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Saudi Teachers' Experiences and Attitudes Toward Integrating Video Games for Learning: Affordances and Constraints of Using Video Games in Saudi Arabian Classrooms

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SAUDI TEACHERS' EXPERIENCES AND ATTITUDES TOWARD INTEGRATING VIDEO GAMES FOR LEARNING: AFFORDANCES AND CONSTRAINTS OF USING VIDEO GAMES IN SAUDI ARABIAN CLASSROOMS

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ABSTRACT

Alqurashi, Mohammed A. *Saudi Teachers' Experiences and Attitudes Toward Integrating Video Games for Learning: Affordances And Constraints of Using Video Games in Saudi Arabian Classrooms.* Published Doctor of Philosophy dissertation, University of Northern Colorado, 2016.

The effectiveness of integrating educational video games into classrooms depends on teachers' attitudes toward video games. This descriptive study investigates Saudi teachers' experiences playing video games and their attitudes about integrating video games into their classrooms in Saudi Arabia. A total of 930 Saudi teachers completed an electronic survey developed by the researcher. Overall, the results of this study showed Saudi teachers' attitudes toward video games were fairly positive despite a low level of play. Analysis found a relationship between teachers' philosophy of teaching and their perspectives toward using video games in their classroom for learning. A moderate negative correlation was found between behaviorist philosophy and teachers' attitudes. On the other hand, there was a moderate positive correlation between cognitivism and constructivism philosophies Saudi teachers' attitudes toward using video games in classrooms. Moreover, this study identified significant factors that prevented Saudi teachers from using video games in their classroom. The factors preventing Saudi teachers from employing video games in their teaching was explored through two methods: principal component analysis and principal factor analysis. Results identified five nearly identical components/factors. The findings of this study inform educators about Saudi teachers' perspective of integrating video games in their classroom as well as

contribute to the literature about gaming in teaching and learning. The results of this study could encourage parents, educators, and the Saudi Arabia Ministry of Education to provide educational games that satisfy students' desires for challenge and knowledge.

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CHAPTER I

INTRODUCTION

In recent years, technology has impacted the daily lives of humans and now plays a significant role for our futures (Ortega, 2012). Games are one of the important technologies that affect children and adolescents. Today, the impact of video games on the youth is similar to that of religion, political movements, music, and culture (Miller, 2008). They have become a primary entertainment tool for children and a very prominent part of our kids' leisure time (Kirriemuir & McFarlane, 2004). Games are one of a few technological applications that have improved at a constant and rapid speed (Pimenta Arruda, 2014). Miller (2008) said, "Outside the classroom, playing is one of the fundamental human activities, one of the first that human children develop together with talking, toddling, and relating to others" (p. 3). He also mentioned that video games have become the center of attention in all homes today including all modes of digital applications such as PlayStation, GameCube, Sega, and Xbox. Therefore, the concept of gaming has transferred from being a form of entertainment to a form of technological literacy.

Whatever their age, playing is one of people's main daily activities. Although playing is a natural human activity such as communicating, eating, working, playing has different characteristics since it is often a spontaneous activity (Miller, 2008). Pimenta Arruda (2014) stated that playing games becomes a normal action like language.

Although many people see the opposite of a job or work to be playing, many researchers (cite) do not agree with this point. They assert that play itself is not the opposite of work but that the opposite of work is leisure (Miller, 2008).

Nowadays, about 155 million Americans play video games. In the United States, there is an average of two players in each family and about 80% of families own devices to play video games (Entertainment Software Association [ESA], 2015). Since 1996, there has been a marked growth in the development of video games. Recently, the percentage of Internet expansion in Saudi Arabia has increased at a high rate; there are about 19.6 million users, representing about 63.7% of Saudi Arabia's population compared to 5% in 2001 (Communications and Information Technology Commission [CITC], 2014).

Entertainment Software Association (2015) showed there was a sharp increase in game titles from 2002 to 2011. In parallel, the gaming industry has increased; more than 135 million games were sold during 2014, which provided about $22 billion in revenue (ESA, 2015). In Spain, the gaming industry recorded outstanding economic results in 2012 with 822 million games sold (Marín Díaz & Martín-Párraga, 2014). The size of spending of the Saudi child on electronic games and entertainment was $400 a year (Alshammry, 2014).

Moreover, there has been growing published research since 2000 about the use of gaming in education (Ritzhaupt, Poling, Frey, & Johnson, 2014). The sharp growth in video game development has encouraged researchers and educators to integrate video games into different pedagogical areas. The effectiveness of using these games in school for educational purposes has also become a common topic in the field of educational

technology and a potential means for personalized and blended learning environments (Thompson, 2015). This topic has been discussed from many perspectives such as performance, thinking, and behavior (Miller, 2008). It is a commonly held view that games can be used as a type of reward for students completing their work (Miller, 2008). Therefore, the use of games has shifted from being merely a form of entertainment to playing an important role in visual and technological literacies (Clark & Ernst, 2009). Video games increase students' awareness and consciousness. It is evident that games play a central role in increasing students' intelligence quotients (IQ; Miller, 2008). Also, games can enhance other skills such as movement, social skills, visual abilities, and collaboration (Clark & Ernst, 2009; Miller, 2008). Findings from more studies suggest video game usage can improve technical, linguistic, dynamic, cognitive, social, and collaborative work skills of students (Adkins, 2014; Marín Díaz & Martín-Párraga, 2014). Many researchers also believe video games can be effective tools for learning (Miller, 2008). The video game environment impacts the current generation of learners and researchers have noted how it is changing the ways in which students think and learn (Howard, Morgan, & Ellis, 2006). Players' social skills can also be enhanced by playing video games (Khoo, 2012).

Statement of the Problem

All the above evidence is in agreement with many researchers' views that games can no longer be considered a minor part of our culture and our lives because games have become an essential element in many peoples' lives (Beck & Wade, 2004). According to Del-Moral Pérez (2014), gaming is gaining huge value in daily life and playing games has invaded everything in our lives. Regarding learning, researchers have noted that

games can fascinate learners and get their attention (Clark & Ernest, 2009; Marín Díaz & Martín-Párraga, 2014). Yet, teachers in learning contexts have not embraced gaming concepts despite technology integration practices.

In the 21st century, the issue of games in education is prominent, especially due to huge developments in the games industry (Miller, 2008). The role of teachers is to provide quality education indicated by critical elements of the learning process (Howard et al., 2006). Therefore, effective teachers utilize sound methods and active learning strategies including collaboration and use of games (Howard et al., 2006). Some teachers may still not recognize the role of games in education; however, teachers need to be prepared to use games in education (Miller, 2008). The perceptions and attitudes of teachers about integrating technology influence what and how they use tools in their classrooms (Williams, Foulger, &Wetzel, 2009). Adopting gaming strategies or tools is no different. Games can be used in classrooms but to be effective, teachers need to have positive attitudes toward games. Attitudes have a strong relationship to behavior (Ajzen, 2005). Behavior can be changed from one situation to another (Burton, Moore, & Magliaro, 1996). Thus, teachers' behaviors toward using educational video games can be change when their attitudes are defined.

Using technology continues to increase in all school levels in Saudi Arabia. The Saudi government approves any tools that can improve student achievement and integration of video games could be one of these initiatives. Teachers are the most important stakeholders to bring change and innovation into the classroom (Miller, 2008). They could play a role in the adoption of educational games in classrooms and teachers' attitudes often account for whether or not certain teaching strategies are integrated.

Therefore, this study aimed to identify if teachers in Saudi Arabia had positive or negative attitudes toward game use in classrooms. Teachers' attitudes are very important if teachers are to play a main role in the adoption and application of educational games in the classroom. If they have negative feelings toward integrating educational games, they may not use them in their classrooms.

Much research has been conducted about teachers' attitudes toward educational video games (Hsu & Chiou, 2011; Jones, Copeland, & Kalinowski, 2007; Noraddin & Kian, 2014; Sobhani & Bagheri, 2014). These studies were focused on population, sampling, and design limitations so those teachers' attitudes may not necessarily be similar to Saudi teachers' attitudes. After an examination of the literature, the researcher found no notable study that analyzed teachers' experiences with games and teachers' attitudes toward using games in classrooms in Saudi Arabia.

Although much research exists about students and gaming, this study focused on teachers so research on students' attitudes was beyond the scope of this study. While the literature indicated barriers exist (Baek, 2008; Hanghj, 2011; Kirriemuir & McFarlane, 2004; McLester, 2005; Miller, 2008; Sandford, Ulicsa, Facer, & Rudd, 2006), studies on factors that prevented teachers from using games in classrooms were minimal. This gap in the literature provided space for the present study in furnishing needed details about teachers' attitudes and barriers for implementation. This was a statistical study of teachers' understanding and attitudes of using video games in the classroom.

Purpose of the Study

The purpose of this quantitative study was to investigate Saudi teachers' attitudes toward video game integration in education and explore teachers' experiences with video

games at elementary, middle school, and high school levels in Saudi Arabia. It also described the current condition of video game usage; identified significant factors that prevented Saudi teachers from using video games in their classroom; and found differences in teachers' experiences, attitudes, and hindering factors between gender and level of teaching and teaching experience. It also investigated relationships between teachers' philosophy based on three major learning theories (behaviorism, cognitivism, and constructivism) and their perspectives toward video game use in the classroom.

Research Questions

Research questions "serve to restate the purpose in specific questions that the researcher seeks to answer" (Creswell, 2012, p. 124). This study was designed to answer four main questions. The first two main questions were descriptive in nature and were used to identify participants' responses to specific variables (Creswell, 2012). Under each descriptive question were three comparison questions that were asked to determine how two or more groups on an independent variable differed in one or more dependent variables (Creswell, 2012). The third main question aimed to find the relationship between two variables (Creswell, 2012). The last main question served to find underlying factors with three comparison questions.

The following research questions guided this study:

Q1 What are Saudi Arabian teachers' current gaming experiences as defined by the number of hours spent on video games per week?

- Q1a Is there a significant mean difference between teachers' gender in the number of hours spent per week on video game play?
- Q1b Is there a significant mean difference among teachers' level of teaching (elementary school, middle school, and high school) in the number of hours spent per week on video game play?

Q1c Is there a significant mean difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20, more than 20 years) in the number of hours spent per week on video game play?

Q2 What are the attitudes of Saudi Arabian teachers toward video games in education utilizing the Games in the Classroom Attitudes Survey (GCAS)?

Q2a Is there a significant mean difference between teachers' gender and their perspective toward video game use in the classroom?

Q2b Is there a significant mean difference among teachers' grade level (elementary school, middle school, and high school) in their perspectives toward video game use in the classroom?

Q2c Is there a significant mean difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20, more than 20 years) in their perspectives toward video game use in the classroom?

Q3 Based on three major learning theories (behaviorism, cognitivism, and constructivism), is there a significant relationship between teachers' philosophy and their perspectives toward video game use in the classroom?

Q4 What are the underlying factors or barriers that prevent the Saudi Arabian teachers from using video games in the classrooms?

Q4a Is there a significant difference between teachers' gender and underlying factors or barriers that prevent them to use video games in the classrooms?

Q4b Is there a significant difference among teachers' levels of teaching (elementary school, middle school, and high school) and underlying factors or barriers that prevent them from using video games in the classrooms?

Q4c Is there a significant difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20, +20 years) and underlying factors or barriers that prevent them from using video games in the classrooms?

Hypotheses

A hypothesis is necessary since this is a quantitative study. Null hypotheses were rejected at the significance level of 0.05 ($p \leq 0.05$). In general, there are two kinds of

hypotheses--null and the alternative. Alternative hypotheses can be directional or non-directional (Creswell, 2012). In this study, all alternative hypotheses were non-directional and were used when the researcher expected a change in the result (difference or relationship) without determining the direction for the change such as positive, negative, greater, or less than (Creswell, 2012). Hypotheses were not used for the main questions because they were descriptive questions. The following 10 null hypotheses were utilized:

$H_0$1 There will be no significant mean difference between teachers' gender and the number of hours spent per week on video game play.

$H_0$2 There will be no significant mean difference between teachers' level of teaching (elementary school, middle school, and high school) and the number of hours spent per week on video game play.

$H_0$3 There will be no significant mean difference between teachers' experience (1-5, 6-10, 11-15, 16-20, more than 20 years) and the number of hours spent per week on video game play.

$H_0$4 There will be no significant mean difference between teachers' gender in their perspectives toward video game use in the classroom.

$H_0$5 There will be no significant mean difference between teachers' grade level of teaching (elementary school, middle school, and high school) and their perspectives toward video game use in the classroom.

$H_0$6 There will be no significant mean difference between teachers' experience (1-5, 6-10, 11-15, 16-20, more than 20 years) and their perspectives toward video game use in the classroom.

$H_0$7 There will be no significant relationship between teachers' philosophy and their perspectives toward video game use in the classroom.

$H_0$8 There will be no significant difference between teachers' gender and underlying factors or barriers that prevent them from using video games in the classroom.

$H_0$9 There will be no significant difference between teachers' levels of teaching (elementary school, middle school, and high school) and underlying factors or barriers that prevent them from using video games in the classroom.

$H_0$10 There will be no significant difference between teachers' years of experience (1-5, 6-10, 11-15, 16-20, +20 years) and underlying factors or barriers that prevent them from using video games in the classroom.

Significance of the Study

The results of this study were shared with Ministry of Education in Saudi Arabia where the study was conducted. The results of this study could assist the Saudi Arabia Ministry of Education in focusing on the need for the use of educational video games in the classroom. The Ministry could then decide to provide technological equipment/software and professional development opportunities for educators to increase use of games in pedagogy. Moreover, this research could add value to a project currently underway in the Saudi Arabia Ministry of Education that is exploring digital content and interactive curriculum. Further, results could help researchers better understand the impact of educational video gaming on children's academic achievement. In general, this study provided information about the integration of gaming in instruction and its barriers from a global perspective. This addition strengthened the depth of research in the field.

Definition of Terms

The following scientific definitions of some terms in this paper are provided to help the reader understand these concepts.

Attitude. Includes persons' feelings and perceptions about a topic (Greenwald, 1989). The topic for this research is video games.

Barriers. In *Merriam English Dictionary*, barriers (2016) are "a natural formation or structure that prevents or hinders movement or action." In this study, they

are the main factors that prevent Saudi teachers from using video games in their classroom.

Elementary school. The first six years of general education in Saudi Arabia--from first grade to sixth grade.

Game. In this study, game means video game. In *Oxford English Dictionary*, a video game (2016) is defined as "a game played by electronically manipulating images displayed on a television screen" (definition 1).

High school. Refers to the last three years of general education in Saudi Arabia--from 10th grade to 12th grade.

Level of teaching. Refers to the schools in which the teacher works. There are three levels of schools in Saudi Arabia (elementary school, middle school, and high school).

Middle school. Refers to the three years after the elementary level of general education in Saudi Arabia--from seventh grade to ninth grade.

Ministry of Education. Refers to the Saudi Arabia educational institution. that makes educational policies and procedures.

Teachers' experiences. This term is used in two different ways: (a) the number of years a person has worked as a teacher and (b) the number of hours per week spent playing video games.

Teachers' philosophy. Refers to the teaching strategies and plans used by teachers, i.e., what they believe is the best way to inspire learning in their students (Johnson, 2015). In this study, we mean the teaching philosophy teachers appear to endorse (behaviorism, cognitivism, and constructivism).

CHAPTER II

LITERATURE REVIEW

The purpose of this study was to investigate Saudi teachers' experiences and perspectives toward using video games in education. Moreover, this study identified hindering factors that prevent Saudis teachers from using video games in their classrooms.

The following literature review explores existing research about related topics. A literature review is a very important part of the research process. According to Creswell (2012), reviewing the literature means "locating summaries, books, journals, and indexed publications on a topic; selectively choosing which literature to include in your review; and then summarizing the literature in a written report" (p. 9). In this literature review, previous studies were reviewed and information was presented about the components of this study. The literature review begins with an introduction of gaming. Then it provides an explanation about game-based learning and discusses these relationships. Finally, information about the education system in Saudi Arabia is detailed.

Games and Play

History

Games have a long history. Following the 15th century when Europeans were playing chess, the military changed the chessboard to terrain maps in the 19th century (Roberts, 1976). War games have become the most famous and widely played games;

they were very popular around World War II. In 1957, the American Management Association (AMA) designed a very simple business game (Roberts, 1976).

The scientific-technical and the information and telecommunications revolutions have played major roles in improving and developing games. These revolutions produced new types of games called electronic games or video games. Although, it was not necessary in this study to count all video game milestones, a brief synopsis is provided of important developments in video games. In 1940, Edward U. Condon designed a computer that played the traditional game, Nim. It is considered the first system that could be called a video game. It appeared in the Westinghouse display during the World's Fair (Museum of Play, 2015).

John Burgeson, an IBM computer programmer, designed a computer baseball simulation in 1960 (Museum of Play, 2015). In 1965, Dartmouth programming students designed the first computer football game. The kids' dream, ATARI®, was born in 1972; after five years, ATARI 2600 was released with upgrade visionary features such as a joystick, color graphics, new controls, and a variety of games with various difficulty levels (Museum of Play, 2015). In 1980, Pac-Man® was sold in the game market and two years after that, Ms. Pac-Man® appeared. In 1989, Nintendo's Game Boy® became popular as the first hand-held gaming device. PlayStation 1 was released in 1995 by Sony (Museum of Play, 2015). PlayStation 2 was released in 2000 and became the highest selling electronic device in history with about 980,000 devices sold during in its first weekend (Poole, 2000). In 2005, Microsoft's Xbox 360 introduced a higher quality of game. In 2008, World of Warcraft became the most popular online game with more than 10 million players (Museum of Play, 2015). Since 2009, interaction games have

begun to compete in the gaming industry. Today, in 2016, anyone can carry a game system in their pocket with the wide spread use of the mobile smartphone (Museum of Play, 2015).

Concepts

As the brief history illustrates, games are not new. Games are an innate activity for both humans and animals. This can clearly be seen when kids enjoy interacting and playing with others from childbirth. Pimenta Arruda (2014) indicated that a game is a "free activity" known to be “not serious” and is not considered a part of formal life (p. 470). Also, it is practiced in specific places and times. Games are "an anthropological constant" and we can say that the game is a counterpart to leisure (Pimenta Arruda, 2014, p. 470).

Playing a game is dependent on elements that exist in the game such as rules, steps or levels, collaboration, competition, whether or not a player wins or loses, and fun (Miller, 2008).

Video Game

It is necessary here to clarify exactly what is meant by a video game. In the Oxford English Dictionary, a video game (2016) is defined as “a game played by electronically manipulating images displayed on a television screen (definition 1). Studies have shown video games attract adults as well as children (ESA, 2015). Nowadays, young people are spending more time with video games than in school (Prensky, 2001a). It is commonly assumed that most of the content available in commercial video games is violent. Interestingly, commercial games have been shown to improve a player’s ability to solve problems (Gee, 2005); however, these types of games

are not accepted in schools. Perhaps in the case of video games, we need to consider the term *game* as a form of media and agree that media can be good or bad based on its use. These results suggest further exploration of pedagogical applications of gaming is in order (ESA, 2015).

Many researchers discussed the reasons for playing games. Although, Malone (1981) presented four main reasons for playing games (motivation, fantasy, challenge, and curiosity), Amory, Naicker, Vincent, and Adams (1998) believed there is one widespread reason that motivates players to play game--curiosity. According to Miller (2008), many motivational characteristics of games include competition, curiosity, and challenge. Moreover, video games should contain challenge elements because challenge is a strong motivator for students to play them (Al-Hadlaq, 2011). In contrast, 85% of parents in the United States feel fun is the main reason their children are playing games (ESA, 2015). Alqurashi, Almoslamani, and Alqahtani (2015) found there are three underlying factors that attract middle school students to play video games in Saudi Arabia--competition, discovery, and knowledge. Miller (2008) mentioned males seek to win or beat the video games rather than simply playing for enjoyment.

