



The Instructional Power of Game-Based Learning and simulation in a K-12 school in the United Arab Emirates

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Received 3 Mar. 2014, Revised 28 Jul. 2014, Accepted 3 Aug. 2014, Published 1 Sept. 2014

Abstract: Psychologists have often emphasized the need to incorporate games into the school curriculum as a way of providing learners with opportunities to develop skills in all aspects of the curriculum. Accordingly, these games offer learners an avenue to release their mental tension resulting from rigorous academic engagement in the classroom. Studies have indicated that the learning process can be made more engaging for learners when games are incorporated into the teaching and learning process. This study examines the instructional power of game-based learning and simulation in a K-12 setting and seeks to provide insight as to whether game-based learning would be an emphatic method that could be used for teaching and learning. Researchers have argued that game-based learning creates a sense of motivation for learners. Therefore, this study explores the distinct features of game-based learning which learners consider to have helped enhance their learning. The findings of this study demonstrate that the use of game-based learning as an instruction method is effective in the teaching and learning process. It has the ability to engage and provoke learners' interests. Its experimental nature allows learners to participate fully in class work as highlighted in this study. If game-based learning is to be implemented effectively, teachers would need to develop teaching content that incorporates games since this is a practical learning approach which helps learners to retain teaching content. The study also discusses implications for educators who would be equipped with designing and developing curriculum content where the key pedagogical emphasis is on the importance of instructional methods that would allow the integration of games.

Keywords: instructional design, game-based learning, simulation, online education, K-12 education, UAE

1. INTRODUCTION

With the increasing use of technology in today's society, many educators are exploring the use of instructional methods that would enhance their teaching and students' learning. Educators acknowledge the fact that pedagogical practices need to embrace the learning opportunities available in the modern learning environment where learning tools such as computers, the internet, graphics, fantasy tools, and so on are available. They also acknowledge that learners' learning behaviour has changed and therefore innovative learning tools have to be used in the teaching and learning process so as to retain student motivation and importantly enhance their concentration spans. Consequently, many educators have embraced game-based learning with the aim of motivating learners. Various games have been incorporated in a range of instructional approaches for educational purposes in a number of studies. Psychologists argue that there is a

positive correlation between students' progress and attainment and them enjoying learning (Glasser, 1998). Enjoyment is regarded as a fundamental determinant of student behavior in the classroom. According to Glasser (1998), students are responsive in what their teachers ask them to do since it allows them to have interactive and engaging interactions. Game-based learning enables students to learn by practice; hence, they are engaged in the entire learning process. Similarly, games reinforce learner motivation. The main reason that games are considered to be motivating is the fact that participants in the games need to search for the relevant information that can enable them to meet the challenges presented by the game (Chiong, 2010). In addition, researchers have noted that the inclusion of enhanced interaction in the learning process boosts the memory ability of students as the content is retained for longer (Mathews, 2010).

Games are seen to complement the role of the teacher in the classroom; making learning more



engaging and enjoyable. For example, video and computer games allow students to simulate situations such as experiments, scientific, and historical events for themselves. Similarly, they motivate students, who otherwise may struggle in certain subject areas by allowing them to encounter 'real problem' and devise ways of solving problems. The increased use of games in classrooms can contribute to students' development in other aspects of their personal lives. Skills such as patience, discipline, critical thinking, problem solving, and others, are enhanced through the use of games. This study therefore seeks to determine the effectiveness of game-based learning in a K-12 school, exploring its influence on students' motivation, and other factors of motivation associated with game-based learning.

