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The Effectiveness of Video Games in Enhancing Students' Learning

Sultan Hammad Alshammari, Mohammad Bilal Ali and Mohd Shafie Rosli
Faculty of Education, Universiti Teknologi Malaysia, Johor, Malaysia

Abstract: In the modern world with massive innovation taking place extensively, a new learning method is important for students to improvise the existing method and sustain a rapid development phase. Therefore, video games as a solid tool can be used as a learning method in an innovative and modernized approach. This study reviews the importance of video games based enhanced learning and concurrently evaluates this approach to promote students' citizenship via 4 different aspects of video games, namely impact of having various type of video games, cognition response, gender and peer based learning and complementary element for classroom teaching. Additionally, herein, the limitations have also been discussed. However, by critically reviewing the literature, the advantages of video games based learning prevails its disadvantages with proper control and moderation. Simply because it contributes at all aspects of learning without inducing any lost of interest in a student and contribute extensively towards logical thinking.

Key words: Video games, electronic games, cognitive process, educational technology, game learning

INTRODUCTION

Video games have been around for more than four decades. However, research on the effects of video games gained interest only a few years ago (Gee, 2008). Video game is an equivalent of electronic game that requires human involvement with machines on video devices. According to De Aguilera and Mendiz (2003), there are different types of video games and each is associated with different skills for example, sport games, strategy and role games, puzzle and simulation based games. Realizing these differences in video games is important to understand the varying benefits of these video games towards learners. Facer determined that video games were gaining favour, especially among teenagers, who found the technology fun and motivating. Video games can be adapted for educational purposes. Although, some educators have ignored video games as being only about social effects, actually video games demonstrates an important educational potential (Squire, 2003). Video games are useful tools for learners in any level in their studies (Aguilera and Mendiz, 2003). Bourgonjon *et al.* (2010) stated that video games are considered a promising learning tool for the 21st century because of their appeal to earlier contemporary students.

Furthermore, using video games for students' learning improves their skills and learning. According to Lieberman *et al.* (2009), well-designed video games provide rich, interactive experiences that lead to enhance learning and skills. Aguilera and Mendiz (2003) were in agreement with Lieberman *et al.* (2009)'s views and mentioned that "video games are considered very useful in acquiring practical skills as well as increasing perception, stimulation and developing skills in problem-solving, strategy assessment, media and tools organization and obtaining intelligent answers". They added that video games are important in developing learners' intellectual abilities. Video games can provide students with knowledge of other' cultures and concurrently develop their logical thinking. Moreover, Olson (2010) pointed out that video games can serve a surprising number of social, emotional and intellectual needs in addition to improving cognition. According to Sanford and Madill (2007), video games offer powerful learning for students. Students can play in teams which leads to effective learning (Trespalacios *et al.*, 2011). Effective learning means "learning how to learn" and involving students in meta-cognitive process of planning, monitoring and reflecting. In this study for the first time, several aspects of video games will be thoroughly reviewed including impact of experiencing various types of video games, cognitive response toward video games, role of gender and peer learning in video games, possibility of video games complementing subjects in classroom and finally some limitations of video games.

MATERIALS AND METHODS

The research methodology adopted in this study is based on critical review to perform a detailed investigation on the overall literature of impact of video games in

Corresponding Author: Sultan Hammad Alshammari, Faculty of Education, Universiti Teknologi Malaysia, Johor, Malaysia

enhancing student's learning. The critical review on video games is carried out to seek answers for the aspects of the impact of the various video games, cognitive response, gender and peer learning relationship, complementary instrument for teaching and the associated disadvantages. Answering these questions would create an overall picture of how a student could benefit from video games as part of their daily routine in their respective lives. The study provides the body of knowledge of video games usage for mind development and concurrently cater new ideas for researchers with interest on the social impact of video games and its multidimensional role in developing and supporting towards the growth of student knowledge.