People do differ in their game preferences (Malone, 1980). There are many types of video games: fighting games, puzzle games, sports games, adventure games, strategy games, etc. Some studies discovered most students prefer fighting games (Qudair, 2011). Alqurashi et al. (2015) found male students preferred fighting games and sports games while female students preferred puzzle and adventure games. In general, males prefer fighting games because, as Miller (2008) mentioned, some characteristics present in fighting games use short-term memory and repeated actions.

Learning

Before games in learning are discussed, some important questions need to be answered. What is learning? How do people learn? When do we learn? Although every learning theory has its own version of the term "learning," some general definitions of it are presented. Researchers and theorists have defined the term "learning" in many different ways. In literature, the term *learning* (n.d.) tends to be used to refer to "the activity or process of gaining knowledge or skill by studying, practicing, being taught, or experiencing something: the activity of someone who learns." Learning is also defined as a change in behavior or the ability to behave in a certain way; this change is a result of individual practice and experience (Shuell, 1986, p. 412). For Oblinger (2004), learning is a constructed, "active process" (para. 1); the main factors of knowledge are facts, experience, and practice. According to a definition provided by De Houwer, Barnes-Holmes, and Moors (2013), learning is "functional" changes in the learner's behavior as a result of experience. Scholars have developed many theories about the way we learn. There are three general learning theories: behaviorism, cognitivism, and constructivism (Reiser & Dempsey, 2006). Learning can be achieved when learners move from one situation to a new situation by using new knowledge to solve problems (Oblinger, 2004). This changing in a learner's situation can be achieved with any of the previous theories (Boyer, Akcaoğlu, & Pernsteiner, 2015).

Theories

Learning Theories

As found in the literature review, the three major learning theories are behaviorism, cognitivism, and constructivism (Reiser & Dempsey, 2006). In this section,

the three major learning theories are discussed and how these theories have developed in the current educational context.

Behaviorism is a learning theory that concentrates on observable behaviors and ignores mental activities (Schunk, 1991). Behaviorism is a theory of human and animal learning. Behaviorism theorists consider learning as gaining new behavior (Burton et al., 1996). They see the mind as a "black box" as they disregard the effect of thought processes happening in the mind (Alzaghoul, 2012, p. 27). The behaviorist school proposes that learning is only the observable, quantitative behavioral response to an external stimulus in the environment. They see observable behavior as the measure of learning a new thing and do not consider what occurs in the learner's brain (Alzaghoul, 2012; Burton et al., 1996; Schunk, 1991).

According to behaviorism theory, the role of learners is mainly passive; their role is just to respond to stimuli (Driscoll, 2005). Students learn by following the teacher's instructions and the writing materials. Regarding the role of teachers, their responsibility is to design and control the learning context and supervise the learning process. Thus, teachers mainly lead the learning process independently from the student. The main concept of teaching in behaviorism theory is teachers basically present (transmit) the information and students have to show they understand what they listened to and complete tasks. Finally, students are evaluated mainly through individual and written tests (Burton et al., 1996; Schunk, 1991).

The teacher's role, according to behaviorism theory, is to form the learner's behavior by positive or negative reinforcement. Reinforcement is used to increase the probability of eliciting a specific behavior by delivering a stimulus immediately after a

response/behavior. On the other hand, negative reinforcement increases the probability of the desired response by removing an undesirable stimulus as a result of completing the desired response. Finally, punishment is used to eliminate undesirable behaviors by presenting an undesirable stimulus when the behavior occurs (Driscoll, 2005; Schunk, 1991).

The development of instructional objectives is the main implication of behaviorism theory; it can be used when there is a need to meet specific goals. It allows the learner to focus on achieving those goals since there is a cue to lead the learner's behavior. Instructional cues allow one to predict a learner's behaviors/responses (Austin, Orcutt, & Rosso, 2001; Ertmer & Newby, 2013). Behaviorism theory is dependent on stimulus-response and instructional design is dependent on the workplace or classroom containing the appropriate stimuli to get the desired behavior. Therefore, if a certain stimulant is not available, then the desired behavior may not occur (Altuna & Lareki, 2015). Also, Skinner (cited in Altuna & Lareki, 2015) found some behaviors do not have a reinforcement mechanism and, thus, it will be difficult for instructors to maintain reinforcement (Ertmer & Newby, 2013; Reiser & Dempsey, 2006).

In terms of e-learning, instructors must explicitly provide learners with the desired outcomes of the online course so they will be able to set expectations for themselves to achieve those outcomes. Learners will be assessed for achieving the learning outcomes (Altuna & Lareki, 2015; Alzaghoul, 2012). Although, teachers can use different technological resources with the behaviorist approach, many of these resources are one-directional; the only way the students can engage in the learning process is through answering questions or performing the directed activities. It is merely "a transmitter–

consumer relationship" (Altuna & Lareki, 2015, p. 219), i.e., using technology from the behaviorist perspective is for the presentation purpose only. Thus, the student's role is still passive without involvement in the learning process.

With respect to educational gaming, behaviorism-learning theory is compatible with first generation educational games (Egenfeldt-Nielsen, 2005). This generation started in the 1980s when the edutainment games were designed. This generation of educational games focused on the direct learning such as repeated drill and practice (Egenfeldt-Nielsen, 2005).

In contrast to behaviorism, cognitivism concentrates on the human mind. In cognitive theory, learning is based on changes between states of knowledge and not on changes in the probability of behavior as in behaviorism (Shuell, 1986). Cognitivism theory stresses internal mental (cognitive) processes that include thinking, language, memory, and problem solving (Schunk, 1991). The cognitivism theorist studies the mechanism of how the human mind receives information, stores, and retrieves it in the learning process (Altuna & Lareki, 2015). Therefore, in cognitivist theory, learning is reached when information is stored in the memory in a meaningful way. Since cognitive theory focuses on mental processes, it is a proper approach for explaining complex shapes of learning that include mental structures such as reasoning and problem-solving (Driscoll, 2005; Schunk, 1991; Shuell, 1986).

In contrast to behaviorism, cognitivist theory states that if we consider the mind as a "black box," we must open and understand it (Alzaghoul, 2012, p. 27). As stated previously, in this theory, the learner's role is to process information, similar to a computer processor, storing it, and later retrieving it (Alzaghoul, 2012). The learner is

dependent on the depth of his/her information processing capacity as well as the amount of effort put into this process to fully understand and transfer new knowledge. The main focus of the cognitive approach is to encourage the learner to use suitable learning strategies (Driscoll, 2005; Shuell, 1986).

A main concept of cognitivist theory is the model of information processing. This model goes through three stages (Shuell, 1986). The first stage is sensory register--where information is received as an input from the senses. Following that is short-term memory (STM)--where important sensory input is transferred from the sensory register to short-term memory. After that stage, the stored information in the STM is transferred to be stored for long term use in the unlimited capacity memory stage called long-term memory and storage (LTM). Information is stored in LTM through rote memorization and deeper levels of processing where the learner generates links between old and new knowledge (Driscoll, 2005; Reiser & Dempsey, 2006; Shuell, 1986; Winn & Snyder, 1996).

According to cognitivist theory, the role of teachers is to manage problem solving. Teachers should help learners organize acquired knowledge in some way by using techniques such as analogies, hierarchical relationships, and matrices. Teachers have to provide students with opportunities to relate and compare new knowledge to an existing schema (Alzaghoul, 2012).

With regard to the instructional design process, learners' thinking, attitudes, beliefs, and values are all important in the learning process in cognitivist theory. Relying on the cognitivist model, instructional designers must consider the learner when determining how to design instruction to be easily assimilated. The instructional designer

specifies the goals by developing the learning objectives, i.e., the designer determines the important information to be learned by the students and finds the proper way to transfer that knowledge to the students. Since learners' thoughts are the focus of the learning process, the designer should consider learners' thinking as well as experience levels during the instructional design process. Consequently, this type of design may require additional cost and time (Driscoll, 2005; Ertmer & Newby, 2013; Reiser & Dempsey, 2006).

Following cognitivism theory, the instructional designer necessarily must specify a fixed set of goals and expectations. However, having predetermined goals may be problematic because it may restrict learning potentials. Moreover, in cognitivism, the instructor also specifies the cues to do the tasks and the learner knows the way to do tasks based on those cues. This may be an efficient way to do tasks in some specific environments or scenarios but may not be effective in others (Ertmer & Newby, 2013).

With respect to e-learning, cognitivism theory is useful if the goal is to teach principles and processes. Different learning and cognitive forms should be considered when designing these learning materials. To improve the learning process, teachers need to attract learners' attention by concentrating on critical information. Also, teachers should rationalize the instruction and show learners how to connect new to existing knowledge in long-term memory by using advanced organizers. The information has to be presented in an organized, collective manner such as lists, hierarchical structures, spider-shaped information maps, or charts. This method of representing knowledge decreases the issue of cognitive overload (Alzaghoul, 2012).

With respect to educational gaming, cognitivism learning theory was the center of the second generation of educational games in the 1990s (Egenfeldt-Nielsen, 2005). The second generation of educational games focused on the learner rather than focusing on behavior (Egenfeldt-Nielsen, 2005).

Constructivism theory sees learners as the center of the learning process. The learning process is seen as a meaningful creation formed from experience (Bednar, Cunningham, Duffy, & Perry, 1991). It is a constructive method where learners construct information based on their prior experience as well as culture to aid their learning (Driscoll, 2005). In constructivism theory, learners connect new information to their prior knowledge. Constructivists consider all learners to have the ability to build upon information in their own minds by discovery and using problem-solving skills (Ertmer & Newby, 2013).

Constructivism is known as a branch of cognitivism in that both theories view the learning process as a mental activity. However, they are different in some ways. Cognitivists see the human mind as a reference for knowledge while constructivists see the human mind as a filter of the real world to generate its own reality (Ertmer & Newby, 2013). Also, although both cognitivism and constructivism involve the learner in the learning process, constructivism sees the role of the learner as more than just an active processor of information. The learner's role in constructivism theory is to construct new ideas from current/past knowledge. Constructivists involve the learner in the interpretation process of given information, social interaction, and motivation that affect the construction process (Ertmer & Newby, 2013). The constructivism approach gives learners the responsibility of deriving goals while still being able to discuss those goals

with teachers. The constructivism theory approach gives learners instruction in how to construct knowledge to encourage them to collaborate with others and exchange their perspectives to solve a particular problem (Driscoll, 2005; Ertmer & Newby, 2013).

The role of instructors is modified when compared to behaviorism and cognitivism. Rather than simply presenting the facts in the content, teachers should assist and show the learners how to construct the information (Driscoll, 2005). They should connect their teaching strategies to students' responses and encourage students to analyze and interpret the information (Ertmer & Newby, 2013).

In the constructivist approach, instructional designers consider hypertext and hypermedia that allow for a branched design rather than a linear format of instruction. However, learners need to be guided in hypermedia or hypertext environments, which equals a combination of objective (behaviorist and cognitivist) and constructive instructional designs (Altuna & Lareki, 2015; Reiser & Dempsey, 2006).

In the current learning context, constructivism theory presents many possibilities for learning activities and varied implications such as collaborative learning to expose learners to alternative viewpoints, problem-based learning, higher-order thinking skills and deeper understanding, object-based learning, modeling, and coaching (Driscoll, 2005).

Regarding educational technology, Altuna and Lareki (2015) found significant research asserting that we should change traditional teaching approaches and strategies when working with information and communication technology. Also, scholars emphasize that constructivism is the most appropriate approach for teaching and learning when technology is used (Altuna & Lareki, 2015). In support of this assertion, a number

of studies have verified the success of using technological resources in constructivist contexts (Altuna & Lareki, 2015). Moreover, it has been found that instructors who have a constructivism perspective are more likely to use technology in their teaching (Obafemi & Eyono Obono, 2014). Since constructivism learning theory focuses on knowledge construction based on learners' previous experience and knowledge, which in turn determines learning achievement, this theory is very appropriate for an e-learning approach. More specifically, constructivism theory focuses on each learner individually with his/her unique needs and experience and is a very effective component of e-learning courses (Alzaghoul, 2012). Moreover, using technology to communicate with others enables students to be in an active role to construct and present their knowledge (Means & Olson, 1997). Using some computer-based activities in learning would also increase problem-solving skills of students since most of these activities require collaboration with others. These types of learning clearly represent constructivist perspectives. Thus, a constructivist learning approach works properly with technology-based learning activities (Means & Olson, 1997; Obafemi & Eyono Obono, 2014).

With respect to educational gaming, the third generation of educational games was based on constructivism learning theory (Egenfeldt-Nielsen, 2005). This generation represents the last generation of educational digital games compatible with constructivism-learning theory (Egenfeldt-Nielsen, 2005).

Gaming Theories

Numbers of important theories and models are used in games designing. Game designers apply these game theories and models to construct high quality games. In game theory, several terminologies define these theories. First, there are two types of

games: cooperative games and non-cooperative games. Cooperative games are when different players play together to get same goal, while non-cooperative games are when players play against each other. Other terminologies are based on the player's movement--simultaneous or sequential. Simultaneous games are when players are moving at the same time, while sequential games are when players are moving individually. There are three types of games information: perfect information, imperfect information, and complete information. The perfect information game is when all players have same information about the game. On the other hand, the complete information game is when all players have complete information. In contrast, when all players do not have complete information, it is called imperfect information. In addition, there are symmetric and asymmetric games. The symmetric game is when all players have the same chance of getting rewards, while an asymmetric game is when players have different chances of gaining rewards. Games can also be classified as continuous and discrete. Continuous games are considered as an infinite system but discrete games have a particular system. Moreover, based on the number of players, games are categorized as individual or group. In addition, there are two categories of graphics games: two dimensional and three dimensional (Christopher, 2011).

The Relationship Between Games and Learning

It is widely believed that school is not meant to be a place of amusement but an educator's goal is to make the school a place where "intellectual curiosity, emotional well-being, and feelings of social worth" are combined with learning (Miller, 2008, p. 24). Miller (2008) asserted that to achieve this goal, educators need to design and use specific activities such as games.

In education, there were varied reactions when some teachers used technology for the first time in classrooms. Some teachers had negative reactions because they allowed their students to play video games (Miller, 2008). Although many parents believe playing video games is not useful and is just a waste of time, over 63% of parents in the United States believe games can positively affect their child's learning (ESA, 2015).

Nowadays, games also play an important role in our culture. The benefits of using games in education are motivating students toward learning and changing teaching methods to enhance skills. Game-based learning (GBL) helps create student-centered environments, increase problem-solving skills, and promote engagement (Bouras et al., 2004).

In recent years, games that support educational objectives are being utilized in schools. Therefore, curriculum knowledge is supported by use of games. Video games have been shown to have a positive impact on psychomotor functions and thereby decrease stress (Clark & Ernst, 2009). Researchers have suggested that playing games can even be considered as a preventive treatment (Sharori, 2008). In addition, many scholars hold the view that video games can improve students' thinking skills and abilities (Sharori, 2008). Playing games can improve thinking skills including logical thinking, analytical skills, and computing. In addition, games can develop students' visual and spatial skills and their capacity to discover and learn new concepts (Marín Díaz & Martín-Párraga, 2014). Playing games in the classroom can encourage students to form teams and make up their own strategies to win games. In such situations, students are induced to observe and analyze critical points and to think more critically to avoid problems (Ashton, 2011). Moreover, video games may increase students'

awareness and consciousness (Miller, 2008). From those findings, researchers can investigate whether video games could be a helpful tool to treat some types of mental or physical weakness (Marín Díaz & Martín-Párraga, 2014). Integrating games in schools without requiring grades or evaluation gives students the freedom to be creative (Miller, 2008).

In the field of using games in education, we need to consider two main avenues for integration--playing games and designing games (Miller, 2008). Educators need to consider the benefits of using games in their teaching process. Beneficial games need to be attractive to the students, be fun to play, be clear about the object of the game/teaching point, and the relationships between the game's objects while having clear goals and feedback. Also, the design of a beneficial game has to have evident educational goals and be based on the relationship between all learning contents (Miller, 2008). Interaction is one of the most useful elements of a game and can provide an enormous amount of information about the players (Miller, 2008). The resultant information from these interactions will be useful if the students are playing meaningful games. Also, intellectual justification for designing games can be linked to the epistemology of constructivism (Grabinger, 1996) that denotes the learner as constructor, which means learners can interact with others and build information and knowledge individually (Miller, 2008). Finally, playing theories are classified into four subjects: "Play as: progress, power, fantasy, self" (Sutton-Smith, 1997, p. 129); those who are designing games for learning have to include these four subjects (Miller, 2008).

Game-based learning (GBL) can help students learn and practice new concepts. Game-based learning provides students enhanced learning experiences with interactive

content and, thus, encourages life-long learning. Game-based learning also increases effective communication, development of creativity, and encourages a cooperative culture. In addition, it can help students construct new knowledge and work collaboratively (Bouras et al., 2004).

More recently, literature has emerged that showed findings about using games in education. Many studies have indicated that games can increase students' motivation and make students more engaged. About 70% of teachers use educational games in their classrooms. The teachers mentioned video games played an important role in students' motivation (ESA, 2015).

Aliefendic (2013) conducted a study in a northeast Texas school district that contained 156 fifth grade students. The researcher asked the students to use math educational video games. The study found a positive relationship between students' achievement on their final mathematics test scores and the amount of time students spent playing educational video games. In addition, there was a significant positive relationship between the points earned playing video games and students' performance on standardized tests (Aliefendic, 2013).

Clark and Ernst (2009) also conducted a study about using games in education. This study indicated 74% of participants considered gaming a good tool for students' learning and 89% responded that games have a future in education. As for using video games in teaching content, 77% of participants agreed they could be used to teach science, technology, and mathematic concepts. Outside the classroom, 72% of participants agreed outside classroom homework assignments using computer or video gaming could be useful for student learning.

In Saudi Arabia, Alharbi (2010) conducted a study about the effect of educational video games on students' achievement in math for second grade male students in the city of Almadina. The researcher used a control group and an experimental group. The study found significant differences between the two groups in the posttest. The results also showed a significant difference between the pretest and posttest for the experimental group. The study recommended integration of educational games into classrooms as teaching methods to increase students' performance (Alharbi, 2010).

Aljuhani (2011) conducted an experimental study with 72 female students at a middle school in Jeddah City. The researcher examined educational games with an experimental group in an English language class. The study found a statistical significant difference between the mean scores for the two groups on the posttest--the game had a positive effect on student performance and enhanced student learning. It was also pointed out that the students were very excited when they played the game. This high level of motivation is yet another positive aspect of game integration. As a result of this study, Aljuhani approached the Saudi Arabia Ministry of Education about providing educational games for students.

Al-Hadlaq (2011) found more than 80% of students in Riyadh city at Saudi Arabia agreed video games have positive effects on learning. In contrast, about 73% expected video games could consume their time, which would affect learning achievement.

Alqurashi et al. (2015) conducted study on 201 middle school students to investigate their experiences with gaming in Makkah city in Saudi Arabia. The study found a significant relationship between hours spent playing video games and students'

GPAs. Additionally, male students were perceived to have higher positive attitudes toward video games than females.

Sadiq (2010) examined online games' impact on students' performance in undergraduate physics courses. The experimental study was conducted with 40 undergraduate physics students--20 students in the control group and 20 students in the experimental group. He indicated games can be used to help in the conceptual understanding of physics. Lee and Kwon (2005) found achievement improved more for students who played games in class than students in a traditional classroom environment.

Further, an experimental study at the University of Central Florida was conducted to investigate the effect of modern math video games on students' math class motivation and achievement in a formal K-2 setting (Kebritchi, Hirumi, & Bai, 2010). About 193 algebra and pre-algebra math students were divided between a control group who did not play a game and an experimental group who played *Dimension M*®. After 18 weeks, the researchers found the experimental group increased their math test score by 8.07%, whereas the control group just increased its score by 3.74% (Kebritchi et al., 2010).