A. BACKGROUND OF THE STUDY

Not too long ago, education was imparted mainly through blackboard and textbooks. Teachers' knowledge was considered to be ultimate. However over the years, technology has leaped to great heights and so have the teaching and learning strategies. The Technological advancements and innovative technological tools have played a crucial role in creating new avenues for enhancing learning. Researcher, policy makers, academics and classroom teachers have been vocal about the need to reform education systems; revamp classroom teaching in order to equip students with the relevant technological skills that they can later be applied in their daily lives (Chen, 2011). Game-based learning is a strategy that helps students better grasp content (Chen, 2011). Teachers are now moving their approaches to cater to the needs of innovative teaching and learning styles. Classroom teachers are also acknowledging the pressing need to review the current pedagogical practices where we are all expected to jump on the wagon wheel of adopting the internet in the classroom, technological tools such as iPads and laptops hence a move away from the traditional methods of teaching and learning (Garris, Ahlers and Driskell, 2002). Students in today's society are more independent in their own learning styles; they search for their own information as contemporary technology provides a wide array of learning materials. The technology-based mode of learning that is adopted in many schools in the UAE is a clear indication that the approaches to teaching and learning have changed. (Garris, Ahlers and Driskell 2002).

Neurologists suggest that when pleasure, opulence and impulsiveness are substituted by consistency and compliance, the brains of the students are hindered from processing information in a successful manner, thus, affecting their memory (Willis, 2006). Therefore some teachers have embraced game-based learning for the purpose of motivating students. The fastest growing

technological change in modern world has also brought with it various challenges which we will also elaborate on further in the paper. Students who struggle with technology or have basic skills in the use of technology, once they leave school they will be at a greater disadvantage in the job market than their counterparts who are more skilled in the use of technology. This is due to the sole reason that most employers in the 21st century are looking for employees who are 'good with computers' and so 'without computer knowledge, a person is not well prepared for the eventual success' (Amorim et al. 2011, p.12). The importance of computer skills has been reflected in the call for computer literacy and the integration of the computers in the teaching and learning process (Deaney, Ruthven and Hennessy, 2006).

The game-based approach will help create a better interest in learning in the classroom (Cassell and Jenkins, 1998). Content on laptops can be more illustrative and informative in comparison to content found in textbooks. Content-related videos and audios on laptops can also add value to teaching strategies. Games prompt motivation and students become more engrossed in the competitive aspects of the game; they try harder at winning the games which stimulate student interest in the classroom activities, making one motivated and willing to learn (Randel et al. 1992).

Gaming and simulation facilitates learning, acquiring new knowledge on specific domains and concept and other several cognitive skills such as decision making, pattern recognition and problem solving (Funk, 2002). A student's effectiveness, motivation, exploration and skill increases by playing computer games (Bredemeier and Greenblat, 1981). Like for instance, a 30 minutes' collaborative learning using dialogue games encompassing constructive conflict, explanatory talk and collaborative argumentation elicited significant improvement in students' conceptual understanding and knowledge about physics of motion (Aldrich, 2005). So, it is evident that students can acquire specific skills by embracing game based learning (Green and Bavalier, 2003). As such, games like Civilization III, Racing Academy and Revolution are widely embraced by schools to facilitate learning (Bonk and Dennen, 2005). Games can also be used to teach students important personal skills such as patience, discipline, critical thinking and problem solving (Michael and Chen, 2006).

There are strengths and challenges that also need to be considered while exploring the introduction of game-based learning. Such aspects are of varied nature ranging from the involved cost to the authenticity of