RESULTS AND DISCUSSION

Impact of various video games: Different types of video games are required to enhance the associated skills and abilities that grows relative to the nature of the video game. This is important in considering their effectiveness in enhancing students' learning. According to Aguilera and Mendiz (2003), each kind of game is associated with different skills and abilities for example, a strategy and role-playing game is useful in helping to stimulate students' internal motivation which is important to engage learners in any task to improve their skills and in turn, their capabilities. Moreover, a puzzle game helps students improve their logical thinking. Solving puzzles through video games help learners think about proposing strategies and organising elements in anticipation of objectives which also improves logical thinking. Simulation video games are another type of game and they can develop students' intellectual abilities. Lastly, there are sport games which are useful in relieving students' stress. According to Lytle and Todd (2009), reducing learners' stress is important in enhancing the learning environment. Knowing the different effects of games is useful for game designers and teachers, so they can improve different skills through using different video games. Knowing the skills that a specific game provides will help in choosing the suitable video game for learners to enhance their learning.

Cognition response: According to Olson (2010), learners find that video games are attractive and can help in developing learners' cognition. Lieberman *et al.* (2009) added that excellent design games provide rich, fun and interactive experiences that enhance learners' cognitive development, social interaction and healthy behaviour. Hoffman and Nadelson (2010) performed a study on 25 students who play video games to assess the cognition response and affect. They found that video games can result in feeling satisfied which enhances learning, even when the player has unsuccessful results. Moreover, the different educational abilities among learners can play a big role in the choice of video games. According to Bijvank *et al.* (2012), students who have higher education ability are attracted to nonviolent video games that involve social interaction while students with low education ability are attracted to stand-alone video games. Therefore, it is important for teachers to recognize these learners' choices and encourage students who have low education ability to play games involving social interaction to enhance their skills in that domain.

Several researchers have investigated the direct relation between video games and learners' preferences. The easier the video game is, the higher the preference of the learners will be. According to Papastergiou (2009), more intricate video games will be chosen by those with superior learning ability because they can easily solve most of the problems in the easier games. Bourgonjon *et al.* (2010) conducted a study involving 858 secondary school students to assess their perceptions and preferences about the use of video games in classes. Their results showed that there are four factors that affect directly on the students' preferences about the use of video games in classrooms: students' perception regarding usefulness, ease of using the video game, learning opportunities and students' personal experience with video games in general. Moreover, Trespalacios *et al.* (2011) found that students prefer to play in teams for challenging scenario which leads to effective learning. Furthermore, students are in favour of video games for their fun and positive effects. Hoffman and Nadelson (2010) performed a study on 25 students to find out their perceptions toward video games where it was discovered that learners find video games challenging but relaxing, leading to positive effects and better cognition.

Motivation is important for learning and video games play a significant role in enhancing students' motivation. According to Trespalacios *et al.* (2011), collaboration, challenge and competition increases motivation and lead to effective learning skills. Scanlon *et al.* (2005) stated that video games can engage and motivate learners in ways that classes and teachers cannot. Hayes and Silberman (2007) support this view, pointing out that when students are not motivated by traditional methods of teaching, video games can motivate them because they enjoy and are familiar with them. Hayes and Silberman also mentioned that video games can attract learners and provide benefits, namely collaboration, experimentation, individualisation and adaptability. Hoffman and Nadelson

(2010) explained that motivation and engagement in video games are related to factors such as gender differences, hours of play, the orientation of task and socialisation.

Gender and peer learning: Gender differences is another important area in understanding the effects of these games on students' attitude and behavior. Joiner *et al.* (2011) recently completed a study on 138 students to discover whether gender plays a role in differing the benefits of academic studies through video games. Their findings showed that female students can benefit from video games as much as males and there were no differences between males and females in terms of posting or reading messages. However, according to Miller and Summer (2007)'s study, there are gender differences in learners: they argue that males have more ability than females. Males are more likely to be dominant in video games while women tend to be supplemental characters. Moreover, male characters are more powerful while females are attractive, helpless and innocent. Bonanno and Kommers (2010) were in agreement with Miller and Summers' view, stating that most females prefer puzzles and adventure video games because of their challenges and arousal while males tend to play shooting based, sports, role-playing and strategy games due to their challenge and social interaction. They also mention that male students spend more time playing video games than female students. Bourgonjon *et al.* (2010) stated that gender differences in video games are affected by the students' experience and ease of use of the games. Understanding these differences can help designers and teachers provide suitable video games for male and female students to enhance learning.