Abdul Razak and Connolly (2013) conducted an experimental study using games to teach students times tables and compared it with a traditional teaching method. They found the results for students who used games were better than students who did not use games. Also, they indicated teachers should receive more training to use games in education. According to a recent report, Clyde and Wilkinson (2012) pointed out some ways in which using digital games is more exciting for students because it is different than textbooks.

Learning Principles

Prensky (2001b) presented considerable learning differences between the current gamer generation and previous generations. The current generation's learning speed is fast while the preceding generation's learning speed is considered traditional speed. Also, the learning process is parallel and randomly accessible for the gamer generation while it is linear and step-by-step for other generations. The gamer generation depends on a more connected and active learning process. In contrast, previous generations' learning style has been stand-alone and passive. Game-based learning takes into consideration fantasy and technology as friend where graphics come first. On the other hand, traditional learning focuses on reality and often the technology is seen as foe where text comes before graphics (Prensky, 2001b).

Oblinger (2004) listed some main learning principles such as individualization, feedback, active learning, motivation, social, scaffolding, transfer, and assessment. Each principle will be discussed and matched with game-learning generation characteristics as well how the games dealt with each principle.

1. Individualization. Learning is adapted to the needs of the individual student's learning (Oblinger, 2004). It is obvious that some students have the ability to work faster and move their attention from one topic to another instantly, which may conflict with the traditional style classroom where all students have to be on the same page at the same time (Miller, 2008). Regarding using games in education, games are tailored to the need of an individual student's learning and development of his/her own skills (Miller, 2008; Tham & Tham, 2014). Games can motivate students to become

involved on a deep and personal level of learning (Chee & Lee, 2009). In the other words, games can meet the need for individuality in learning by supporting the twitch speed ability some students have (Miller, 2008; Prensky, 2001b).

2. Feedback. To improve the learning process, students need instant and contextual feedback, which is often lacking in the traditional learning process. This feedback also helps reduce uncertainty for students about their work (Oblinger, 2004). As discussed above, in game-based learning, technology is considered as friend to the students; it gives them the instant and contextualized help and feedback they are looking for (Miller, 2008; Prensky, 2001b).
3. Active Learning. Learning has to involve students in discovery and constructive activities for new learning (Oblinger, 2004). In terms of game-based learning, games supply students with activities that guide them to discover new knowledge and they become accustomed to multitasking (Miller, 2008; Prensky, 2001b; Tham & Tham, 2014). In contrast, traditional learning methods are passive; they do not often engage learners in any activities to construct and discover learning (Prensky, 2001b).
4. Motivation. As described in the previous paragraph, learning must engage students in rewarding and effective activities that motivate students to learn (Oblinger, 2004). It has been clearly shown that a game's characteristics, such as graphics and fantasy, attract student's attention and can improve their understanding of a subject (Miller, 2008). It has also been found that

the motivation of students to learn the content increased (Marín Díaz & Martín-Párraga, 2014). The game's goals motivate students' thinking and encourage them to think about the different roles in the game to pursue the goal (Prensky, 2001b). Also, the competition itself, which is a main component of most games, is a fundamental motivating factor (Miller, 2008). Moreover, the fantasy elements engage the students' senses during playing. By contrast, traditional learning methods rely on reality only.

5. Social. Learning has to be a social process and needs to involve the concept of participation (Oblinger, 2004). One of the essential characteristics of games is interaction (ESA, 2015), i.e., most games require playing with others, such as multiplayer games, or involve communicating with other players who have the same interest. Also in classrooms, students collaborate with others or form groups to play games in a social environment (Miller, 2008; Prensky, 2001b). The most popular video games are social games (31%). Studies showed a high percentage of players (39%) preferred social games that included playing with others (ESA, 2015). Moreover, around 54% of players saw those games as a way to connect with their friends. It has been found that players spend around 6.5 hours per week playing with others online and five hours per week with others face-to face (ESA, 2015).
6. Scaffolding. Learning has different levels of difficulty where learners need to move gradually from one (easier) level to the next to succeed (Oblinger, 2004). Games clearly apply this principle of learning since games have

multiple levels to achieve a goal with each level needing to be accomplished before moving to the next level. Students need to acquire the skills and knowledge of each level of the game to move on and solve the next, more difficult level (Miller, 2008; Prensky, 2001b).

7. Transfer. One of the main characteristics of success in the learning process is the ability to transfer learning from one condition to another. It has been reported that games encourage players to transfer learned concepts and knowledge from a current situation to a new one (Miller, 2008; Oblinger, 2004; Prensky, 2001b). This transferring of learned knowledge from one game to another gives players a useful experience from the games.
8. Assessment. Learning provides students with meaningful feedback to evaluate their own learning and learn from their own mistakes (Miller, 2008; Oblinger, 2004). These self-evaluations must focus on the learning process and applied problem solving strategies, not on facts memorization (Miller, 2008). It is believed that games provide the player with the ability to assess their work and compare themselves to other players. This assessment during game playing can be done through a game's levels of completing essential skills and tasks (Miller, 2008; Oblinger, 2004).

Taken together, these evidences of applying the conventional learning principles to video games suggest games can become a valuable tool in classrooms for the learning process.

Games' Impact on Behavior

In terms of prosaical effects of video games, games have been seen as social practices where players interact with each other and have discussion and debate about

their actions. Playing video games can enhance students' social abilities and skills (Khoo, 2012). Also, due to the games' interactive systems, players make their own choices to play different roles and characters through the game, which reflects on their values (Khoo, 2012). Moreover, video games usually contain stories, characters, graphics, and sounds, all of which are considered senders of valuable messages. Games that include prosocial messages could encourage players to emulate and practice desired behaviors. In addition, some studies have shown playing games can enhance the effectiveness of dealing with real-world situations (Khoo, 2012).

With regard to what was mentioned previously about the aggressive effects of video games, a number of scholars point out that if players can get aggressive effects from games, it is possible for players to gain prosaical skills from games by enhancing moral reasoning and promoting empathetic behavior (Khoo, 2012; Narvaez & Mattan, 2006). Greitemeyer and Osswald (2010) conducted a study about the effects of prosocial video games on prosocial behavior. After the experimental study, the authors found prosocial video games supported the participants' behavior. The results showed participants who played prosocial video games showed tendencies to help others more than the participants who played neutral or aggressive video games. The study results indicated positive or negative effects of video games on social behavior are dependent on the game content (Greitemeyer & Osswald, 2010).

According to Howard et al. (2006), games are the active engagement of content, which enhances learning. Games provide learners with central processing and the freedom to explore content to construct meaning. In addition, GBL does not contradict traditional methods but provides students with more stimulating, exciting, and fun

opportunities to learn. Games have the potential power to enhance the learning environment (Howard et al., 2006).

Teachers' Attitudes

The definition of attitude (2016a) is how someone feels or how he or she expresses opinions about something. According to the Oxford Dictionary, the definition of attitude (2016b) is a thinking or feeling about something and reflects a person's behaviors. The definition of attitude explains social behaviors. Another of definition of attitude is a system of evaluating feelings or emotions toward social objects (Greenwald, 1989). Moreover, Fazio (1986) expressed the definition of attitude as the impact of people's perceptions of their behavior toward objects.

Recently, Sobhani and Bagheri (2014) conducted a study to investigate the attitudes of learners and teachers toward the effectiveness of games and fun activities in learning English. They observed that traditional teaching was not enough to motivate students. Sobhani and Bagheri advised teachers to add educational games to their teaching as a method to make learning engaging.

Jones et al. (2007) conducted a pilot study about pre-service teachers' attitudes toward computer games and found more than 92% of participants played their first computer games in elementary or high school. Hsu and Chiou (2011) conducted a study about attitudes toward digital gaming with 125 pre-service teachers. The researchers found most pre-service teachers played digital games and agreed that games could be a useful tool for learning. While 66.4% of participants believed games affected their academic performance, 97.6% felt games could bring people a lot of enjoyment.

Hayes and Ohrnberger (2013) conducted a survey study with about 223 pre-service teachers about their attitude toward technology and using games in education. About 93 pre-service teachers currently played games. All of them played games before college. About 48 pre-service teachers (51.6%) reported playing games before first grade. While 5.4% of participants were playing games for eight or more hours per week, 72% of participants were playing three or less hours per week. Then the researchers compared the non-gamer, casual gamer, and committed gamer to the four groups of questions related to their interest in using specific technologies for learning, their beliefs about how technology affected their learning, their orientation toward using new technologies, and their beliefs about the role of technology in their future profession. They found many of participants did not consider technology as a valuable tool to use in their future career. The researchers mentioned some pre-service teachers tended to be consumers more than creators of game-related content. Thus, the researchers believed it would be hard for those teachers to support applying games in education (Hayes & Ohrnberger, 2013).

Noraddin and Kian (2014) conducted a study that investigated teachers' positive and negative attitudes toward digital games in the classroom in higher education in Malaysia. The sample was 273 teachers--139 males and 134 females--from five universities in Malaysia. The results showed teachers' attitudes tended to be positive regarding the benefits and importance of digital games. The teachers did not agree with negative attitudes toward digital games. The results showed a positive attitude was not impacted by gender or age except in the experience with digital games (Noraddin & Kian, 2014).

Al-Zoyoodi (2015) conducted a study about the educational implications of electronic games on primary school students in Saudi Arabia as perceived by teachers and parents. The study sample was about 336 teachers and 500 parents. It was conducted at one site in Saudi Arabia. The study survey contained 40 questions about teachers' and parents' viewpoints about the negative impacts of electronic games and their perspectives toward preventing these negative effects. The survey results indicated the teachers believed there were negative effects and risks of the games. They thought the games did not have any benefit for improving students' cognitive, learning, and physical skills (Al-Zoyoodi, 2015).

Klemetti, Taimisto, and Karppinen (2009) asked 400 Finnish school teachers about their experiences and attitudes toward educational digital games. They found most of teachers (92%) agreed to use educational games in their classroom. About 99% of the teachers believed educational games motivated students in learning. In general, they found teachers in Finland had highly positive attitudes toward educational games (Klemetti et al., 2009).

Wu (2015) conducted a study with 116 pre-service and in-service teachers about their current experience, attitudes, self- efficacy, and perceived challenges and barriers to the implementation of digital game-based learning (DGBL) in the classroom. He mentioned that most teachers played games lightly by using mobile devices. They provided positive attitudes toward integrating games in their teaching. The majority of teachers indicated they could use digital game-based learning in their current or future teaching (Wu, 2015).

Gender Issue

Interestingly, according to many studies in the field, there is a significant difference between genders with regard to playing games. It has been observed that males are willing to play video games more often than females (Hayes & Ohrnberger, 2013; Miller, 2008). In addition, there is a marked difference between male and female game choices (Aliefendic, 2013; Miller, 2008), i.e., males usually prefer the types of games that require strong qualities, such as fighting and sport games, while females prefer puzzle games (Miller, 2008). McFarlane, Sparrowhawk, and Heald (2002) conducted a survey of English school children; they found playing games was the first activity choice for boys. In contrast, the girls played games when they felt bored. Similarly, in the same area, Quaiser-Pohl, Geiser, and Lehmann (2006) conducted research on German secondary school children to examine game preferences with regard to performance and gender differences. The authors used three types of players: non-players, action and simulation game players, and logic and skill-training game players. More than 81% of males preferred the action and simulation play while more than 82% of females preferred logic and skill training game play (Quaiser-Pohl et al., 2006).

The most likely cause of this difference is many games were designed for male players (Aliefendic, 2013). In addition, Miller (2008) stated, "One of the arguments that often arises about girls and video games is that girls are not willing to devote as much time to playing as boys" (p. 63). Miller also said, "Unfortunately, the current sophistication level of most video games cannot utilize girls' greatest weapons: communication and imagination" (p. 64).

Although boys and girls play games, there is a difference in their enjoyment. There is also a difference in the games used and playing style between the genders (Miller, 2008). A number of studies showed there are differences between genders in learning, thinking, and playing (Miller, 2008). Also, researchers have conducted studies on gender differences on attitudes of using technology. These studies found a significant difference between male and female attitudes toward technology. Reasons for these differences between gender attitudes are based on cultural and social constructs (Alrasheedi, 2009). Many reasons could explain these differences between genders. Sharp (2005) explained,

> Most of the computer games are violent and appeal to the male population; computers are linked to math and science, fields that show an overrepresentation of males; magazines and newspapers depict men using the computer more than women; when women are associated with the computer, it is in a secretarial role; and many teachers encourage boys to use computers but discourage girls from doing so. (p. 405)

In contrast, Hsu and Chiou (2011) did not find significant differences between genders on participants' attitudes toward digital gaming. Also, Noraddin and Kian (2014) mentioned there was no significant difference in negative and positive attitudes toward using digital games between males and females.

Challenge of Applying Games in Education

Most research studies about using video games in classroom focused on the effectiveness of games in learning and teaching (Abdul Razak & Connolly, 2013; Alharbi, 2010; Aliefendic, 2013; Aljuhani, 2011; Alqurashi et al., 2015; Lee & Kwon, 2005; Sadiq, 2010). These research studies ignored looking at the most significant reasons that prevent teachers from using video games in classrooms (Baek, 2008). The use of video games in the classroom can be discussed from different directions (Miller,

2008). Although video games are popular among students, many researchers have found a number of barriers that prevent teachers from accepting and applying video games as a teaching resource in the classroom (Baek, 2008; Hanghj, 2011; Kirriemuir & McFarlane, 2004; McLester, 2005; Miller, 2008; Sandford et al., 2006). Miller (2008) said, "We have to acknowledge the barriers the teachers face" (p. 234). Also, Baek (2008) mentioned it is very important to define the major factors that prevent teachers from using games in classrooms to get desirable outcomes for game- based learning. These barriers should be addressed when applying video games in classrooms (McLester, 2005; Miller, 2008).

Researchers have noted that integrating games into the curriculum may not succeed for many reasons (Kirriemuir & McFarlane, 2004). First, the game should be relevant to subject so it is hard for teachers to review the game and check the appropriateness of the game to the content being taught (Kirriemuir & McFarlane, 2004; Miller, 2008). Also, it takes time for teachers to become familiar with the game and find the best method with which to use it (Kirriemuir & McFarlane, 2004). Since the game has content that is read-only, it is impossible to delete undesirable parts from the game (Kirriemuir & McFarlane, 2004; Miller, 2008). On the other hand, there is a lack of Arabic content on the Internet since it is about 3% of the total (Thompson, 2015).

Another consideration is some educational games have failed to achieve their educational goals. Many educational games are too simple in their design. A game's challenges should contain many levels to match players' skills (Kirriemuir & McFarlane 2004). Although educational games often depend on repetition, they can become boring. Games should be complex in design (Malone, 1980). Traditionally, educational games

have been very limited and do not improve the learners' progressive achievement. The games should have many levels of information (Malone, 1980).

Another factor is educational games are usually played as classwork and most learners know they will be forced to play (Kirriemuir & McFarlane, 2004). Miller (2008) advocated that students should be free to play without grading or formal evaluation of their achievement. Also, players should have full control in the game and not feel any anxiety (Miller, 2008). Some pre-service teachers do not consider technology as a good tool to use in their job (Hayes & Ohrnberger, 2013).

Alotaibi (2006) conducted a survey study with 420 educational directors about hindrances of e-learning in Saudi Arabia. He mentioned there were different kinds of hindrances related to teachers, curriculum, administrative and technical, and financial. The first barrier is the lack of teachers' experience in applying e-learning. Also, the teachers are not receiving any motivation to apply e-learning. In addition, the shortage of staff compared with the high number of students in the classroom prevents the application of e-learning. Moreover, the density of school curriculum and the missing accord between the curriculum and e-learning programs are considered a significant hindrance. Another barrier is the shortage of computers and networks, thereby causing a weak or weakness in the information infrastructure. In addition, the high cost of e-learning prevents its application (Alotaibi, 2006).

Hanghj (2011) stated in his study that educational games that represent different pedagogical aspects could lead to mixed reactions. Game expectations from teachers and students could be totally different from what they actually are. These expectations may lead to conflicts between different evaluating criteria for acquired knowledge from the

games. Some teachers expected that any type of educational games would be attractive to game savvy boys, who were actually quite critical of the game experience. As the study stated, one of the negative aspects of using games in classroom was to generalize game preferences among students (Hanghj, 2011).

Baek (2008) conducted a survey study of 35 teachers to identify factors inhibiting teachers' use of computer and video games in the classroom. He discovered six factors that hindered teachers' use of games in the classroom: "inflexibility of curriculum, negative effects of gaming, students' lack of readiness, lack of supporting materials, fixed class schedules, and limited budgets" (p. 665).

Kirriemuir and McFarlane (2004) found some barriers to applying game-based learning in the classroom were the limited time span of individual classes, verification of gaming effectiveness in the classroom, insufficient support materials, licensing agreements, budget constraints, and lack of time for both teachers and students to familiarize themselves with a game (Miller, 2008).

In general, Egenfeldt-Nielsen (2004) concluded when we study the use of technology in schools, the problems are representative. He mentioned the most common problem was the lack of computer equipment. Then he indicated the teachers do not have a deep knowledge of the video games to support and help students in the classrooms. Also Egenfeldt-Nielsen said, "The technical problems will be an important challenge when using computer games in most schools" (p. 184).

McLester (2005) pointed out several barriers when teachers used commercial games in the classroom: "accountability, research-based tools and methodology,

administrative support for innovation, professional collaboration, teacher preparedness, and scaffolding new methodologies with existing practice" (para. 9).

Wu (2015) found five barriers that hindered teachers from using games in education:

1. Mismatch between DGBL and standardized curriculum.
2. Administrative and parental negative perceptions.
3. Lack of technology support and preparation in teacher preparation.
4. Short class periods.
5. Low quality of educational digital games.

Education System in Saudi Arabia

Saudi Arabia government cares about its educational system. Education is free in Saudi Arabia (see Table 1). The Saudi government provides a free education to every Saudi citizen at all school levels: kindergarten, elementary school, middle school, high school, and university.

The education system in Saudi Arabia is under the authority of the Saudi Arabia Ministry of Education. The Saudi Arabia Ministry of Education is responsible for the planning and supervision of education for three educational levels (elementary school, middle school, and high school). The elementary school is grades one through six, the middle school is grades seven through nine, and the high school is grades 10-12.

Table 1

Statistics on General Education in Saudi Arabia

	Elementary Schools		Middle Schools		High School		Total
	Male	Female	Male	Female	Male	Female	
Schools	6,341	6,266	3,824	3,582	2,500	2,529	25,042
Students	1,157,099	1,196,880	569,626	571,320	519,527	507,391	4,521,843
Teachers	101,547	118,720	54,206	62,260	45,798	58,998	441,529
Administrators	9,816	21190	4,356	10229	3,547	8,534	57,672

Saudi students take 12 years to finish these levels. The education system in Saudi Arabia is gender disaggregated. Male and female schools are separated through all levels of education, which may present Saudi teachers with different cultural and behavioral issues. As noted in Table 1, in all levels of school and for both genders, there are about 25,042 schools containing 441,529 teachers who teach 4,521,843 students (Ministry of Education in Saudi Arabia, 2014). Teachers in Saudi Arabia must finish a minimum of four years in college to teach in schools.

According to the Global Information Technology Report (World Economic Forum, 2015), the quality of educational system in Saudi Arabia is number 47 in the world. The percentage of adult literacy is 94.7 (World Economic Forum, 2015). Regarding the information and technology aspect, Saudi Arabia was 35th in the world in network readiness in 2015. About 60% of Saudis use the Internet. Moreover, 72% of Saudi households have personal computer and Internet access (World Economic Forum, 2015).

Communications and Information Technology Commission in Saudi Arabia conducted a national study in November 2010, which included 1,504 participants who were 15 to 60 years of age. The study indicated 96% of participants used the Internet as a source of information and entertainment. Also, about 42% of participants played games utilizing the Internet (Communications and Information Technology Commission, 2010).