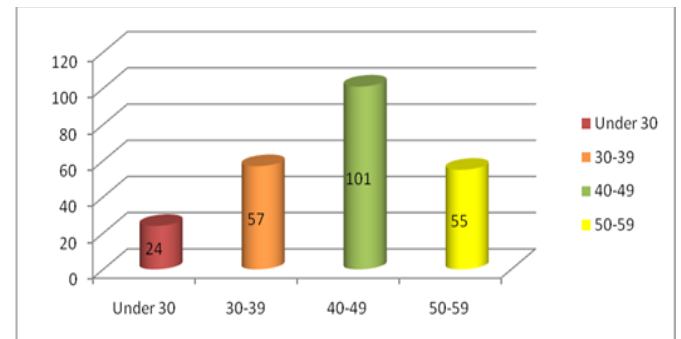
content (particularly when the content needs regular updating). While considering the various strengths and weakness, a key issue for consideration should be whether students in schools in the UAE are able to adapt to such a change in an efficient manner and be able to study better. Considering the strengths and challenges of a game-based approach to learning, one of the key challenges is the cost involved the implementation of such a project. The cost of purchasing laptops would be more than the annual cost of textbooks, in addition to maintain the laptops. Asking parents to contribute such costs do not go without resistance. In private schools parents are already paying a substantial amounts of fees and this would only be adding further costs to the already high cost of schooling in the UAE. A further key challenge is the acceptance from parents who tend to see the use of iPads/laptops or technology altogether a distraction from 'real' learning (Dixon and Tierney, 2012). On the other laptops will prove to be useful in game based learning, as a compact storage for all the content material avoiding students carrying heavy bags can be seen in many schools across the UAE (Boris, 2012). The use of laptops in classrooms in itself can help to attain student attention and will help reduce truancy rates ensuring that students are keen to attend school and not miss classes (Fried, 2006).

2. METHODOLOGY

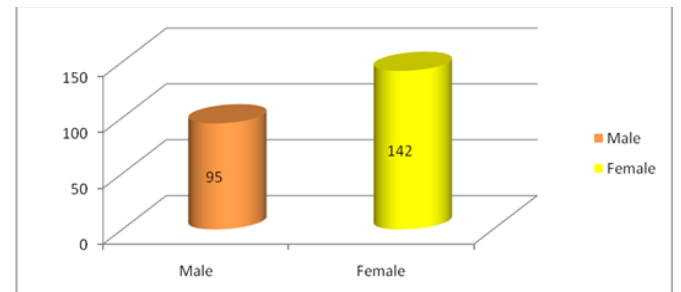
In order to achieve the objective of the study, the researchers adopted a mixed methodology approach by incorporating both qualitative and quantitative methods. Quantitative methodology is relevant for categorizing the observations or variables, examining the variables and generating statistical representations to analyze the observations. Qualitative approach on the other hand helps generate information that applies to the current study. We sampled 450 students and teachers and sent them questionnaires to gather quantitative data. The questionnaire items comprised of two major categories including the demographic part and the Likert-scale items and closed-ended items seeking to gather views of the respondents on the study topic. The Likert-scale questionnaire contained 10 items and the other section also contained 5 closed ended items.

237 respondents (52.6%) of the expected 450 respondents completed the questionnaires. Female respondents were 142 and male respondents were 95. Respondents from the age group 40-49 years (43%, n=101). This was followed by respondents in the age group 30-39 years (24%, n=57). The third largest age group was 50-59 years which had 55 respondents (23%). The age group under 30 years had the lowest number of respondents (10%, n=24). The results were analyzed using SPSS software and correlation analysis. At the same time, the researcher sampled 20 students who were engaged in 13 weeks of game-based learning.

Each game-based lesson lasted for 30 minutes. At the end of the intervention period, the researchers engaged the participants in an interview. The interview questions sought to answer the questions 'why, how, and what' with regards to the subject of the research.



The figure indicates that many respondents were from the age group 40-49 years (43%, n=101). This was followed by respondents in the age group 30-39 years (24%, n=57). The third largest age group was 50-59 years which had 55 respondents (23%). The age group under 30 years had the lowest number of respondents (10%, n=24). The gender distribution is summarized in Figure 4.2 below.



The figure indicates that many respondents (60%, n=142) were female, whereas only 40% (n=95) were male employees.

