology is a medium, not a pedagogy that is useful in creating such learning environments. Okan calls educational researchers to critically examine the potential of edutainment software while outlining advantages and disadvantages that it brings to the instructional process.

There are many other researches that have established the value of digital games in education. Some of these studies include Gredler (2004) who argued that educational games and simulations are experiential exercises that transport learners to another world; Segers and Verhoeven (2005) who examined the long-term effects of a computer intervention for the development of phonological awareness in Dutch kindergartners; Cameron and Dwyer (2005) who examined the effect of gaming on delayed retention of different types of educational objectives for students identified as field dependent/field independent; and; Van Mierlo and Van de Bulck (2004) who studied digital games from the perspective of the mass media cultivation theory.

III. CONCEPTUAL AND THEORETICAL FRAMEWORK

The main argument being presented in this paper is that instructional designers and educational researchers need to shift their attention from performance to interest. Educational digital games have to aim at building lasting interest in real world applications. In other words, it is not enough to look at how well students perform in a certain subject, but rather how interested students become in the subject matter. One way to generate interest on the part of students is to institute a rewards system that promises immediate gratification to performance. This argument suggests that educators need to incorporate the use of rewards in instructional games in order to stimulate students' interest in the subject matter. This argument draws its foundation from the educational concept of positive reinforcement. Positive reinforcement is known in educational psychology as a consequence that brings about the increase of a behavior through the presentation of a stimulus. It is a procedure whereby a student, contingent upon performing a specific behavior, is immediately rewarded to maintain or increase that behavior. An example is taking a child to their favorite theme park after they do well on a test. Or providing a child with a link on the web where they can download free ring tones for their mobile phone. A positive reinforcer is an event that, when presented contingent on some behavior, increases the future likelihood of that behavior. Therefore, behavioral therapists refer to positive reinforcement as operant conditioning, and learning theory as an environmental event (i.e. free coupon) that reinforces or increases the probability of a behavioral response.

Many younger students do not consider good grades or academic achievement as a reward. Therefore, it is almost hard to argue that a digital game that puts to much emphasis on achievement alone would breed long-term interest in any given field of study. It is imperative for educators to use tangible rewards, those that do not pertain to grades in school, so that students will associate the subject matter to something they like. This argument also draws upon the concept of Operant Conditioning. Operant conditioning is defined as the increase in frequency of a response after it has been followed by reinforcement. This conditioning generates a behavior that is known as operant behavior. Operant behavior is defined as a behavior that is maintained by its consequences in the environment. That is, depending on what happens after one engages in certain behaviors, one may be more or less likely to engage in similar behavior in the future. This line of reasoning in this research is that reinforcing students' behavior with rewards in educational digital games will increase their interest in the subject matter in which they expect more rewards.

IV. FRESH PERSPECTIVES AND CONCLUSIONS

The background literature discussed in this paper maintains that children are being exposed to computer and video games at an early age; and that this exposure affects the way they view the world around them, and the way they learn. There are clear indications that digital games can play a potential role in helping children learn complex concepts that could be difficult to learn in the abstract world. So far, there is

not enough research data to help us understand whether learning complex concepts through a digital game could result in increased interest in the discipline. What is known is that instructional digital games do help students in their learning process, and that it does play a role in their academic performance. We have found no data so far suggesting that good performance leads to students to become interested in the subject matter. For example, there is not enough information on whether students playing digital math games become interested in math beyond the classroom setting. It is paramount to find ways to build intrinsic motivation that goes beyond the classroom setting. This intrinsic motivation building can be achieved through a combination of educational strategies.

Some examples of a child who is intrinsically motivated in science would be that the child will be more likely to check out science books from the library, or that the child is more likely to visit science websites, interest in science museums, science fairs, or that the child is more likely to watch science education programs on television. Therefore, drawing from various educational concepts, the this study will design an experiment that will investigate whether such a link exists between digital games, rewards, and children's increased interest in science. The idea is to design instructional digital games where students will receive incentives for their achievement. Some of the modules in the games have to contain interactive quizzes and that draw from other sources. These incentives have to be immediate and relevant to a child's need or leisure.

The modules of the digital games need to guide students in terms of where they might be able to find some of the answers to the questions. The game designers need to include quizzes from content modules, and special reward quizzes that lead students to want to check out books, or participate in science Olympics, or to want to follow certain science education programs on television. There has to be a combination of the fun of playing digital games, the learning experience, and the rewards for success and achievements that can be in terms of gadgets, ring tones, coupons, special tickets, etc. The hypothesis is that, in a society that is accustomed to instant gratifications, these challenges will motivate students to want to seek for additional resources in the subject matter, which will in turn lead to an on-going interest in the subject.

V. CONCLUSIONS AND RECOMMENDATIONS

This paper has laid down a theoretical framework for a new perspective in educational digital games. We have argued in this paper that educational digital games need not be limited to high academic achievement, but also in fostering a long-lasting interest in the subject matter. The main hypothesis has been that one way to achieve this goal is to use positive reinforcement and conditioning in the form of relevant, immediate incentives that will lead students to cultivate an interest in the subject matter. This argument is based in part on learning theories, and on the review of existing literature that supports the significance of educational digital games in the 21st century. Nonetheless, the hypothesis we have advocated in this paper claiming

that the use of rewards in educational games may aid build an intrinsic motivation in students need to be verified. The practical aspect of this hypothesis will need to involve instructional game developers, entertainment producers, and teachers that will utilize creativity to build interactive multimedia applications that incorporate the concepts that have been discussed here. The null hypothesis will only be rejected after it has been tested in an experimental design. This is a task that needs to be undertaken in a future research.

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