Summary

Many research studies that covered different aspects of video games were discussed in this literature review. The literature covered the concepts and the history of games including video game and playing. The literature review also discussed the theories of learning and gaming and the relationship between these two concepts. Also reviewed were learning principles, how learning games fell within each principle, and how each of them matched with game-learning generation characteristics. In addition to the effects of games on learning, the games' impact on behavior was also discussed. As the main purpose of the current study was to explore teachers' attitudes toward applying games in education, the literature review focused on studies that concentrated on this topic. The literature review also included the difference between gender experiences and attitudes toward applying games in education. Finally, it explored the challenges of applying games in education.

In conclusion, the research and literature indicated teachers' experiences and perspectives toward video games are a very important part in applying video games in classroom. Therefore, teachers' experiences and perspectives should be investigated and barriers of using video games in the classroom should be defined to help teachers overcome them. Effective application and use of video games in classroom requires

integrating video games in learning and teaching rather than dealing with them as separate from instructional activities. Currently, video games are popular digital tools in the teaching and learning process. Therefore, it is timely to study how teachers should be supported in using video games in their classrooms. This study aimed to contribute new information as it investigated the relationship between teachers' perspectives toward video games and their teaching philosophy. Also, there is an absence of studies that examine the experiences and perception of Saudi teachers toward using video games in education and factors that prevent teachers from applying video games in their classrooms. Therefore, this study filled the gap by investigating Saudi teachers' experiences and perspectives toward applying video games in education and identifying main barriers preventing Saudi teachers from using video games in their classrooms.

CHAPTER III

METHODOLOGY

This chapter addresses the methodology used to investigate Saudi teachers' attitudes toward video game integration in education and explore teachers' experiences with video games in Saudi Arabia in elementary, middle, and high schools by identifying significant factors that prevented Saudi teachers from using video games in their classrooms. It also explores the relationship between perceptions of game use in the classroom and teachers' philosophical beliefs about teaching and learning. The following topics are addressed in subsequent sections of the chapter: research design, research variables, population and sample, instrumentation development, pilot study, data collection procedures, and data analysis.

Design of the Study

This research is a quantitative study exploring attitudes toward video games. Generally, quantitative studies use at least one of the following two research designs: non-intervention research and intervention research (Creswell, 2012). Non-intervention research can be descriptive or relational and intervention research is experimental (Creswell, 2012). According to Creswell (2012), descriptive research is "describing trends for a population of people" such as survey designs while relational research is "associating or relating variables in a predictable pattern for one group of individuals," such as correlational designs (Creswell, 2012, p. 20). On the other hand, experimental

research is "explaining whether an intervention influences an outcome for one group as opposed to another group," such as experimental designs (Creswell, 2012, p. 20).

A survey research design was used to investigate Saudi teachers' attitudes toward video games. Survey research design has been used in education since 1817 (Creswell, 2012). It is defined as "procedures in quantitative research in which investigators administer a survey to a sample or to the entire population of people to describe the attitudes, opinions, behaviors, or characteristics of the population" (Creswell, 2012, p. 376). Researchers have used the most popular form of survey design in education--cross-sectional. According to Creswell (2012), cross-sectional survey design is when the researcher collects data at one point in time. In contrast, when researchers want to study over a period of time, a longitudinal design would be the appropriate design (Creswell, 2012).

Variables

Based on the research questions, independent and dependent variables were identified for each. The independent variable is called the cause or treatment variable—it intervenes to affect the outcome or dependent variable (Creswell, 2012). The independent variable has at least two values. The independent variables in this study were (a) gender--male, female; (b) teachers' levels of teaching--elementary, middle, and high school; (c) teachers' years of experience—1-5, 6-10, 11-15, 16-20, or more than 20 years; and (d) learning theories--behaviorism, cognitivism, and constructivism.

The dependent variable, also called the outcome or effect variable (Creswell, 2012), was dependent on the research question. The dependent variables in this study were as follows:

1. Teachers' experiences with video games defined by the number of hours spent on video games per week in Saudi Arabia.
2. Teachers' attitudes toward video games in Saudi Arabia.
3. Factors that prevented Saudi teachers from using video games in their classrooms.

Sampling

Population is defined as "the group of individuals having one characteristic that distinguishes them from other groups" (Creswell, 2012, p. 20). The population of this study had many similar characteristics in common with the majority of Saudi Arabian teachers. The participants included educators who are teaching in Saudi Arabia. The ages of participants ranged from 22 to 60 years since teachers start teaching after they finish four years in the college and retire when they become 60 years old in Saudi Arabia. Participant characteristics included Saudi Arabian teachers working for the Ministry of Education in public or private schools; taught in elementary, middle, and high schools; and taught in many different content areas (Ministry of Education in Saudi Arabia, 2014). According to the Ministry of Education in Saudi Arabia report in 2014, there are about 441,529 teachers--201,551 male teachers (45.6%) versus 239,978 female teachers (54.4%).

The sample is a group of participants chosen from a particular population (Creswell, 2012). The sample in this study was chosen from teachers in Saudi Arabia. According to Creswell (2012), there are two types of sampling: probability or nonprobability sampling approaches. Probability sampling is used when the researcher selects the individuals randomly from the population while nonprobability sampling is

used when "the researcher selects individuals because they are available, convenient, and represent some characteristic the investigator seeks to study" (Creswell, 2012, p. 20). Since individual participants cannot be randomly selected from the target population and the participants will choose whether or not to participate in the survey, convenience sampling is a good method to select participants (Creswell, 2012).

Sample size plays a main role in reducing sampling error. Although a large sample size reduces sampling error, the sample size should be determined on many factors such as alpha level, power, and effect size (Creswell, 2012). Since many statistical methods were used (MANOVA, ANOVA, correlation) in this study, a G*Power was run to estimate the appropriate sample size. With a power of 0.80, an effect size of 0.5, and a 0.05 level of significance, the minimum sample size for this study was 55 participants. However, the sample size for this study was 930 teachers; 48.1% of them were male teachers and 51.9% of them were female teachers.

This study focused on Saudi teachers; thus, the results will be generalized to all Saudi teachers. The sample should represent the population (Creswell, 2012). To get representative sampling, the researcher divided Saudi Arabia into regions or districts to have participants from the entire country. According to the Ministry of Education in Saudi Arabia (2016), there are five regions: the north, the south, the east, the west, and the middle. Each region has many education departments or districts. Figure 1 shows the percentage of Saudi teachers in each region.

1. The north region consists of six education departments: Alqurayyat, the northern borders, Hail, Tabuk, AlJouf, and Hafar Albatin. There are about

3,969 schools in the north region. Approximately 53,799 teachers represent 10% of the teachers in Saudi Arabia (Alsaiah, 2014).

2. The south region consists of 11 education departments: Albaha, Almakhwah, Bisha, Assir, Alnamas, Mahailassir, Rejal Alma, Sarat Abidah, Najran, Sabia, and Jazan. The south region has about 100,874 teachers--about 20% of the teachers in Saudi Arabia. Those teachers work in about 8,123 schools (Alsaiah, 2014).
3. The east region consists of two education departments: Alhasa and East. About 3,643 schools have about 67,765 teachers, representing about 13% of the teachers in Saudi Arabia (Alsaiah, 2014).
4. The west region consists of nine education departments: Makka, AlMadina, Jeddah, Altaife, Yanbu, Alola, Allaith, Qunfodah, and Mahd Althahab. In this region, 147,955 teachers teach in 9,066 schools, representing about 28% of the teachers in Saudi Arabia (Alsaiah, 2014).
5. The middle region consists of 17 education departments: Alriyadh, Alkharj, Aldawadmi, Alhotah, Algahat, Alrass, Unayzah, Almithnab, Afif, Alaflaj, Shaqra, Alquwaiiyah, Almajmaah, Alqaseem, Albukayriyah, Wadi Aldawasir, and Alzulfi. The middle region has the majority of teachers in Saudi Arabia; 155,222 teachers represent about 29% of the teachers at 9,978 schools (Alsaiah, 2014).

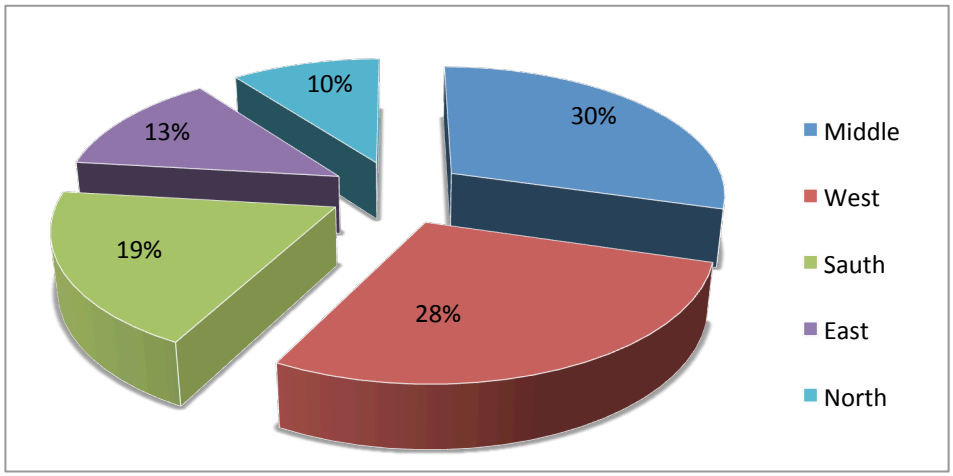

Figure 1. Percentage of Saudi teachers in each region.

Instrument

According to Creswell (2012), an instrument is "a tool for measuring, observing, or documenting quantitative data" (p. 151). This researcher used a questionnaire as it is "a form used in a survey design that participants in a study complete and return to the researcher" (Creswell, 2012, p. 382). The questions were based on a 5-point Likert scale: 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Neutral*, 4 = *Agree*, 5 = *Strongly agree* (see Appendix A). The goal of the questionnaire was to collect data that would help the researcher answer all of the research questions. The questionnaire consisted of four sections:

1. The first section requests demographic information and the teacher's background such as gender, level of teaching, years of experience in teaching, and playing experiences by the number hours teachers currently play video games per week on average. This section is the first section of

The Games in the Classroom Attitudes Survey (GCAS) developed by the researcher for the pilot study.

2. The second section is about the teacher's philosophy. It contains three questions; each question relates to a specific learning theory (behaviorism, cognitivism, or constructivism). Each question comes with three statements that will investigate the teacher's alignment or beliefs in teaching. This section is selected from Attitudes and Self-Efficacy toward Digital Game-Based Learning Survey by Wu (2015). The aim of this section determines the teacher's philosophy. The reliability of these three sub-items in each of the three philosophies was high since Cronbach's alpha was ranging from .76 to .96 (see Appendix A).
3. The third section contains 26 questions about the teacher's perceptions of educational games. These 26 questions are in four groups. The first 13 questions are about learning attitudes. The second five questions are about the games' impact on the teacher's attitude. Enjoyment attitudes came next with four questions. The last four questions are social interaction attitudes. The purpose of this section is to investigate Saudi teachers' attitudes toward educational games. This section is the second section in The Games in the Classroom Attitudes Survey (GCAS) developed by the researcher for the pilot study. Reliability for the 26 items of GCAS was 0.97, which showed a high level of internal consistency for the scale (Creswell, 2012; see Appendix A).

4. The purpose of the last part of the survey is to identify factors inhibiting Saudi teachers' use of video games in the classroom. There are 25 barriers. These barriers were adopted and adapted from *What Hinders Teachers in Using Computer and Video Games in the Classroom? Exploring Factors Inhibiting the Uptake of Computer and Video Games* by Baek (2008). Baek collected these barriers by asking 35 teachers to list which reasons prevented them from using computer and video games in their classroom.

Pilot Study

A pilot study is an important step in having a good survey. Pilot testing of a questionnaire is a process to examine an instrument utilizing respondents' feedback (Creswell, 2012). There are many advantages for conducting a pilot study. It gives the researcher the clear picture about how participants' understood the questions and their ability to finish the survey. Also, it finds any ambiguity of the questions or any mistakes (Creswell, 2012). A pilot study was conducted in spring 2015.

The purpose of this pilot study was to investigate Saudi Arabian school teachers' attitudes toward game integration in education. In addition, it investigated the difference among teachers' attitudes with regard to gender, teaching level, and teaching experience.

Participants included 328 educators who were teaching in Saudi Arabia--184 male teachers represented 56% and 144 female teachers represented 44% of the participants. Participant characteristics included Saudi Arabian teachers working for the Ministry of Education who taught in elementary, middle or high schools and taught in many different content areas (Ministry of Education in Saudi Arabia, 2014).

Pilot Testing the Instrument

The Games in the Classroom Attitudes Survey (GCAS) implemented in the study was created to investigate Saudi teachers' attitudes toward educational games. The survey consisted of two main sections. The first section was designed by the researcher for use with that particular study. It asked questions about gender, teacher experience, level taught, and playing experience. The second section included 26 items about perceptions of educational games. This section was developed by the researcher with inclusion of material from other researchers (Bourgonjon, Valcke, Soetaert, & Schellens, 2010; Connolly, Stansfield, & Hainey, 2011; De Grove, Bourgonjon, & Van Looy, 2012; Hellström, Nilsson, Leppert, & Åslund, 2012). Specifically, items 2, 6, 8, 9, 13, 25, and 26 were adapted from the Survey of Video Games in the Classroom Opinions (Bourgonjon et al., 2010). Also, items 5, 10, and 19 were selected from the Student Pre- and Post-Alternate Reality Game Questionnaire developed by Connolly et al (2011). Items 21 and 23 were adapted from the Motives to Play Online Computer Games Scale developed by Hellström et al. (2012). Items 11, 14, 16, and 22 were adapted from the Teachers' Adoption Intention of Digital Games in Formal Education Survey developed by De Grove et al. (2012). Items 1, 3, 4, 7, 12, 15, 17, 18, 20, and 24 were developed specifically by the researcher for this study. After the data were collected, a quantitative analysis was conducted. First of all, the researcher used factor analysis to analyze the survey to find the reliability for the survey utilizing Cronbach's alpha. An exploratory factor analysis (EFA) was applied to all 26 items. Exploratory factor analysis describes the data, collects variables that are correlated, and reduces a large number of variables to a smaller number of constructs (Tabachnick & Fidell, 2007). The results from a varimax

rotation were used, which meant the factors remained uncorrelated (Tabachnick & Fidell, 2007).

The researcher noted four constructs. Each construct was named based on the items in that category (learning, teacher impact, enjoyment, and social interaction). All four factors explained 74.2% of the total variability. Cronbach's alpha was calculated for all items to determine the level of internal consistency for the scale (Creswell, 2012). Reliability for the 26 items of GCAS was 0.97, which showed a high level of internal consistency for the scale (Creswell, 2012).

The first construct was learning. The eigenvalue for the learning construct was 7.2 and explained 27.7 % of the total variability. It had positive loadings for the first 13 items, which were about content learning and engagement. This construct had a 0.96 reliability.

The second construct was teacher impact. The eigenvalue for the second construct was 4.6 and explained about 9.7% of the variability. It had positive loadings for items 14 to 18. These five items were about the impact of games on teachers. Cronbach's alpha for this construct was 0.90.

The third construct was enjoyment; questions 19 to 22 had positive loadings on this factor. These four items focused on the teacher's attitude about games. This construct had an eigenvalue of 4.1 and explained 15.7% of the variability. The reliability of this construct was 0.91.

The last construct had positive loadings for last four items and was named social interaction. These four items were about the impact of games on social relationships.

The eigenvalue for this construct was 3.4 and explained about 13.1% of the total variability. Cronbach's alpha was about 0.89.

Summary of Pilot Study Findings

The results showed a significant difference in teachers' attitudes between the four sections. Although, the teachers showed positive attitudes toward games in education in the enjoyment section with a 4.2 mean, the researcher could not prove positive attitudes for the remaining three sections: learning, teacher impact, and social interaction with 3.6, 3.3, and 3.7 means, respectively. Although the results showed significant differences in teachers' attitudes between teachers experience and levels of teaching, there was no significant statistical difference in teachers' attitudes between genders.

Translation of the Survey

Since the population of this study was Saudi teachers who speak Arabic and the survey was originally written in the English language, the researcher translated the survey to the Arabic language. The researcher used many steps to translate the survey from English to Arabic language. First, the researcher translated an initial version to Arabic. Next, this version was translated back from Arabic to English by a professional translator fluent in both English and Arabic. The back-translated version was a very useful process for identifying errors in the originally translated version (Maxwell, 1996). The resulting version was evaluated by four professionals in education who are fluent in both English and Arabic. These professors were chosen based on five key characteristics that should be held by appropriate translators: an excellent knowledge of Arabic, a strong knowledge of English, extensive experience in both cultures and languages, experience with the population taking the survey, and experience developing surveys (Maxwell, 1996). The

professionals evaluated the survey for how well it fit the Arabic culture and language. After evaluation and necessary modifications, the final version was produced.

Data Collection and Procedure

This study used quantitative methods. The questionnaire was used to survey participants and collect data. After the researcher determined the participants, the data were collected by the questionnaire, which contained many sections for investigating Saudis teachers' experiences, philosophy, and their perspectives toward games in education and barriers that prevent them from using games in classroom. The data were collected during spring, 2016.

Once the researcher's committee approved the proposal and Institutional Review Board (IRB) approval was obtained from the University of Northern Colorado (see Appendix B), the online questionnaire was implemented (see Appendix A). The researcher used many different methods to distribute the survey to reach the largest number of participants. The participants received the link to the survey by one of the following choices:

1. Email.
2. Cross-platform instant messaging, WhatsApp Messenger.
3. Twitter accounts that have many followers of Saudi teachers.

Participation in the survey was optional and voluntary (see consent form in Appendix C). When the participants finished answering the survey, they were asked to click on a "Submit" button to send the whole survey to the researcher. After the researcher received an appropriate sample, the electronic survey was closed. Then the data were ready for analysis.

Data Analysis

This quantitative research study collected data via survey. After the data were collected, the researcher conducted quantitative analyses. The obtained data were uploaded to SPSS. The researcher first found the reliability for the survey utilizing Cronbach's alpha. Then descriptive methods such as means and standard deviations were used to answer the first and second main research questions:

Q1 What are Saudi Arabian teachers' current gaming experiences as defined by the number of hours spent on video games per week?

Q2 What are the attitudes of Saudi Arabian teachers toward video games in education utilizing the Games in the Classroom Attitudes Survey (GCAS)?

To answer the sub-questions, the researchers used an ANOVA one-way test to determine if there were significant mean differences in experiences and attitudes of Saudi teachers toward games in education as correlated by genders, levels taught, and teachers' experiences.

For the third research question, a Pearson's correlation coefficient was used to investigate the relationship between teachers' philosophy and their perspectives toward video game use in the classroom.

Q3 Based on the three major learning theories (behaviorism, cognitivism, and constructivism), is there a significant relationship between teachers' philosophy and their perspectives toward video game use in the classroom?

Creswell (2012) mentioned that "a correlational design in which the researcher is interested in the extent to which two variables (or more) [is] where changes in one variable are reflected in changes in the other" (p. 340).

The last main research question to be answered was

Q4 What are the underlying factors or barriers that prevent Saudi Arabian teachers from using video games in the classrooms?

An explanatory factor analysis was applied to all 25 items to discover the underlying factors that prevented Saudi Arabian teachers from using video games in the classroom. Exploratory factor analysis describes the data, collects variables that are correlated, and reduces a large number of variables to a smaller number of constructs (Tabachnick & Fidell, 2007). The researcher used two methods to find the common factors: principal components analysis and principal factor analysis. The MANOVA test was used to analyze the differences among genders, levels taught, and teachers' experiences by using factor scores. Since this was a quantitative study, the researcher had hypotheses. The null hypotheses were rejected at the significance level of 0.05 ($p \leq 0.05$).

Validity and Reliability

Validity is "the development of sound evidence to demonstrate that the intended test interpretation matches the proposed purpose of the test" (Creswell, 2012, p. 630). Many methods ensure the instrument's validity. In this study, the researcher adopted and adapted the questionnaires from many previous studies. Thus, the instrument was considered valid and reliable since the existing questionnaires had already been evaluated for validity and reliability. Member checking was used in this study to ensure validity and accuracy. First, two professional experts in educational field examined the content validity of the instrument. Then instructional technology experts in Saudi Arabia examined the content validity of the questionnaires. Finally, the validity was tested by feedback from four Saudi teachers as participants before this research was conducted.