3. RESULTS

A. Survey results

Respondents were issued with questionnaires in order to provide their responses regarding the instructional power of game-based learning and simulations in education. The results demonstrate that the mean for the effectiveness of game-based learning was 113.20, with a standard deviation of 14.30. From this computation, it is implied that many students and teachers believed that game-based learning is effective. This is indicated by the high value of the standard deviation. The mean and standard deviation for the other relationships: the influence of game-based



learning on motivation; the impacts of game-based learning on students' learning; and other motivating factors connected to game-based learning and instructional power, are also shown in table 3.1 below.

Table 3.1 Summary of descriptive statistics

Study question	Mean	Standard deviation
Effectiveness of game-based learning	113.20	14.30
Influence of game-based learning on Motivation	102.12	11.30
Impacts of game-based learning on students' learning	103.10	10.80
Other motivating factors connected to game-based learning and instructional power	127.20	15.30

Inferential statistics were also calculated and the results showed a strong correlation between the influence of game-based learning on motivation and instructional power ($r = 0.598$, $p < 0.01$), other motivating factors connected to game-based learning and instructional power ($r = 0.585$, $p < 0.01$), effectiveness of game-based learning and its instructional power ($r = 0.386$, $p < 0.01$), and between impacts of game-based learning and instructional power ($r = 0.268$, $p < 0.05$).

Table 3.2 Summary of the inferential statistics

Study question	Pearson Correlation	Sig (2-tailed)
Effectiveness of game-based learning	0.273	0.044*
Influence of game-based learning on Motivation	0.598	0.000**
Impacts of game-based learning on students' learning	0.268	0.042*
Other motivating factors connected to game-based learning and instructional power	0.585	0.000**

Note: * = $p < 0.05$, ** = $p < 0.01$

B. Interview Results

The results of the interview data provided various valuable insights. First, a large majority ($n=16$) of the students who were interviewed responded that they really enjoyed their learning when it was game-based. The students liked the idea of searching for information on their own as well as corresponding to their peers as they engaged in problem solving situations. However,

the remaining four students responded that their learning motivation did not change even with the introduction of game-based learning. They were mainly motivated by the need to attain excellent grades. It was noted that game-based learning was engaging especially with regards to aspects of team work, healthy competition between teams, and the feedback received from the instructors. Game-based learning provided an enjoyable ambience to them as it promoted strong social connection among the students. The use of game-based learning helped the students to gain interest in their learning as it enabled them to search for information by themselves instead of relying mainly on the notes provided by the teachers in the classroom. This strategy allowed them to actively participate during the learning process. Other actors such as the purposes, aims and goals of the students were found to be motivating factors for the students to work with more rigour in their class work.

The results were analyzed using Statistical Package for the Social Sciences (SPSS) and correlation analysis. The responses of the students who were interviewed were listed under five main categories as suggested below:

- i. Out of 20 students, 16 of them confirmed that they enjoyed their learning when it was game-based. The students had a higher affinity of sourcing for their own information in addition to corresponding with their colleagues in order to meet the challenges of their studies. The students indicated to the fact that learning was more enjoyable in game-based learning as compared to the traditional teaching and learning. The remaining four students explained that their motivation for learning did not change with the introduction of game-based learning. Their main purpose for learning was the ability to attain excellent grades; thus, the introduction of games did not matter at all.
- ii. The students appreciated that game-based learning was engaging particularly with regards to aspects of team work, competition between teams, and the feedback received from the instructor. Game-based learning provided an enjoyable ambience to them as a stronger social connection among the students was created. The learning environment is was less stressfully for both students and teachers. When the students work as a team amongst themselves, a feeling of social belonging is created.
- iii. The use of game-based learning helped the students to gain interest in their learning because of the fact that the students searched



for information by themselves instead of just relying on the notes provided by the teachers in classrooms. In addition, the students did not find any lesson to be boring because of the fact that they were actively participating during the lessons. This notion was supported the fact that the results of the study showed that the class attendance was excellent during the 13 weeks of the course.