Video games are quite effective in improving learner's emotions by building a spirit to win against the players' chosen opponents as well as boosting confidence level. According to Olson (2010), emotions play a significant role in growing motivation for electronic game use. The research claimed that 62% of boys and 44% of girls agreed that playing games keeps their minds relaxed and helps them release stress. The survey also depicted that playing video games is effective in handling aggression, reducing isolation that youngsters often experience. Moreover, Olson hypothesised that making new friends while playing these video games would rank high as a motivational factor in his survey, however, most respondents did not agree. According to his survey, 78% of children were more likely to be the victims of bullying by senior players. Therefore, those players would put a greater value on interacting with peers. Li (2010) evaluated learners' traits with respect to three dimensions:

- Learners' creativity: the majority reported that they had good experiences with video games where it offers the freedom of learning and as well as exploring new information
- Learners' engagement with video game: the learners highlighted that they were interested in video games' design. Therefore, the students not only gathered information but acknowledged that the video games were fun. Video games increased engagement and resulted in the students' preferences to learn the subject involved
- Identity of learners with the subject following a video game method of teaching: whenever, students wanted to teach others, they assumed the role of professional teachers. This meant that there was some level of commitment by the learners, who passed the content on to those who have no experience. This commitment can be instilled by video games, a further demonstration of students' engagement beyond nurturing the imagination

Video games provide learners with the opportunity to critique and share their knowledge with their peers. According to Squire (2008), video games empower learners to impose, critique and share their learning materials and knowledge. Moreover, Li (2010) asserted that video games offer learners basic and advanced knowledge within the shortest period. Klopfer and Begel (2003) added that video games engage learners in developing brilliant scientific minds which opens space for future engagement with respect to the given subject.

Complementing classroom subjects: Using video games for students' learning is useful when breaking down complex issues in the curriculum. Scanlon *et al.* (2005) mentioned that video games can turn some complex subjects such as math, less complex and easier to adapt, making them more acceptable to learners. Gee (2009), one of the leading researchers in the field of games and their learning enhancement, added that video games are successful in breaking down complex learning contents into smaller themes that the students can identify. Moreover, video games have the ability to demonstrate historical knowledge in the modern realm. This means that the virtual advantages that most games propose connect between the learners' thought and action. Shaffer (2004) also added that video games are effective in enhancing learners' intelligence thus it is reasonable to assume that even young learners can gain more knowledge when video games improve their understanding and argument. For this impact, many schools and institutes consider the strength of video games in teaching complex science

contents. Hagel and Brown agreed that video games have narrowed the mental gaps between scientific knowledge and social learning context. Furthermore, scientific lessons are better to be taught using video games to organise knowledge and through allocation of video game players' roles by video tools.

Video game competition can play an important role in enhancing students' learning. Gee (2008) considered video games players as key motivators for their consistency in participation. These types of competition can be either on a team level or personal level. Video games can become entertaining activities that learners play in support of their education. Moreover, competition enables video game learners to break or set standards while socialising with peers. Competition stimulates the mind to accept the events of life as successes or failures, giving players ideas about how collaboration such as teamwork can overcome most failure indicators. Furthermore, video game competition enable learners to make the right decision and prioritise actions.

Video games have the ability to deliver learning outcomes. According to Gee (2009), a well-designed video game has a higher probability of delivering outcomes because of its ability to enhance theoretical and contemporary pedagogy. Moreover, video games have had great success in outlining learning logic that conforms to the rules of human learning. However, Barsalou (1999) had concerns about using games as the way learners being able to perceive calculation concepts from theoretical to real circumstances. The main concern was the question of whether simulation video games may contribute to learners with the right kind of approach to address their learning problems. Nevertheless, Gee (2008) asserted that video games enable learners to generate hypotheses that connect their innovative knowledge with their past experiences. DiSessa added that video games have the ability to deliver learning outcomes conditionally:

- Learners must have previous learning experience where video games will enable prioritisation ranking according to problem solving
- Learners must decipher the experiences and then build them into actionable targets as well as measure whether the outcomes will be realistic
- Learners have to be able to measure the impact of games in delivering their learning expectations instantly. This allows learners to adjust games to address any emerging gaps
- Learners must have enough time to maneuver and experiment with the games, so they can sharpen their understanding and comprehension of the learning context
- Learners should have a reference point of peers who have tried games in same circumstances to benchmark their experiences and act as role models

Moreover, video games are effective in social and workplace problem-solving. Specifically, unproductive behavior in teams and groups can be minimised using video games by free-rider behaviours. By using video games such as "World of Warcraft", it is easy for the supervisor to identify inactive participants for either task relocation or further action. Moreover, this game can measure each team member's input and her or his efficiency in utilising available skills. Team members can be informed of this progress as well as observing the input of others. The earlier lesson of manipulation of video games enables team members to learn from other members' functions at each stage as an accountability structure. Moreover, the game "Guild War" defines social learning and its effects in its entirety by going a step further to ensure that teams interact at least as much as the individual team member.

Limitations of video games in learning: There are several limitations in the use of video games in learning. The first issue related to causing addiction and stress. According to Hutchison (2007), video games can be highly addictive and cause stress injuries. However, these problems can be solved by teaching students how to engage games in moderation as well as interacting with the video games as writers to critique the games or as game designers not just as players. Moreover, the adaptation of the game is another issue. According to Gee (2008), there are various games that post challenges to the learners due to their context. Learners face some challenges, namely the safety of application, depth of engagement and sophistication. The major drawback of video games is uncertainly about whether learners are able to contextualise and decipher the learning process with real-life challenges. Moreover, these games are not specific with respect to their objective, even though the role of tutor is embedded in games. This means that games stress identity by the learners at the expense of learning goals which defeats the overall aim of video games as learning tools.

Some video games designs cause negative effects for learners due to their nature of not providing flexibility of beyond three players, therefore, some video games limit group or team learning opportunities. Moreover, the social characteristics of learning which extend beyond paired games are limited when using some games such as "Avatar". Gee (2008) also criticised video game designs for multiple players where the roles of more

participants cannot be modeled to effect equal function once extra players come in with a different state of mental ability.

Moreover, Brown and Thomas explained how video games can work in cross-functional teams or group, enabling each member to know about others' roles and duties. This issue can become counter productive due to stress among the learning members. Furthermore, some members may not be able to meet specific aims and might undergo pressured environment. In other cases, team members might feel out of place because of their peers' finesse in executing learning tasks with ease followed by rewards from the teacher or supervisor.

Furthermore, emotional development by video games can cause some negative effects. Gee (2008) blamed video games as being counterproductive in this instance, citing the issue of emotional frustration when learners are not able to solve problems using the games; in some cases, the brains of learners shut down. Moreover, the large input of information sometimes overwhelms learners and some lessons that involves languages suffer the most because learners cannot comprehend the consequences of failure. Once the learners fails to achieve his or her goals, the learner may lose their interest in exploring the video games themselves. This is undesirable for learning norms.

Video games with multiple-user interfaces are quite costly and many learners may not be able to afford them personally. To solve this issue, video games can be available in schools on an individual basis or as a shared resource. In using the video games as a shared resource, a bundle of video games can be used by all students in the classroom. Such learning tools can be shared among classes for a particular duration of lesson. As a result, those students who do not have the luxury of owning video games with multiple-user interfaces will not be deprived of learning opportunities since the institute provides them.

CONCLUSION

This study revealed the significant advantages of utilizing video games for enhanced learning. The advantages were categorized into 4 different segments, namely impact of having various types of video games, cognition response, gender and peer based learning and complementary element for classroom teaching. Many research investigations support the above segments in aiding students toward an improved learning approach. Additionally, students who actively engage in video games adopt learning in a more comprehensive approach. Although, some disadvantages exist, it is clear that with careful handling and positive approach towards video games, it can be used as a complementary technique for a successful knowledge transfer to a student.

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