In addition to the above procedures, the validity was tested separately. For the teachers' attitude part, the researcher conducted a pilot study to check the content validity

of the questionnaire so the results of the pilot study ensured content validity of the questionnaire. For the barriers part, a triangulation method was used to ensure validity (Baek, 2008). Triangulation uses multiple data collection methods to confirm the information collected (Creswell, 2012).

According to Creswell (2012), reliability "means that scores from an instrument are stable and consistent" (p. 159), i.e., the scores should be same when the instrument is administered many times at different times. The reliability of questionnaire was high since Cronbach's alpha showed a high level of internal consistency for the scale. For the teacher's philosophy section, the reliability of the three sub-items in each of the three philosophies was high since Cronbach's alpha ranged from .76 to .96. For the Saudi teachers' attitudes toward educational games section, the reliability for the 26 items was 0.97, which showed a high level of internal consistency for the scale (Creswell, 2012).

Limitations

According to Creswell (2012), limitations are "potential weaknesses or problems with the study identified by the researcher" that could impact the results in various aspects such as validity or generalizability (p. 199). The researcher was aware of some limitations in this study. Limited resources available about Saudi teachers were a challenge for the researcher, which could have had an impact on the questions asked or background supporting the purpose of the study. Another potential limitation was the researcher used an electronic survey to collect the data, which limited access to teachers familiar with electronic devices such as computers, iPads, mobile devices, etc.; this could have marginalized parts of the target population. It limited the participants to teachers who had access to the Internet. This study covered attitudes of Saudi teachers at the

elementary, middle, and high school levels; thus, it did not include teachers at kindergarten and educators at universities. This limit in the population was a design of the study; since the researcher used a convenience sample, the results could not be generally applied to a larger population that did not share the same characteristics as the participants in the convenience sample. Moreover, a small sample size was one of the limitations the researcher would have faced depending on the return rate of the surveys.

CHAPTER IV

FINDINGS

This chapter presents the results and findings for this study. In presenting research results, the researcher answers each question in order and presents the statistical findings without drawing broader implications. These results should give specific information about the descriptive and inferential statistical analysis (Creswell, 2012).

The findings in this chapter showed Saudi teachers' attitudes toward video game integration in education and presented the teachers' experiences with video games in Saudi Arabian elementary, middle, and high schools. Moreover, it displays significant factors that prevented Saudi teachers from using video games in their classrooms. It also demonstrates the relationship between perceptions of game usage in classrooms and teachers' philosophical beliefs about teaching and learning. Collected data in this study were used to answer the following questions:

Q1 What are Saudi Arabian teachers' current gaming experiences as defined by the number of hours spent on video games per week?

- Q1a Is there a significant mean difference between teachers' gender in the number of hours spent per week on video game play?
- Q1b Is there a significant mean difference among teachers' level of teaching (elementary school, middle school, and high school) in the number of hours spent per week on video game play?

Q1c Is there a significant mean difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20, more than 20 years) in the number of hours spent per week on video game play?

Q2 What are the attitudes of Saudi Arabian teachers toward video games in education utilizing the Games in the Classroom Attitudes Survey (GCAS)?

Q2a Is there a significant mean difference between teachers' gender and their perspectives toward video game use in the classroom?

Q2b Is there a significant mean difference among teachers' grade level of teaching (elementary school, middle school, and high school) in their perspectives toward video game use in the classroom?

Q2c Is there a significant mean difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20, more than 20 years) in their perspectives toward video game use in the classroom?

Q3 Based on three major learning theories (behaviorism, cognitivism, and constructivism), is there a significant relationship between teachers' philosophy and their perspectives toward video game use in the classroom?

Q4 What are the underlying factors or barriers that prevent the Saudi Arabian teachers from using video games in the classrooms?

Q4a Is there a significant difference between teachers' gender and underlying factors or barriers that prevent them from using video games in the classroom?

Q4b Is there a significant difference among teachers' levels of teaching (elementary school, middle school, and high school) and underlying factors or barriers that prevent them from using video games in the classroom?

Q4c Is there a significant difference among teachers' experience (1-5, 6-10, 11-15, 16-20, +20 years) and underlying factors or barriers that prevent them from using video games in the classrooms?

Although the data were collected through a four-part survey, this chapter presents the results and analyses of five types of outcomes:

1. The results of the demographic data including information about teachers' gender, levels of teaching, years of teaching experience, and playing video game experience.
2. Saudi teachers' experience in playing video game as defined by the number of hours spent on video games per week. It also showed the difference between teachers' gender, teachers' level of teaching, teachers' experiences, and the number of hours spent per week on video game play.
3. Saudi teachers' attitudes toward video game use in the classroom. It also showed the difference between teachers' gender, teachers' level of teaching, teachers' experiences, and their attitudes toward video game use in the classroom.
4. The relationship between teachers' philosophy and Saudi teachers' attitudes toward video game use in the classroom.
5. Barriers that prevent Saudi teachers from using video games in their classroom. It also showed the difference between teachers' gender, teachers' level of teaching, and teachers' experiences with regard to barriers.

Although descriptive statistics were used to analyze the data for the first and second questions, inferential statistics were used to analyze the data in response to the remaining questions.

Although the minimum sample size required for this study was 55 teachers with a power of 0.80, an effect size of 0.5, and a 0.05 level of significance, the received responses well exceeded this minimum ($N = 930$). The computer software Statistical

GPower was used to determine the power of the present study. The results showed the power was 0.99, an effect size was 0.14, and there was a 0.05 level of significance.

Reliability of the Instrument

The Statistical Package for Social Sciences (SPSS) Version 20.0 was used to analyze the data of this study. First of all, although the reliability of instrument was presented in Chapter III from the pilot study and previous research, the reliability of the instrument in this chapter was calculated with study data. As we can see in Table 2, the results showed a high level of internal consistency for the scales:

1. Cronbach's alpha = .978 (26 questions) for attitudes toward video games
2. Cronbach's alpha = .918, .912, .931 (three questions) for teachers' philosophy
3. Cronbach's alpha = .934 (25 questions) for barriers.

Table 2

Overall Internal Consistency of the Instrument

Questionnaire		Cronbach's Alpha	Items
1. The Games in the Classroom Attitudes Survey (GCAS)		.978	26
Learning and engagement		.979	13
The impact on teachers		.928	5
Enjoyment		.912	4
Social interaction		.924	4
2. Teachers' philosophy	Behaviorism	.918	3
	Cognitivism	.912	3
	Constructivism	.931	3
3. Barriers		.934	25

Tests for Assumptions

Since I chose to analyze the data using a one-way ANOVA, I had to be sure the data I wanted to analyze could actually be analyzed using this test by examining the ANOVA assumptions prior to performing the ANOVA test. The one-way ANOVA had some assumptions:

The first assumption was there is one continuous dependent variable (Tabachnick & Fidell, 2007). This research had three sections and every section had one continuous dependent variable:

1. Number of hours playing video games.
2. Teachers' attitudes.
3. Barriers of using video games in classrooms

Thus, this assumption was met.

The second assumption was there is one independent variable that consists of two or more categorical, independent groups (Tabachnick & Fidell, 2007). This research had three independent variables and each of them had two or more categorical groups:

1. Gender (Male, Female).
2. Level of teaching (Elementary, Middle, High).
3. Teacher experiences (1-5, 6-10, 11-15, 16-20 years, and more than 20 years).

Thus, this assumption was met.

The third assumption was independence of observations (Tabachnick & Fidell, 2007). Since I used electronic surveys, it was reasonable to assume each participant answered the survey independently from the others. Thus, this assumption was met.

The fourth assumption was outliers. Outlier means the value is extremely small or large compared to other scores. Although there were many techniques to check the outliers, I used descriptive statistic boxplots (Tabachnick & Fidell, 2007). I decided to delete some of the outliers that were less than 2% of the data and retained some others.

The fifth assumption was normal distribution. That means the dependent variable should be approximately normally distributed for each group of independent variables (Tabachnick & Fidell, 2007). Although, for statistical significance, testing using a one-way ANOVA was necessary, the one-way ANOVA was considered "robust" to violations of normality. In the other word, some violations of this assumption could be tolerated but the test would still provide valid results (Tabachnick & Fidell, 2007). Also, “a sample size with at least twenty in each cell would ensure robustness” (Tabachnick & Fidell, 2007, p. 381). In this research, there were more than 20 in each category. Also, many different methods were available to test this assumption. I used the most common method--the Shapiro-Wilk test for normality. Based on this test, my data met this assumption.

Sixth assumption: homogeneity of variances. That means the population variances of the outcome variable for each group of the independent variable are the same. The one-way ANOVA is sensitive to the violation of this assumption when sample sizes are quite different within each group of the independent variable. To check if the data met or violated this assumption, I used Levene's test of equality of variances. Most of my data met this assumption. When the homogeneity of variances was violated, I used a modified version of the ANOVA, i.e., the Welch ANOVA, since the standard one-way ANOVA could not be interpreted in this case (Laerd Statistics, 2015a).

Demographics

There were 930 teachers who completed the survey as participants in this study (see Table 3). Male teachers totaled 447 and represented 48.1% of the participants while female teachers totaled 483 and represented 51.9% of the participants.

Table 3

Frequencies and Percentages of Participant Characteristic Variables

	Variables	Frequency	Percent
Gender	Male	447	48.1
	Female	483	51.9
Region of Saudi Arabia Residency	North	61	6.6
	South	102	11.0
	East	30	3.2
	West	602	64.7
	Middle	135	14.5
Level of teaching	Elementary school	385	41.4
	Middle school	239	25.7
	High school	306	32.9
Teachers' experience in teaching	1-5	201	21.6
	6-10	225	24.2
	11-15	138	14.8
	16-20	165	17.8
	More than 20 years	201	21.6

Participants were asked about their level of teaching; the largest group represented in the survey was 385 elementary schools teachers from both genders. This group represented 41.4% of participants. The smallest group represented was middle school teachers (N = 239 male and female teachers). This group represented 25.7% of

the participants. In total, there were 306 male and female high school teachers, representing 32.9% of the participants.

The teachers' experience analysis showed the majority of the participants were teachers who had 6-10 years of experience and represented 24.2% of the participants (*N* = 225). Teachers who had between 1-5 years of experience represented 21.6% of the participants (*N* = 201). Teachers who had 11-15 years of experience represented 14.8% of the participants (*N* = 138). Teachers who had 16-20 years of experience represented 17.8 % of the participants (*N* = 165). In addition, 21.6% of the participants had more than 20 years of experience (N = 201). As seen in Table 4, the largest group of surveyed participants was the female elementary schools teachers with 1-5 years of experience who represented 6% (*N* =56) of the total respondents. The lowest group of surveyed participants was female middle schools teachers with 11-15 years of experience who represented 1.2% (*N* =11) of the total respondents.

Table 4

Years of Experience for Gender and Level Taught

Years	Gender	Level Taught					
		Elementary		Middle		High	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
1-5	Male	32	3.4	20	2.2	23	2.5
	Female	56	6.0	34	3.7	36	3.9
6-10	Male	49	5.3	41	4.4	44	4.7
	Female	26	2.8	20	2.2	45	4.8
11-15	Male	34	3.7	26	2.8	19	2.0
	Female	22	2.4	11	1.2	26	2.8
16-20	Male	25	2.7	20	2.2	19	2.0
	Female	40	4.3	21	2.3	40	4.3
More than	Male	53	5.7	19	2.0	23	2.5

20 years	Female	48	5.2	27	2.9	31	3.3

For male teachers, the highest percentage presented in middle school with 6-10 years of experience was 4.4% of total respondents (*N* =41); the lowest percentage was 2.0% (*N* =19) in high school with 11-15 and 16-20 years of experiences. In contrast, the highest percentage (6.0%, *N* =56) for female teachers was in elementary school with 1-5 years of experience; the lowest percentage was 1.2% (*N* =11) in middle school with 11-15 years of experiences.

The highest percentage of elementary school teachers was female teachers with 1-5 years of experience (6%, *N* =56). Also, teachers with the lowest percentage were female elementary school teachers with 11-15 years of experience who represented 2.4% of the total collected data (*N* = 22). For middle schools, 41 male teachers who had 6-10 years of experience got the highest percentage (4.4%) and female teachers with 11-15 years of experience (*N* =11, 1.2%) had the lowest percentage. In high schools, female teachers with 6-10 years of experience (*N* =45, 4.8%) represented the highest percentage and the lowest percentage was male teachers at 2.0% (*N* =19) with 11-15 and 16-20 years of experiences, respectively.

Teachers' Experience with Video Games

The first research question was about Saudi teachers' experience playing video games defined by the number of hours played every week. It came with three sub research questions as follows:

Q1 What are Saudi Arabian teachers' current gaming experiences as defined by the number of hours spent on video games per week?

Q1a Is there a significant mean difference between teachers' gender in the number of hours spent per week on video game play?

Q1b Is there a significant mean difference among teachers' level of teaching (elementary school, middle school, and high school) in the number of hours spent per week on video game play?

Q1c Is there a significant mean difference among teachers' experience (1-5, 6-10, 11-15, 16-20, more than 20 years) in the number of hours spent per week on video game play?

To answer the main question, descriptive statistics such as mean and standard deviation were used. While answering the sub-questions, a one-way ANOVA test was used to determine the significant mean differences in gaming experiences among genders, levels taught, and teachers' experiences.

The participants were asked about the number of hours they spent during the week playing video games. Their responses showed 496 teachers (53.3%) did not play video games at all. Teachers who spent one hour a week were 256 (27.5%). Teachers who played two hours a week were 47 (5.1%) while 41 teachers spent three hours a week (4.4%) playing video games. Four hours a week were spent by 15 teachers who represented 1.6 % and five hours were spent by 19 teachers who represented 2.0%. Nine teachers (1.0%) spent six hours a week plying video games and the same number of teachers spent seven hours a week. The rest of the teachers (4%) mentioned they spent different numbers of hours--eight hours by eight teachers to 30 hours by four teachers as can clearly be seen in Table 5.

Table 6 shows the frequency and percentage of non-player teachers, the mean number of hours spent during the week, and the standard deviation for teachers who played video games regarding all independent variables. There were 496 (53.3%) teachers who did not play video games while about 434 teachers (46.7%) played video games.

Table 5

Number of Hours Spent Playing Video Game During the Week by Teachers

Hours spent	Frequency	Percent
Not plying	496	53.3%
1	256	27.5%
2	47	5.1%
3	41	4.4%
4	15	1.6%
5	19	2.0%
6	9	1.0%
7	9	1.0%
8	8	0.9%
9	1	0.1%
10	8	0.9%
12	1	0.1%
14	5	0.5%
15	5	0.5%
16	1	0.1%
17	1	0.1%
20	2	0.2%
21	1	0.1%
28	1	0.1%
30	4	0.4%

Table 6

The Frequencies, Means, and Standard Deviations of Non-Players for Total Time Playing Video Games

Variables		Non Playing		Time Playing	
		Frequency	Percent	Mean	S.D
Gender	Male	224	45.2	3.5	5.1
	Female	272	54.8	2.5	3.4
Region of Saudi Arabia Residency	North	27	5.4	3.8	5.9
	South	51	10.3	3.3	4.6
	East	11	2.3	4.4	7.6
	West	331	66.7	2.9	4.2
	Middle	76	15.3	2.3	1.9
Level of teaching	Elementary school	216	43.5	2.7	3.8
	Middle school	118	23.8	2.8	4.6
	High school	162	32.7	3.5	4.7
Teachers' experience in teaching	1-5	103	20.8	2.9	4.3
	6-10	96	19.4	2.7	3.4
	11-15	76	15.3	3.6	4.9
	16-20	89	17.9	3.3	5.5
	More than 20 years	132	26.6	2.7	3.9

For non-player teachers, there were 224 (45.2%) male teachers and 272 female teachers (54.8%). In the West region, there were 331 (66.7%) non-player teachers and the Middle region had 76 (15.3%) non-player teachers. While there were 51 (10.3%) non-player teachers in the South region, there were 27 (5.4%) in the North region. Finally, there were 11 (2.3%) non-player teachers in the East region of Saudi Arabia. The highest percentage of non-player teachers taught in elementary schools (216, 43.5%) while the lowest percentage of non-player teachers taught in middle schools (118, 23.8%). High schools had 162 (32.7%) non-player teachers. There were 103 (20.8%)

non-player teachers with 1-5 years of experience and 96 (19.4%) non-player teachers with 6-10 years of experience. The lowest percentage was non-player teachers who had 11-15 years of experience (76, 15.3%). There were 89 (17.9%) non-player teachers who had 16-20 years of experience. Non-player teachers who had more than 20 years of experience had the highest percentage (132, 26.6%).

Table 6 showed the mean and standard deviation for the total time spent per week playing video games for the players' teachers. The male teachers had a higher mean (M = 3.5, SD = 5.1) than did female teachers (M = 2.5, SD = 3.4). While the East region had the highest mean (M = 4.4, SD = 7.6), the Middle region had the lowest mean (M = 2.3, SD = 1.9). The teachers in high school had a higher mean (M = 3.5, SD = 4.7) than did teachers in middle school (M = 2.8, SD = 4.6) and teachers in elementary school (M = 2.7, SD = 3.8). Teachers who had 11-15 years of experience had the highest mean (M = 3.6, SD = 4.9), while teachers who had 6-10 years of experience (M = 2.7, SD = 3.4) and those with more than 20 years of experience had the lowest means (M = 2.7, SD = 3.9).

The survey asked the respondents to identify reasons that attracted them to play video games. Not all teachers could answer this question. Just 434 teachers (46.7%) who played video games could answer this question.

As seen in Figure 2, the most popular reason for playing video games among the participants was for enjoyment--66.8% of the total responses--with 148 for male and 142 for female. Playing for competition, which was 37.5% of the total participants, was higher for males--98 answers than for females--65 answers. On the other hand, 115 females played video games for intelligence development, while only 71 males played for the same reason. Playing video games for intelligence development represented 42.8% of

the participants. Male and female participants were similar in playing video games for discovery (16.3%) and for communication (5.7%) reasons with 34 and 14 for males and 37 and 11for females, respectively.

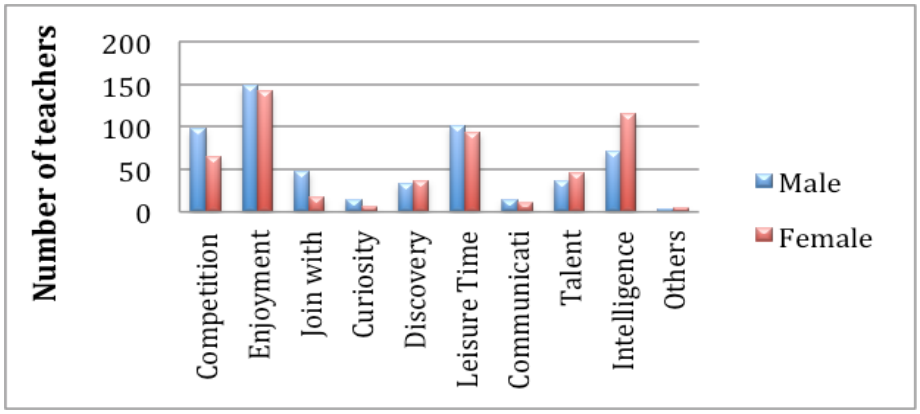

Figure 2. Reasons for playing video games by gender.

Only 15.2% of teachers played video games with others; 48 male and 18 female teachers chose this reason for playing. Playing video games for curiosity was chosen by 21 (4.8%) of total participants (15 for male and 6 for female). A high percentage (45.1%) of participants played video games to spend during leisure time—196 total answers where 102 of them were from males and 94 were from females. Playing video games to develop talent represented 18.9% of the total participants with 82 teachers (36 for male and 46 for female). Most participants who chose "Other" as the reason for playing video games represented 2.1% of the total responses; they mentioned they played video games to share and spend time with their kids.