- iv. The students were comfortable with the 30 minutes that were allocated for the game-based learning as it was effective in stimulating their interests. Nevertheless, the 30 minutes was not found to be sufficient enough to affect the motivation of the students with regard to their learning. The main motivation of the students came from the fact that they desired to attain high grades or scores and to have a bright future with regard to their careers.
- v. Besides game-based learning acting as a motivating factor the students, other factors such as the aims, desires and the goals of the students were the main motivating factors for the students to work hard in their studies. Some students pointed out to the fact that they worked so hard in their studies so as to attract confidence and recognition from their parents.

4. DISCUSSION

Psychologists emphasize the integration of games in school content as a way of helping students develop in all aspects of curriculum. Games provide students with an avenue to release their mental tension resulting from rigorous academic engagement. Studies have shown that the teaching and learning process can be made more enjoyable through the use of games as part of the learning activities. They also add value to learning as they encourage conceptualizing imagined phenomenon to real life experiences. In addition, when effectively used, games can facilitate learning because they enable students to attain important life skills such as problem solving skills, patience, critical thinking skills and discipline among others. As opposed to traditional learning methods which tend to involve direct instruction, game-based learning reinforces learning motivation. The main reason why games are considered to be motivating is that participants in the game get the opportunity to source for relevant information that can enable them to meet the challenges presented by the game. Traditional learning method is very much different from game-based learning due to the fact that students do not have to think or be creative as they are given the necessary skills to comprehend the.... The practice of teachers

using games in class is gaining popularity at a fast rate. This is especially because it is more appealing to students and it makes learning more enjoyable and memorable. The practice is applicable to all subjects and it only requires less effort on the part of the teacher to effectively achieve the lesson objective to a high level. Teachers who are not well experienced in the use of games in the classroom can now access resources on the internet on the best practice of transferring games to the classroom. When effectively used, games can facilitate learning because they enable students to learn important life virtues such as problem solving, patience, critical thinking skills and discipline among others. Also, they add value to learning as they encourage conceptualizing imagined phenomenon to real life experiences. Despite the positive effects that games bring in a learning environment, improper use can have adverse effects on student such as health issues, increased aggressiveness and poor time management can also be the result of improper use of games.

The use of games in the classroom has potential for enhancing educational values due to the impact resource on improving the standards of learning. Students are encouraged to manage their time better in addition to being focused and attentive to the teachers' instructions. Just like teachers, some students also find it difficult to embrace new change in the learning environment. Therefore, it is prudent that, when introducing educational technology to the learning environment, attention should be paid to students who struggle to embrace technology in the classroom.

5. CONCLUSION

Supporters of computer-based learning point out that game-based learning carries with it the capacity to revolutionize the mode of learning in the classroom. Today's students feel more motivated to learn than they would have felt when using traditional tools of teaching. The main reason why games are considered to be motivating is that the participants in the game are more independent as they search for the information themselves that help them to meet the challenges presented by the game. Traditional learning is very different from game-based learning due to the fact that students are more dependent on the teacher to deliver reducing the need to be creative as they are given the necessary figures or facts to comprehend the essential ones. The use of games, therefore, has an impact on the learning environment. The increased use of games in the classrooms has also contributed to students' development in other aspects of their personal lives. Skills such as patience, self-discipline, critical thinking,

problem solving are enhanced through the use of game-based learning.

More research is required that explores the various aspects of game-based learning that offer motivation to the students. Key measures of learning gains and the degree of attainment with game-based learning also needs to be explored further. There is paucity of studies investigating the effectiveness of game-based learning amongst students with special needs or learning difficulties.

ACKNOWLEDGMENT

Dr. Khadeegha Alzouebi and Mr. Khaled Sharabas would like to thank Hamdan Bin Mohammed Smart University for supporting this research. The inspiration of the wise leadership that drives the university forward is what has given us the motivation and passion to pursue research in e-learning. Dr. Mansoor Al Awar has been an inspiration throughout and his vision for innovative learning has always been at the forefront of the university's strategy.

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