In the next question, the survey asked the participants about the type of video games they preferred (see Figure 3). Only 434 (46.7%) teachers who played video games

answered this question. The highest percentage of teachers (56.9%) chose the puzzle games as their prefer type of video games with 247 choices. Puzzles were the most popular type of games for female participants with 145 answers compared to 102 answers for male participants. On the other hand, the most popular type of games for male participants was sports with 127 answers but sports was a rare answer for females with only 25 responses. Sports video games represented 35.1% of 152 participants. While 46 male participants played fighting video games, which represented 12.7% of the total participants, only nine female participants did. The least chosen type of video games was fighting with only 55 participants. Males and females were similar in playing adventure video games with 58 and 66 answers, respectively. Adventure video games represented 28.5% of teachers who played video games with 124 choices. Female participants played strategy video games (87 answers) more than male participants (58 answers) where strategy video games represented 33.4% (n = 145) of total teachers' choices. Teachers who chose "Other" for the type of video games presented 8.5% of total participants with 37 choices.

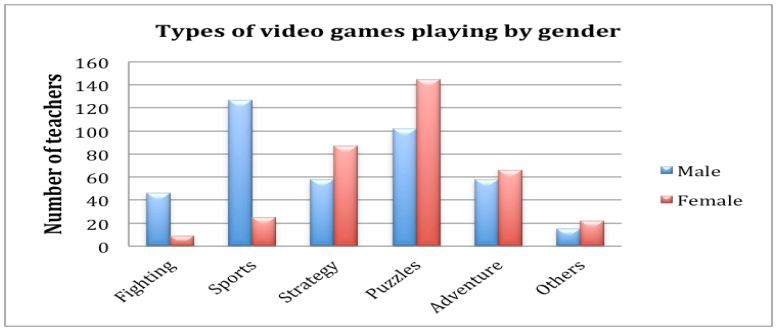

Figure 3. The number of respondents playing different types of video games by their gender.

Q1a Is there a significant mean difference between teachers' gender in the number of hours spent per week on video game play?

To answer the first sub research question, a one-way ANOVA was used to assess whether there was significant difference between genders. The resulting analysis is presented in Table 7. For the homogeneity assumption, there was homogeneity of variances as assessed by Levene's test for equality of variances ($p = 0.062$). Thus, this assumption was met. The dependent variable for this research question was the number of hours spent per week on playing video game by Saudi teachers and the independent variable for this research question was the gender for Saudi teachers (male, female).

The result of a one-way ANOVA showed there was a statistically significant difference between male and female teachers and the number of hours spent per week on video game play, $F(1,899) = 4.03$; ($p < 0.04$). An inspection of the mean scores indicated male teachers reported more hours playing video games, ($M = 1.02$, $SD = 1.67$) than female teachers ($M = 0.81$, $SD = 1.41$).

Table 7

One-Way Analysis of Variance: Teachers' Experiences with Video Games Based on Gender

	Sum of Squares	df	Mean Square	*F*	Sig.
Between Groups	9.557	1	9.557	4.03	0.045*
Within Groups	2133.797	899	2.374		
Total	2143.354	900			

*Significant difference at .05 levels.

Q1b Is there a significant mean difference among teachers' level of teaching (elementary school, middle school, and high school) in the number of hours spent per week on video game play?

To answer the second sub research question, a one-way ANOVA was used to assess whether there was a significance difference among levels of teaching (elementary school, middle school, and high school). The resulting analysis is presented in Table 8.

Table 8

Descriptive Statistics for One-Way Analysis of Variance: Teachers' Experiences with Video Games Based on Levels of Teaching

	Sum of Squares	df	Mean Square	*F*	Sig.
Between Groups	8.948	2	4.474	1.882	0.153
Within Groups	2134.406	898	2.377		
Total	2143.354	900			

For this research question, the dependent variable was the number of hours spent per week on playing video game by Saudi teachers and the independent variable was the level of teaching (elementary school, middle school, and high school). The result of a one-way ANOVA showed there was no statistically significant difference among elementary, middle, and high school teachers in the number of hours spent per week on video game play: $F(2,898) = 1.88$; ($p < 0.15$; see Table 8). Although the mean scores looked very close, high school teachers reported more hours playing video games ($M = 1.04$, $SD = 1.77$) than did middle school ($M = 0.9$, $SD = 1.4$) and elementary school ($M = 0.8$, $SD = 1.4$) teachers.

Q1b Is there a significant mean difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20 years, more than 20 years) in the number of hours spent per week on video game play?

To answer the last sub research question, a one-way ANOVA was used to assess whether there was significance difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20 years, and more than 20 years). The dependent variable for this research question was the number of hours spent playing video games by Saudi teachers. The independent variable for this research questions was Saudi teachers' years of experience (1-5, 6-10, 11-15, 16-20 years, and more than 20 years). The resulting analysis is presented in Table 9.

Table 9

Welch Analysis of Variance: Teachers' Experiences with Video Games Based on Level of Teaching Experience

	Statistic	df1	df2	Sig.
Welch	4.12	4	420.5	0.003*

*Significant difference at .05 level.

Before a one-way ANOVA was applied, the homogeneity assumption was checked by Levene's test for equality of variances. The results showed the assumption of homogeneity of variances was violated ($p = 0.018$). Since this assumption was violated, the researcher could not interpret the standard one-way ANOVA so the Welch ANOVA was used. Also, to compare all possible combinations of group differences, the Games-Howell post hoc test was used instead of the Tukey post hoc test because it is a proper

test when the assumption of homogeneity of variances is violated (Laerd Statistics, 2015a).

The results of the Welch ANOVA showed there was a statistically significant difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20, more than 20 years) in the number of hours spent per week on video game play: Welch's $F(4,420.5) = 4.12$; ($p < .003$; see Table 9). A post hoc analysis was conducted to determine where the differences were within the level of teachers' experience (1-5, 6-10, 11-15, 16-20, more than 20 years). As can be seen in Table 10, the Games-Howell post hoc analysis indicated a significant difference was between 6-10 years of experience and more than 20 years.

An inspection of the mean scores indicated teachers who had 6-10 years of experience reported highest number of hours playing video games ($M = 1.2$, $SD = 1.7$). Next were teachers who had 11-15 years of experience ($M = 0.98$, $SD = 1.8$), teachers who had 16-20 years of experience ($M = 0.85$, $SD = 1.5$), teachers who had 1-5 years of experience ($M = 0.88$, $SD = 1.4$), and teachers who had more than 20 years of experience ($M = 0.61$, $SD = 1.3$).

Table 10

Games-Howell Post Hoc to Determine Where the Differences Were Within the Level of Teachers' Experience

Experience 1	Experience 2	Mean Difference	Std. Error	Sig.	95% Confidence Interval	
					Lower	Upper
1-5	6-10	- 0.310	0.154	0.262	- 0.73	0.11
	11-15	- 0.103	0.184	0.980	- 0.61	0.40
	16-20	0.032	0.158	1.00	- 0.40	0.47
	More 20	0.267	0.136	0.283	- 0.11	0.64
6-10	1-5	0.310	0.154	0.262	- 0.11	0.73
	11-15	0.207	0.192	0.817	- 0.32	0.73
	16-20	0.343	0.167	0.244	- 0.12	0.80
	More 20	0.578	0.146	0.001	0.18	0.98
11-15	1-5	0.103	0.184	0.980	- 0.40	0.61
	6-10	- 0.207	0.192	0.817	- 0.73	0.32
	16-20	0.136	0.195	0.957	- 0.40	0.67
	More 20	0.371	0.177	0.227	- 0.12	0.86
16-20	1-5	-.032	.158	1.000	-.47	.40
	6-10	-.343	.167	.244	-.8	.12
	11-15	-.136	.195	.957	-.67	.4
	More 20	.235	.15	.522	-.18	.65
More than 20	1-5	-.267	.136	.283	-.64	.10
	6-10	-.578	.146	.001	-.98	-.18
	11-15	-.371	.177	.227	-.86	.12
	16-20	-.235	.150	.522	-.65	.18

Teacher Attitudes

The second research question was about Saudi teachers' attitudes toward video games in education. It was defined by the Games in the Classroom Attitudes Survey (GCAS). This research question came with the following three sub research questions:

Q2 What are the attitudes of Saudi Arabian teachers toward video games in education utilizing the Games in the Classroom Attitudes Survey (GCAS)?

Q2a Is there a significant mean difference between teachers' gender in their perspectives toward video game use in the classroom?

Q2b Is there a significant mean difference among teachers' grade level of teaching (elementary school, middle school, and high school) in their perspectives toward video game use in the classroom?

Q2c Is there a significant mean difference between teachers' years of experience (1-5, 6-10, 11-15, 16-20, more than 20 years) in their perspectives toward video game use in the classroom?

To answer the main question, descriptive methods such as mean and standard deviation were used. To answer the sub-questions, a one-way ANOVA test was used to determine significant mean differences in teachers' attitudes among genders, levels taught, and teachers' years of experience.

The Games in the Classroom Attitudes Survey (GCAS) consisting of 26 statements about using video games came in four sections: 13 statements for learning attitudes, five statements for teacher impact attitudes, four statements for enjoyment attitudes, and four statements for social interaction attitudes. Responses to statements were based on a 5-point Likert scale: 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Neutral*, 4 = *Agree*, 5 = *Strongly agree*. Table 11 shows the means and standard deviations for 26 statements combined ($M = 3.6$, $SD = 0.9$).

Table 11

Means and Standard Deviation for 26 Statements Regarding Teachers' Attitudes

	N	Mean	*SD*	S. Error Mean
Teachers' attitudes	930	3.6	0.9	0.03

A one-way ANOVA was used to investigate if there was a statistically significant mean difference among the four constructs: learning, teacher impact, enjoyment, and social interaction. Before the researcher applied a one-way ANOVA, the homogeneity assumption was checked by Levene's test for equality of variances, which showed the assumption of homogeneity of variances was violated ($p = 0.001$). Since this assumption was violated, the researcher could not interpret the standard one-way ANOVA so the Welch ANOVA was used. In addition, to compare all possible combinations of group differences, the Games-Howell post hoc test was used instead of the Tukey post hoc test because it is a proper test when the assumption of homogeneity of variances is violated (Laerd Statistics, 2015a; Tabachnick & Fidell, 2007).

Results of the Welch ANOVA can be seen in Table 12, which showed there was a statistically significant mean difference among the four sections of attitudes (learning teacher impact, enjoyment, and social interaction), Welch's $F(3,2059.73) = 82.44$; ($p < 0.0001$).

Table 12

Descriptive Statistics for Welch Analysis of Variance: Teachers' Attitudes for Four Constructs

	Statistic	df 1	df 2	Sig.
Welch	82.44	3	2059.73	0.0001

*Significant difference at .05 level.

The Games-Howell post hoc analysis showed a significant difference among all four sections of attitudes. An inspection indicated higher mean scores for enjoyment attitudes ($N = 4$, $M = 3.99$, $SD = 0.9$) than for teacher impact attitudes ($N = 5$, $M = 3.32$, $SD = 1.0$), learning attitudes ($N = 13$, $M = 3.5$, $SD = 1.1$), and social interaction attitudes ($N = 4$, $M = 3.7$, $SD = 1.0$).

Table 13 shows the means and standard deviations for perceptions regarding learning attitudes of educational games ranged from 3.29 to 3.67 and from 1.14 to 1.22, respectively. The fifth statement had the highest mean value among all statements at 3.67 and the lowest standard deviation value at 1.14. In contrast, the eighth statement earned the lowest mean value of 3.29 and the highest standard deviation value at 1.22.

As seen in Table 14, the means and standard deviations for perceptions of teacher impact attitudes regarding educational games showed the means for the five variables were confined between 3.20 and 3.48. The third statement had the highest mean value among all statements at 3.48 and the lowest standard deviation value at 1.10. In contrast, the fourth statement earned the lowest mean value at 3.20 with the highest standard deviation value of 1.21 among all statements.

Table 13

Likert Scale Responses for Learning Attitudes

Statements	Mean	*SD*
Games are very important for teaching and learning.	3.49	1.17
Games improve students' content knowledge.	3.50	1.17
Games increase students' skills.	3.63	1.16
Games improve individual learning.	3.65	1.15
Games help students develop thinking skills.	3.67	1.14
Games increase the students' classroom performance.	3.40	1.22
Games help students to solve complex tasks.	3.42	1.17
Games help students to achieve better grades.	3.29	1.22
Games enhance students learning productivity	3.37	1.21
Games motivate students' engagement.	3.58	1.21
Games motivate students learning.	3.60	1.22
Games encourage deeper students learning.	3.57	1.21
Games encourage effective students learning.	3.46	1.22

$N = 13$

Table 14

Likert Scale Responses for Teacher Impact Attitudes

Statements	Mean	*SD*
Games improve teachers' performance.	3.26	1.14
Games help towards reaching instructional objectives.	3.38	1.12
Games help teachers teach students.	3.48	1.10
Games support traditional teaching strategies.	3.20	1.21
Games guide teachers' instructional planning.	3.26	1.14

N = 5

Table 15 shows the means and standard deviations for the enjoyment construct, which had the highest mean among all four attitudes. The means ranged between 3.88 and 4.12 and the standard deviations ranged from 0.94 to 1.08.

Table 15

Likert Scale Responses for Enjoyment Attitudes

Statements	Mean	*SD*
Students need to enjoy in the classroom.	4.12	0.94
Games more exciting	4.03	0.94
Games make learning fun.	3.88	1.07
Games entertainments classroom.	3.91	1.08

N = 4

Table 16 shows the means and standard deviations for the social interaction construct. As can be seen, the third statement had the highest mean at 3.80 and lowest

standard deviation at 1.10. On the other hand, the first statement had the lowest mean at 3.52 and highest standard deviation at 1.17.

Table 16

Likert Scale Responses for Social Interaction Attitudes

Statements	Mean	*SD*
Games enhance social interaction.	3.52	1.17
Games help students to interact with each other.	3.73	1.14
Games make active classroom.	3.80	1.10
Games make participation classroom.	3.74	1.11

N = 4

Q2a Is there a significant mean difference between teachers' gender in their perspectives toward video game use in the classroom?

To answer this sub-question, the researcher examined all 26 attitudes as one variable and then examined the four sections of attitudes separately by calculating an average score. The dependent variable for this research question was attitudes toward video game use in the classroom by Saudi teachers and the independent variable was the gender of Saudi teachers (male, female).

A one-way ANOVA was used to find if there was a significant mean difference between teachers' gender in their perspectives toward video game use in the classroom. The resulting analysis is presented in Table 17. Before the researcher applied a one-way ANOVA, the homogeneity assumption was checked by Levene's test for equality of variances, which showed the assumption of homogeneity of variances was violated (p =

0.012). Since this assumption was violated, the researcher could not interpret the standard one-way ANOVA so the Welch ANOVA was used (Laerd Statistics, 2015a; Tabachnick & Fidell, 2007).

As can be seen in Table 17, the results of the Welch ANOVA showed there was a statistically significant mean difference between male and female teachers in their attitudes toward video game, Welch's $F(1, 894.601) = 4.522$; ($p < 0.034$). An inspection of the mean scores indicated female teachers had more positive attitudes ($M = 3.7$, $SD = 0.86$) than did male teachers ($M = 3.5$, $SD = 0.93$).

Table 17

Welch Analysis of Variance: Teachers' Gender

	Statistic	df1	df2	Sig.
Welch	4.522	1	894.601	0.034*

*Significant difference at 0.05 level.

For the learning attitudes section, a one-way ANOVA was used to find if there was a significant mean difference between teachers' gender in their perspectives toward video game use in the classroom. The resulting analysis is presented in Table 18. The results showed there was no statically significant mean difference in learning attitudes between males ($M = 3.72$, $SD = 0.84$) and females ($M = 3.77$, $SD = 0.74$), $F(1,839) = 1.709$, $p = (0.191)$. However, regarding teacher impact, there was a statically significant mean difference between genders in teachers' attitudes, $F(1,868) = 5.820$, $p = (0.016)$. The female teachers had slightly higher means ($M = 3.5$, $SD = 0.79$) than did male teachers ($M = 3.4$, $SD = 0.88$). In the social interaction section, the results showed there was a significant mean difference between genders in teachers' attitudes, $F(1,927) =$

8.902, p = (0.003). Also, female teachers had slightly higher mean scores (M = 3.8, SD = 0.93) than did male teachers (M = 3.6, SD = 1.1). Finally, the results for enjoyment attitudes showed there was no statically significant mean difference between males (M = 3.97, SD = 0.95) and females (M = 4.0, SD = 0.85), $F(1,927) = 0.298$, p = (0.586).

Table 18

Teachers' Attitudes Toward Video Games for Each Section Based on Gender

Sections		Sum of Squares	df	Mean Square	*F*	Sig.
Learning Attitude	Between Groups	1.053	1	1.053	1.709	.191
	Within Groups	516.662	839	.616		
	Total	517.714	840			
Teacher Impact Attitudes	Between Groups	4.026	1	4.026	5.820	.016
	Within Groups	600.472	868	.692		
	Total	604.498	869			
Enjoyment Attitudes	Between Groups	.242	1	.242	.298	.586
	Within Groups	754.451	927	.814		
	Total	754.693	928			
Social Interaction Attitudes	Between Groups	9.193	1	9.193	8.902	.003
	Within Groups	957.223	927	1.033		
	Total	966.416	928			

Q2b Is there a significant mean difference among teachers' grade level of teaching (elementary school, middle school, and high school) in their perspectives toward video game use in the classroom?

A one-way ANOVA was used to find if there was a significant mean difference among teachers' level of teaching (elementary school, middle school, and high school) in their perspectives toward video game use in the classroom. The resulting analysis is presented in Table 19. The dependent variable for this research question was the attitudes toward video game use in the classroom by Saudi teachers and the independent variable was the level of teaching (elementary school, middle school, and high school).

The results shown in Table 19 indicate no statically significant mean difference in teachers' attitudes among elementary school teachers (M = 3.55, SD = 0.94), middle school teachers (M = 3.64, SD = 0.88), and high school teachers (M = 3.61, SD = 0.85), $F(2,919) = 0.947$, $p = 0.388$).

Table 19

Teachers' Attitudes Toward Video Games Based on Level of Teaching

	Sum of Squares	df	Mean Square	*F*	Sig.
Between Groups	1.523	2	0.762	0.947	0.388
Within Groups	739.257	919	0.804		
Total	740.781	921			

As shown in Table 20, there was no statically significant mean difference in learning attitudes among elementary school teachers (M = 3.74, SD = 0.79), middle school teachers (M = 3.78, SD = 0.81), and high school teachers (M = 3.74, SD = 0.77), $F(2,838) = 0.189$, $p = 0.828$). Also, regarding the teacher impact construct, there was no significant mean difference among elementary school teachers (M = 3.51, SD = 0.83), middle school teachers (M = 3.48, SD = 0.86), and high school teachers (M = 3.43, SD = 0.82), $F(2,867) = 0.858$, $p = 0.424$) in teachers' attitudes. Moreover, regarding the enjoyment section, the results showed there was no significant mean difference among elementary school teachers (M = 3.98, SD = 0.93), middle school teachers (M = 3.99, SD = 0.87), and high school teachers (M = 3.97, SD = 0.89), $F(2,926) = 0.032$, $p = 0.968$). Finally, the result for social interaction attitudes showed there was no statistically

significant mean difference in teachers' attitudes among elementary school teachers (M = 3.64, SD = 1.06), middle school teachers (M = 3.72, SD = 1.03), and high school teachers (M = 3.74, SD = 0.94), $F(2,926) = 0.939$, p = 0.391).

Table 20

Teachers' Attitudes Toward Video Games for Each Section Based on Level of Teaching

Sections		Sum of Squares	d.f	Mean Square	F	Sig.
Learning Attitudes	Between Groups	0.233	2	0.116	0.189	.828
	Within Groups	517.482	838	0.618		
	Total	517.714	840			
Teacher Impact Attitudes	Between Groups	1.194	2	0.597	0.858	.424
	Within Groups	603.304	867	0.696		
	Total	604.498	869			
Enjoyment Attitudes	Between Groups	0.052	2	0.026	0.032	.968
	Within Groups	754.641	926	0.815		
	Total	754.693	928			
Social Interaction Attitudes	Between Groups	1.957	2	0.978	0.939	.391
	Within Groups	964.459	926	1.042		
	Total	966.416	928			

Q2c Is there a significant mean difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20, more than 20 years) in their perspectives toward video game use in the classroom?

A one-way ANOVA was used to discover if there was a significant mean difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20, more than 20 years) in their perspectives toward video game use in the classroom. The resulting analysis is presented in Table 21. The dependent variable was the attitudes toward video game use in the classroom by Saudi teachers and the independent variable was the teachers' years of teaching experience (1-5, 6-10, 11-15, 16-20, more than 20 years).

Table 21

Teachers' Attitudes Toward Video Games Based on Teachers' Years of Experience

	Sum of Squares	df	Mean Square	*F*	Sig.
Between Groups	4.068	4	1.017	1.266	0.282
Within Groups	736.713	917	0.803		
Total	740.781	921			

The results showed no statistically significant mean difference in teachers' attitudes among teachers who had 1-5 years of experience ($M = 3.64$, $SD = 0.84$), teachers who had 6-10 years of experience ($M = 3.67$, $SD = 0.87$), teachers who had 11-15 years of experience ($M = 3.48$, $SD = 0.96$), teachers who had 16-20 years of experience ($M = 3.58$, $SD = 0.89$), and teachers who had more than 20 years of experience ($M = 3.55$, $SD = 0.84$), $F(4,917) = 1.266$, $p = 0.282$).

For each section separately (see Table 22), the results showed no statistically significant mean differences in the learning attitude section among teachers who had 1-5 years of experience ($M = 3.73$, $SD = 0.8$), teachers who had 6-10 years of experience ($M = 3.79$, $SD = 0.79$), teachers who had 11-15 years of experience ($M = 3.86$, $SD = 0.80$), teachers who had 16-20 years of experience ($M = 3.80$, $SD = 0.74$), and teachers who had more than 20 years of experience ($M = 3.75$, $SD = 0.79$), $F(4,836) = 0.520$, $p = 0.721$).

Table 22

Teachers' Attitudes Toward Video Games for Each Section Based on Teachers' Years of Experience

Sections		Sum of Squares	Df	Mean Square	*F*	Sig.
Learning Attitudes	Between Groups	1.285	4	0.321	0.520	0.721
	Within Groups	516.429	836	0.618		
	Total	517.714	840			
Teacher Impact Attitudes	Between Groups	1.909	4	0.477	0.685	0.602
	Within Groups	602.589	865	0.697		
	Total	604.498	869			
Enjoyment Attitudes	Between Groups	2.501	4	0.625	0.768	0.546
	Within Groups	752.192	924	0.814		
	Total	754.693	928			
Social Interaction Attitudes	Between Groups	5.922	4	1.480	1.42	0.224
	Within Groups	960.494	924	1.039		
	Total	966.416	928			

Also, in the teacher impact section, there was no significant mean difference among teachers who had 1-5 years of experience ($M = 3.51$, $SD = 0.83$), teachers who had 6-10 years of experience ($M = 3.51$, $SD = 0.81$), teachers who had 11-15 years of experience ($M = 3.39$, $SD = 0.86$), teachers who had 16-20 years of experience ($M = 3.43$, $SD = 0.80$), and teachers who had more than 20 years of experience ($M = 3.50$, $SD = 0.87$), $F(4,865) = 0.685$, $p = 0.602$) regarding teachers' attitudes.

Moreover, in the enjoyment section, the results showed no significant mean difference among teachers who had 1-5 years of experience ($M = 3.99$, $SD = 0.89$), teachers who had 6-10 years of experience ($M = 4.07$, $SD = 0.90$), teachers who had 11-15 years of experience ($M = 3.96$, $SD = 0.91$), teachers who had 16-20 years of experience ($M = 3.96$, $SD = 0.89$), and teachers who had more than 20 years of experience ($M = 3.93$, $SD = 0.92$), $F(4,924) = 0.768$, $p = 0.546$).

Finally, the results for social interaction attitudes showed there was no statistically significant mean difference in teachers' attitudes among teachers who had 1-5 years of experience ($M = 3.75$, $SD = 0.97$), teachers who had 6-10 years of experience ($M = 3.81$, $SD = 1.02$), teachers who had 11-15 years of experience ($M = 3.62$, $SD = 1.06$), teachers who had 16-20 years of experience ($M = 3.63$, $SD = 1.04$), and teachers who had more than 20 years of experience ($M = 3.63$, $SD = 1.02$), $F(4,924) = 1.42$, $p = 0.224$).

The Relationship Between Teaching Philosophy and Teachers' Attitudes

The third research question was about the relationship between Saudi teachers' philosophy in teaching and their attitudes toward video games in education. Saudi teachers' attitudes toward video games in education was compared with three teaching philosophies (behaviorism, cognitivism, and constructivism).

Q3 Based on three major learning theories (behaviorism, cognitivism, and constructivism), is there a significant relationship between teachers' philosophy and their perspectives toward video game use in the classroom?

First of all, descriptive methods such as means and standard deviations were calculated for three teaching philosophies: behaviorism, cognitivism, and constructivism. As can clearly be seen in Table 23, cognitivism philosophy had a slightly higher mean ($M = 3.84$, $SD = 0.86$) than constructivism philosophy ($M = 3.76$, $SD = 1.04$) and behaviorism philosophy ($M = 3.26$, $SD = 1.10$).

Table 23

Means and Standard Deviations for Teaching Philosophy

Teaching Philosophy	*N*	Mean	*SD*
Behaviorism	930	3.26	1.10
Cognitivism	930	3.84	0.86
Constructivism	930	3.76	1.04

To answer this research question and find whether there was a correlation between the teachers' philosophies and their perspectives toward video game use in the classroom, a correlation coefficient test was performed for all teachers' philosophies regarding teachers' perspectives toward video games. Since the assumption of linearity seemed to be violated, a Spearman rank-order correlation was used instead of a Pearson correlation coefficient (*r*) test (Laerd Statistics, 2015b). The Spearman correlation evaluated the monotonic relationship (Laerd Statistics, 2015b; Tabachnick & Fidell, 2007). Table 24 demonstrates the results.

Table 24

Spearman Correlation Between Teachers' Philosophies and Teachers' Attitudes

Philosophy	Correlation	R^2	Sig.
Behaviorism	-0.30	0.09	0.0001*
Cognitivism	0.331	0.11	0.0001*
Constructivism	0.490	0.24	0.0001*

* Correlation is significant at the 0.05 level (2-tailed).

For the behaviorism philosophy, the results showed the Spearman correlation was significant ($p < 0.0001$); there was also a moderate negative correlation between the behaviorism philosophy and teachers' perspectives toward video game use in the classroom, ($r = - 0.3$). The behaviorism philosophy explained only 9% of the variance in Saudi teachers' attitudes toward using video games in the classroom ($R^2 = 0.09$). In other words, teachers who applied a behaviorism philosophy showed negative attitudes toward using video games in their classrooms.

For the cognitivism philosophy, the results showed the Spearman correlation was statistically significant ($p < 0.0001$); there was a moderate positive correlation between a cognitivism philosophy and teachers' perspectives toward video game use in the classroom ($r = 0.331$). The cognitivism philosophy explained only 11% of the variance in Saudi teachers' attitudes toward using video games in the class room ($R^2 = .11$), i.e., teachers who followed a cognitivism philosophy had positive attitudes toward using video games in their classrooms.

Finally, for the constructivism philosophy, the results showed the Spearman correlation was statistically significant ($p < 0.0001$); there was a high positive correlation between the constructivism philosophy and teachers' perspectives toward video game use in the classroom ($r = 0.49$). The constructivism philosophy statistically explained only 24% of the variability in Saudi teachers' attitudes toward using video games in the classroom ($R^2 = .24$), i.e., teachers who applied constructivism philosophy in their teaching demonstrated high positive attitudes toward using video games in their classrooms.

Barriers

The last research question was about barriers preventing Saudi Arabian teachers from using video games in their classrooms. This research question came with the following three sub questions:

Q4 What are the underlying factors or barriers that prevent the Saudi Arabian teachers from using video games in the classrooms?

Q4a Is there a significant difference between teachers' gender and underlying factors or barriers that prevent them from using video games in the classrooms?

Q4b Is there a significant difference among teachers' levels of teaching (elementary school, middle school, and high school) and underlying factors or barriers that prevent them from using video games in the classrooms?

Q4c Is there a significant difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20, +20 years) and underlying factors or barriers that prevent them from using video games in the classrooms?

The purpose of this question was to find main factors that prevented Saudi teachers from using video games in their classroom; they chose among 25 categories of reasons on the survey. Extraction methods are a very important way to reduce data to obtain useful information (Tabachnick & Fidell, 1996, p. 608). The researcher used two methods to find common factors: principal components analysis (PCA) and principal factor analysis (PFA). Both statistical techniques are used when the researcher wants to find which variables in set form coherent subsets are relatively independent of one another (Tabachnick & Fidell, 1996).

The main goal of using PCA or PFA is to reduce a large number of variables to a smaller number of factors. Separately, "the goal of PCA is to extract maximum variance from a data set with a few orthogonal components. The goal of PFA is to reproduce the correlation matrix with a few orthogonal factors" (Tabachnick & Fidell, 1996, p. 635). The researcher decided to use these two methods with varimax rotations. Rotation is the process of moving the factor to offer an interpretable solution. Varimax rotation is orthogonal, i.e., the rotated factors are uncorrelated (Tabachnick & Fidell, 1996, p. 638).

These two methods were run on 25 barriers that might have prevented 930 Saudi teachers from using video games in their classrooms. In the first step of analysis, descriptive methods such as means and standard deviations were calculated for all 25 barriers. The means for 25 variables ranged between 3.29 and 4.35. The mean and standard deviation for the 25 barriers combined were 3.84 and1.01, respectively. Variable number 13 had the highest mean value among all variables at 4.35 and the lowest standard deviation value at 0.87. In contrast, variable number 16 earned the lowest mean value at 3.29 with a standard deviation of 1.17 and the fourth variable had the highest standard deviation of 1.21 among all variables.

An overall Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity were checked before conducting a PCA or PFA (Laerd Statistics, 2015c). The Kaiser-Meyer-Olkin (KMO) measure examined whether factor analysis was an appropriate test for the data (Laerd Statistics, 2015d; Tabachnick & Fidell, 2007). As can be seen in Table 25, the overall Kaiser-Meyer-Olkin (KMO) measure was 0.928; according to Kaiser (1974), more than 0.9 is considered marvelous. On the other hand, Bartlett's test of Sphericity tested the null hypothesis that correlations among dependent variables equal

zero (Laerd Statistics, 2015c). According to Table 26, the Bartlett's Test of Sphericity was statistically significant ($p < 0.0001$), i.e., correlations among dependent variables were not zero so the data would likely factorizable (Laerd Statistics, 2015c).

Table 25

Means and Standard Deviations for Barriers

Barriers	Mean	*SD*
1	3.60	1.06
2	3.85	1.02
3	3.95	0.99
4	3.47	1.21
5	3.71	1.06
6	3.75	1.03
7	3.96	1.08
8	3.98	1.01
9	3.89	1.05
10	3.78	1.09
11	4.16	0.92
12	4.13	0.94
13	4.35	0.87
14	3.90	1.09
15	3.80	0.99
16	3.29	1.17
17	3.61	1.09
18	4.00	0.96
19	3.93	0.91
20	3.87	0.92
21	3.60	1.03
22	3.66	1.01
23	3.64	1.01
24	4.00	0.89
25	4.03	0.97

Table 26

Descriptive Statistics for Kaiser-Meyer-Olkin and Bartlett Tests for Barriers

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.928
Bartlett's Test of Sphericity	Approx. Chi-Square	11807.935
	Df	300
	Sig.	0.0001

The correlation matrix showed the relationship among all variables and how the data were related. From the correlation matrix, there were many strong relationships among the variables, which helped to meet the first assumption in principle component and factor analysis. The strongest relationships appeared between barrier number 19 and barrier number 20 at 0.74 and between barrier number 21 and barrier number 22 at 0.71. On the other hand, there was no relationship among some variables, i.e., between barrier number 16 and barrier number 11 at 0.16.

Principal Component Analysis

The first step of principal component analysis was starting with the eigenvalues of the correlation matrix. Table 27 shows the eigenvalues of the correlation matrix with varimax rotations containing three columns. In principal component analysis, the number of components was equal to the number of variables. There were 25 orderly principal components because there were 25 variables. However, the researcher decided to retain principal components that had variance greater than one according to Kaiser's rule (Tabachnick & Fidell, 1996). The first column in Table 27 shows the eigenvalues for

each principal component that was graphically shaped in Figure 4. The second column presents the percentages that explain the total variance individually while the third column presents percentages that explain the total variance cumulatively.

From the eigenvalue column in Table 27, it can clearly be seen that five principal components were greater than one; similarly there were five dots in Figure 4 above 1. All five principal components together explained 61.53 % of the total variance in the data. To explain 100% of the total variability in the data, all 25 principal components should be considered (Laerd Statistics, 2015c).

Table 27

Eigenvalues of the Correlation Matrix with Varimax Rotations for Principal Component Analysis

N	Eigenvalue	Proportion	Cumulative
1	3.68	14.73	14.73
2	3.54	14.15	28.88
3	2.84	11.35	40.23
4	2.81	11.22	51.45
5	2.52	10.08	61.53

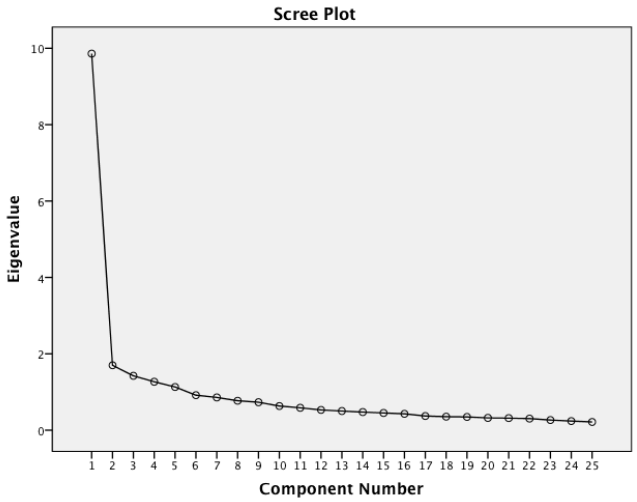

Figure 4. Eigenvalues of the correlation matrix with varimax rotations.

Usually the first principal component is the linear combination of variables that explains the largest amount of variance (Tabachnick & Fidell, 1996). The eigenvalue for the first principal component was 3.68 and explained 14.73% of the total variance, while the eigenvalue for the second principal component was 3.54 and explained about 14.15% of the total variance. The eigenvalue for the third principal component was 2.84 and explained about 11.35% of the total variance. The fourth principal component had a 2.81 eigenvalue, which explained about 11.22% of the total variance. Finally, the eigenvalue for the last principal component was 2.52 and explained about 10.08% of the total variance.

The estimation showed all the variables were accounted for by five components. Table 27 provided the linear combination weights for each component. Table 28 shows the results of orthogonal solutions with varimax rotation, which means the components remain uncorrelated (Tabachnick & Fidell, 2007).

As can be seen in Table 28, the first component had positive loadings for seven barrier numbers (4, 5, 14, 15, 16, 17, and 25) and was named *The impact of educational video games on student and learning process*. The second component had positive loadings for six barrier numbers (11, 12, 13, 18, 19, and 20) and was named *The cost, training, awareness, and technical issues of applying educational video games*. The third component had positive loadings for five barriers number (6, 7, 8, 9, and 10) and it was named *Required times and Ministry of education issues of applying educational video games*. The fourth component had positive loadings for 4 barrier numbers (21, 22, 23,

and 24) and was named *Characteristics of educational video games*. Finally, the fifth component had positive loadings for just three variables (1, 2, and 3) and was named *Harmonization between the educational video games and teaching.*

Table 28

Component Matrix with Varimax Rotation

The Barriers	Component				
	1	2	3	4	5
1. It is difficult to match appropriate styles of teaching with games.	.39	.11	.09	.09	.75
2. It is difficult to locate a specific game related to the content or being taught.	.16	.18	.09	.13	.83
3. There is lack of games that combine fun and education.	.03	.23	.16	.23	.75
4. Teachers cannot control students once they are engaged in gaming.	.63	.02	.36	-.01	.21
5. The level of students' knowledge in using a computer prevents teachers' implementation of games for learning.	.58	.25	.33	.14	.18
6. Students need sufficient time to become familiar with the rules and the techniques of a game.	.49	.09	.52	.11	.08
7. Limited class time does not allow enough time for game play.	.23	.23	.70	.11	.06
8. Video games require additional lesson preparing time.	.20	.16	.74	.21	.12
9. The Ministry of Education has not approved educational games.	.13	.23	.44	.24	.32
10. Games don't compatible with curriculum or academic standards of Ministry of Education.	.34	.25	.37	.29	.36
11. There is a lack of professional training of using video games for teachers.	-.02	.67	.35	.06	.27
12. The high cost of purchasing educational games.	.09	.57	.43	.28	.17
13. Most Internet games run on high-speed networks, but schools cannot provide adequate networks.	.01	.63	.43	.19	.21
14. Efficient learning cannot be guaranteed when students' perceive instructional gaming as play.	.54	.32	.25	.25	.13
15. It is very difficult to give relevant feedback to a student according to his/her progress in a game.	.56	.22	.34	.27	.17
16. Digital game-based learning cannot meet desired learning objectives.	.75	.02	.07	.24	.14
17. Playing video game may have negative influences on the students' behavior.	.71	.24	-.02	.12	.06
18. Most teachers have no knowledge about how to teach with games.	.21	.62	.15	.12	.23
19. Parents' negative perceptions of video games for teaching and learning.	.42	.74	.03	.16	.04
20. Administrators' negative perceptions of video games as educational.	.37	.70	.00	.26	.07
21. Low quality of graphic and audio in educational games.	.24	.14	.14	.76	.12
22. Low quality in the design and play mechanics of educational digital games.	.19	.16	.14	.81	.11
23. Lack of educational video games in Arabic language.	.12	.16	.12	.65	.18
24. Lack of access to reference materials for teaching with games.	.08	.42	.29	.50	.19
25. A side effect of integrating games into teaching can be students' addiction to gaming.	.39	.36	.29	.38	.05

Principal Factor Analysis

Principal component analysis (PCA) and principal factor analysis (PFA) are both variable reduction methods. They have similar results but principal factor analysis is different since it uses a common factor model. The process to conduct the principal factor analysis is similar to principal component analysis (Tabachnick & Fidell, 1996). To use PFA, the researcher applied principal axis factoring (PAF) with varimax rotation. Table 29 shows five common factors that had eigenvalues greater than 1.

Table 29

Eigenvalues of the Correlation Matrix with Varimax Rotations for Principal Factor Analysis

N	Eigenvalue	Proportion	Cumulative
1	3.64	14.57	14.57
2	3.26	13.04	27.61
3	2.22	8.89	36.51
4	2.13	8.50	45.01
5	1.99	7.94	52.95

All five factors together explained 52.95% of the total variance in the data. To explain 100% of the total variability in the data, all 25 principal factors should be considered. In PFA, as in Table 29, the eigenvalues summarized the variance in the correlation matrix. The first factor in the eigenvalues column had the largest value and

the most variance and so on until the last factor, which had small or negative eigenvalues (Tabachnick & Fidell, 1996).

In Table 29, the eigenvalue for the first factor was 3.64 and explained 14.57% of the total variance, while the eigenvalue for the second factor was 3.26 and explained 13.04% of the total variance. The eigenvalue for the third factor was 2.22 and explained 8.89% of the total variance. The fourth factor had a 2.13 eigenvalue that explained about 8.5% of the total variance. Finally, the eigenvalue for the last factor was 1.99 and explained about 7.94% of the total variance.

Table 30 shows the matrix loading for each of the five factors with varimax rotation, which means the factors remained uncorrelated (Tabachnick & Fidell, 2007). The first factor had positive loadings for nine barrier numbers (4, 5, 6, 10, 14, 15, 16, 17, and 25) and was named *The impact of educational video games on student and learning process*. The second factor had positive loadings for seven barrier numbers (7, 8, 9, 11, 12, 13, and 24) and was named *Required times, cost, training, and technical issues of applying educational video games*. The third factor had positive loadings for three barrier numbers (21, 22, and 23) and was named *Characteristics of educational video games*. The fourth factor had positive loadings for three barrier numbers (1, 2, and 3) and was named *Harmonization between the educational video games and teaching*. Finally, the fifth factor had positive loadings for just three barrier numbers (18, 19, and 20) and was named *Unawareness of educational video games*.

Table 30

Factor Matrix with Varimax Rotation

The Barriers	Factor 1	2	3	4	5
1. It is difficult to match appropriate styles of teaching with games.	.39	.11	.11	.68	.10
2. It is difficult to locate a specific game related to the content or being taught.	.17	.18	.13	.78	.11
3. There is lack of games that combine fun and education.	.09	.29	.20	.64	.12
4. Teachers cannot control students once they are engaged in gaming.	.61	.18	.04	.17	.06
5. The level of students' knowledge in using a computer prevents teachers' implementation of games for learning.	.57	.27	.16	.18	.22
6. Students need sufficient time to become familiar with the rules and the techniques of a game.	.54	.33	.13	.09	.07
7. Limited class time does not allow enough time for game play.	.37	.54	.12	.07	.06
8. Video games require additional lesson preparing time.	.38	.59	.19	.11	-.02
9. The Ministry of Education has not approved educational games.	.24	.41	.21	.25	.11
10. Games don't compatible with curriculum or academic standards of Ministry of Education.	.40	.37	.27	.31	.16
11. There is a lack of professional training of using video games for teachers.	.06	.57	.09	.25	.37
12. The high cost of purchasing educational games.	.17	.60	.24	.18	.29
13. Most Internet games run on high-speed networks, but schools cannot provide adequate networks.	.09	.64	.17	.20	.32
14. Efficient learning cannot be guaranteed when students' perceive instructional gaming as play.	.51	.28	.24	.14	.26
15. It is very difficult to give relevant feedback to a student according to his/her progress in a game.	.58	.30	.25	.17	.18
16. Digital game-based learning cannot meet desired learning objectives.	.67	-.01	.23	.14	.12
17. Playing video game may have negative influences on the students' behavior.	.57	.05	.13	.09	.27
18. Most teachers have no knowledge about how to teach with games.	.21	.36	.15	.23	.40
19. Parents' negative perceptions of video games for teaching and learning.	.33	.24	.16	.08	.75
20. Administrators' negative perceptions of video games as educational.	.27	.24	.25	.13	.66

21. Low quality of graphic and audio in educational games.	.25	.18	.69	.14	.13
22. Low quality in the design and play mechanics of educational digital games.	.20	.19	.79	.12	.14
23. Lack of educational video games in Arabic language.	.18	.22	.44	.18	.15
24. Lack of access to reference materials for teaching with games.	.16	.46	.39	.21	.24
25. A side effect of integrating games into teaching can be students' addiction to gaming.	.40	.36	.31	.10	.24

According to Table 31, the first component and factor are almost the same. Also, the fifth principle component and fourth factor are the same. Similarly, the fourth principle component and third factor are the same with variable 24 loading to the second factor rather than the third factor. Also, the first component and factor are similar but variables 6 and 10 loaded to the third component rather than the first component. Moreover, all the variables loading to factor five were loading to the second component.

In the last column of Table 31, reliability was presented for each principle component and factor. The values of Cronbach's alpha were between 0.76 and 0.87. These values are considered to have a high level of internal consistency for the scale (Creswell, 2012).

Table 31

Naming and Comparing Components and Factors

N	Type	Name	Variables	CA
First	C	The impact of education video games on student and learning process	4, 5, 14, 15, 16, 17, 25	0.85
	F	The impact of education video games on student and learning process	4, 5, 6, 10, 14, 15, 16, 17, 25	0.87
Second	C	The cost, training, awareness, and technical issues of applying educational video games	11, 12, 13, 18, 19, 20	0.86
	F	Required times, cost, training, and technical issues of applying educational video games	7, 8, 9, 11, 12, 13, 24	0.84
Third	C	Required times and Ministry of education issues of applying educational video games	6, 7, 8, 9, 10	0.78
	F	Characteristics of educational video games	21, 22, 23	0.76
Fourth	C	Characteristics of educational video games	21, 22, 23, 24	0.79
	F	Harmonization between the educational video games and teaching	1, 2, 3	0.81

Fifth	C	Harmonization between the educational video games and teaching	1, 2, 3	0.81
	F	Unawareness of educational video games	18, 19, 20	0.8

C= Component, F = Factor, CA = Cronbach's alpha.

Q4a Is there a significant difference between teachers' gender in underlying factors or barriers that prevent them to use video games in the classrooms?

To answer the sub-questions of research question 4, the researcher found five factors were considered a variable. The difference between genders was examined in the factors and components. Dependent variables for this research question were the five factors or five components that prevented Saudi teachers from using video games in their classrooms. The researcher used factor scores to define the five factors. The independent variable for this research questions was the gender of Saudi teachers (male, female).

Since there were five dependent variables, a MANOVA was used to find if there was a significant mean difference between teachers' gender in the five factors. Prior to performing the MANOVA test, several assumptions had to be examined. There was no clear violation on MANOVA assumptions of normality, linearity, homogeneity of

regression, and homogeneity of variance-covariance matrices (Laerd Statistics, 2015d; Stevens, 1986; Tabachnick & Fidell, 1996).

For the PCA and according to Wilks' Lambda, $F = 3.07$, ($P > 0.009$), the results indicated there was a significant difference between teachers' gender in all five dependent variables combined. When the results for dependent variables were considered separately (see Table 32), there was no statistically significant mean difference in the first components between males ($M = 0.007$, $SD = 0.94$) and females ($M = - 0.007$, $SD = 1.05$), $F = 0.05$, $p = 0.83$. Regarding the second components, the results showed no significant mean difference between genders ($F = 0.1$, $p = 0.76$). However, in the third components, there was a statistically significant mean difference between genders ($F = 5.29$, $p = 0.02$). Female teachers had slightly more loadings ($M = 0.072$, $SD = 0.98$) than male teachers s ($M = - 0.08$, $SD = 1.02$). Also, in the fourth components, the results showed that there was no significant mean difference between males ($M = 0.062$, $SD = 0.99$) and females ($M = - 0.06$, $SD = 1.006$), $F = 3.29$, $p = 0.07$. Finally, the results on the last components showed a significant mean difference between genders ($F = 6.54$, $p = 0.01$). Male teachers also had slightly more loadings ($M = 0.09$, $SD = 1.04$) than female teachers ($M = - 0.08$, $SD = 0.95$).

Table 32

Multivariate Analysis of Variance for Each Principal and Factor Based on Gender

Sections		Type III Sum of Squares	df	Mean Square	*F*	Sig.
Components	Component 1	0.045	1	0.045	0.05	0.83
	Component 2	0.096	1	0.096	0.10	0.76
	Component 3	5.263	1	5.263	5.29	0.02*
	Component 4	3.287	1	3.287	3.29	0.07

	Component 5	6.505	1	6.505	6.54	0.01*
Factors	Factor 1	0.21	1	0.21	0.27	0.60
	Factor 2	2.37	1	2.37	3.21	0.07
	Factor 3	4.69	1	4.69	6.22	0.01*
	Factor 4	3.80	1	3.80	4.93	0.03*
	Factor 5	0.09	1	0.09	0.13	0.72

*Significant difference at 0.05 level.

For the PFA and according to Wilks' Lambda *(F = 3.27, P >* 0.006), the results showed a significant difference between teachers' gender on all five dependent variables combined. When the results for dependent variables were considered separately as shown in Table 31, the results showed no statistically significant mean difference for the first factor between females (*M* = 0.015, *SD* = 0.926) and males (*M* = - 0.016, *SD* = 0.84), *F* = 0.27, *p* = 0.60. Also, the results for the second factor showed no significant mean difference between genders (*F* = 3.21, *p* = 0.07). However, the results for the third factor showed a statistically significant mean difference between genders (*F* = 6.22*, p* = 0.01). Female teachers had slightly more loadings on factor three (*M* = 0.074, *SD* = 0.86) than male teachers (*M* = - 0.068, *SD* = 0.88). Also, the results for the fourth factor showed a significant mean difference between genders (*F* = 4.93, *p* = 0.03). Male teachers had slightly more loadings on factor four (*M* = 0.07, *SD* = 0.92) than female teachers (*M* = - 0.062, *SD* = 0.84). Finally, the results for the last factor showed no significant mean difference between genders (*F* = 0.13, *p* = 0.72).

Q4b Is there a significant difference among teachers' levels of teaching (elementary school, middle school, and high school) in underlying factors or barriers that prevent them from using video games in the classrooms?

To answer this sub-question, the differences among levels of teaching (elementary school, middle school, and high school) were examined in the factors and components. The dependent variables for this research question were the five factors or five

components that prevented Saudi teachers from using video games in the classrooms. The researcher used factor scores to define the five factors. The independent variable was the levels of teaching (elementary school, middle school, and high school) for Saudi teachers.

Since there were five dependent variables, a MANOVA was used to find if there was a significant mean difference among levels of teaching (elementary school, middle school, and high school). Prior to performing the MANOVA test, several assumptions had to be examined. There was no clear violation on MANOVA assumptions of normality, linearity, homogeneity of regression, and homogeneity of variance-covariance matrices (Laerd Statistics, 2015d; Tabachnick & Fidell, 1996).

For the PCA and according to Wilks' Lambda ($F = 0.946$, $P > 0.489$), the results indicated no significant difference among teachers' levels of teaching (elementary school, middle school, and high school) in all five dependent variables combined. Although there was no difference among teachers' levels of teaching, the teachers in elementary schools had slightly more loadings on the first and fourth components, middle school teachers had slightly more loadings on the third and fifth components, and high school teachers had slightly more loadings on second, third, and fifth components.

For the PFA and according to Wilks' Lambda ($F = 1.22$, $P > 0.272$), the results indicated no significant difference among teachers' levels of teaching (elementary school, middle school, and high school) in all five dependent variables combined. Although there was no difference among teachers' levels of teaching, the teachers in elementary schools had slightly more loadings on the first, third, and fifth factors; middle school

teachers had slightly more loadings on the second, third, and fourth factors; and high school teachers had slightly more loadings on the third, fourth, and fifth factors.

Q4c Is there a significant difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20, +20 years) in underlying factors or barriers that prevent them from using video games in the classrooms?

To answer this sub-question, the researcher found the five factors were considered as a fifth variable. The differences among teachers' years of experience (1-5, 6-10, 11-15, 16-20, more than 20 years) were examined in the factors and components. Dependent variables for this research question were the five factors or five components that prevented Saudi teachers from using video games in the classrooms. The researcher used factor scores to define the five factors. The independent variable was Saudi teachers' years of experience (1-5, 6-10, 11-15, 16-20, more than 20 years).

Since there were five dependent variables, a MANOVA was used to find if there was a significant mean difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20, more than 20 years) in the five factors. Prior to performing the MANOVA test, several assumptions had to be examined. There was no clear violation on MANOVA assumptions of normality, linearity, homogeneity of regression, and homogeneity of variance-covariance matrices (Laerd Statistics, 2015d; Tabachnick & Fidell, 1996).

For the PCA and according to Wilks' Lambda ($F = 1.064$, $P > 0.381$), the results indicated no significant difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20, and more than 20 years) in all five dependent variables combined. Although there was no difference among teachers' years of experience, teachers with 6 to 10 years experience had slightly more loadings on the second, third, and fifth components; teachers with 11 to 15 years experience had slightly more loadings on the first, second,

fourth, and fifth components; teachers with 16 to 20 years experience had slightly more loadings on the first, second, fourth, and fifth components; and teachers with more than 20 years experience had slightly more loadings on the first and third components.

For the PFA and according to Wilks' Lambda ($F = 1.105$, $P > 0.336$), the results indicated no significant difference among teachers' years of experience (1-5, 6-10, 11-15, 16-20, and more than 20 years) in all five dependent variables combined. Although there was no difference among teachers' years of experience, teachers with 6 to 10 years experience had slightly more loadings on the second and fourth factors; teachers with 11 to 15 years experience had slightly more loadings on the first, third, fourth, and fifth factors; teachers with 16 to 20 years of experience had slightly more loadings on all factors; and teachers with more than 20 years experience had slightly more loadings on the first factor.

Chapter Summary

This study analyzed quantitative data collected by a questionnaire. The instrument showed a high level of internal consistency for the scale. This chapter was divided into five parts. The first part was about the results of the demographic data including information about teachers' gender, levels of teaching, years of teaching experience, playing video game experience, and teachers' philosophy. Saudi Teachers (N=930) participated in this study. Male teachers represented 48.1% of the participants while female teachers represented 51.9% of the participants. The second part was about Saudi teachers' experience in playing video games defined by the number of hours spent per week in Saudi Arabia. Results also showed a difference among teachers' gender, teachers' level of teaching, teachers' years of experience, and number of hours spent per

week on video game play. The results indicated 496 teachers (53.3%) do not play video games at all. Male teachers spent more hours playing video games than did female teachers. High school teachers spent more hours playing video games than teachers in middle school and elementary school. Also, teachers who had 11-15 years experiences spent more hours playing video games than did others.

For the type of video games, puzzles were found to be the most popular type of games for female teachers while the most popular type of games for male participants was sports. On the other hand, the results showed the most popular reason for playing video games among participants was enjoyment.

The third part was about Saudi teachers' attitudes toward video game use in the classroom. Results showed a difference among teachers' gender, teachers' level of teaching, and teachers' years of experience in attitudes toward video game use in the classroom. The results showed a mean of 3.6 for the 26 statements combined. On the other hand, the mean scores indicated female teachers had more positive attitudes than male teachers. Attitudes in the enjoyment section were reported more than other sections. In contrast, there was no statistically significant difference in teachers' attitudes among levels of teaching (elementary school, middle school, and high school) and teachers' years of experience.

The fourth part was about the relationship between teachers' philosophy and their attitudes toward video game use in the classroom. A Spearman correlation was run to assess the relationship between teachers' philosophies in teaching and their attitudes toward video games in education. The results showed a moderate negative correlation between behaviorism philosophy and teachers' attitudes ($r = -0.3$, $p < 0.0005$),

behaviorism philosophy explaining 9% of the variation. On the other hand, there was a moderate positive correlation between cognitivism philosophy and teachers' attitudes (r = .331, $p < .0005$), with cognitivism philosophy explaining 11% of the variation. Finally, there was high positive correlation between constructivism philosophy and teachers' attitudes ($r = 0.49$, $p < 0.0005$), with constructivism philosophy explaining 24% of the variation.

The last section defined barriers preventing Saudi teachers from using video games in their classrooms. It also showed the difference among teachers' gender, teachers' level of teaching, and teachers' years of experience regarding the barriers. The researcher used two methods to find the common factors: principal components analysis and principal factor analysis. The results showed five principal components and five factors. The results also found a significant difference between teachers' gender in all five dependent variables combined. In contrast, there was no statistically significant difference among levels of teaching (elementary school, middle school, and high school) and teachers' years of experiences.

In the following chapter, the concepts of the study are reviewed, the main results for every research question are discussed, and the strengths, contributions, and limitations of the study are presented.

CHAPTER V

DISCUSSION AND CONCLUSION

The final chapter of this dissertation provides the purpose of the study, the research questions, and a summary of the findings. The contributions, limitations, implications, recommendations for future research of the study, and conclusions are also discussed in this chapter.

The purpose of this descriptive study was to investigate Saudi teachers' experiences with video games and their perceptions about video game integration in education at the elementary, middle school, and high school levels in Saudi Arabia. It also investigated the relationship between teachers' philosophy based on three major learning theories (behaviorism, cognitivism, and constructivism) and their perspectives toward video game use in the classroom. Moreover, this study identified significant factors that prevented Saudi teachers from using video games in their classroom.

This study answered four main questions. The first two main questions were descriptive in nature and were used to identify participants' responses to specific variables. Under each descriptive question are three comparison questions that were asked to determine how two or more groups on an independent variable differed on one or more dependent variables. The third main question aimed to find the relationship between two variables. The last main question served to find underlying factors with three comparison questions.

The following research questions guided this study:

Q1 What are Saudi Arabian teachers' current gaming experiences as defined by the number of hours spent on video games per week?

- Q1a Is there a significant mean difference between teachers' gender in the number of hours spent per week on video game play?
- Q1b Is there a significant mean difference between teachers' level of teaching (elementary school, middle school, and high school) in the number of hours spent per week on video game play?
- Q1c Is there a significant mean difference between teachers' experience (1-5, 6-10, 11-15, 16-20, more than 20 years) in the number of hours spent per week on video game play?

Q2 What are the attitudes of Saudi Arabian teachers toward video games in education utilizing the Games in the Classroom Attitudes Survey (GCAS)?

- Q2a Is there a significant mean difference between teachers' gender in their perspective toward video game use in the classroom?
- Q2b Is there a significant mean difference between teachers' grade level of teaching (elementary school, middle school, and high school) in their perspectives toward video game use in the classroom?
- Q2c Is there a significant mean difference between teachers' experience (1-5, 6-10, 11-15, 16-20, more than 20 years) in their perspectives toward video game use in the classroom?

Q3 Based on three major learning theories (behaviorism, cognitivism, and constructivism), is there a significant relationship between teachers' philosophy and their perspectives toward video game use in the classroom?

Q4 What are the underlying factors or barriers that prevent the Saudi Arabian teachers from using video games in the classrooms?

- Q4a Is there a significant difference between teachers' gender in underlying factors or barriers that prevent them to use video games in the classrooms?

Q4b Is there a significant difference between teachers' levels of teaching (elementary school, middle school, and high school) in underlying factors or barriers that prevent them from using video games in the classrooms?

Q4c Is there a significant difference between teachers' experience (1- 5, 6-10, 11-15, 16-20, +20 years) in underlying factors or barriers that prevent them from using video games in the classrooms?

A researcher-designed electronic survey was completed by 930 Saudi teachers. The survey consisted of four sections; each section related to a research question discussed in this chapter. The first section contained the results of the demographic data including information about teachers' gender, levels of teaching, years of teaching experience, and playing video game experience. Based on the results and findings from this section, male teachers represented 48.1% of the participants and female teachers represented 51.9% of the participants. The total teacher population in Saudi Arabia was represented by 46% male teachers and 54% female teachers. Thus, the ratio between male and female teachers in my sample was comparable to the ratio in the real population. In my sample, 41.4% of participants were teaching in elementary school, 25.7% were teaching in middle school, and 32.9% were teaching in high school. Slightly similar, the population of elementary school teachers in Saudi Arabia is 49.8%, 26.4% for middle school teachers, and 23.8% for high school teachers.

Many types of video games were shown in this study: fighting games, puzzles games, sports games, adventure games, strategy games, and other games. The findings revealed 56.9% of teachers chose puzzle games as their preferred type of video games. Next were sport video games-- 35.1%, strategy video games--33.4%, adventure video games--28.5%, and fighting video games--12.7%. Teachers who chose "Others" for the

type of video games represented 8.5% of the total participants. These results aligned with a prior study in Taiwan when Hsu and Chiou (2011) found 52.9% of pre-service teachers preferred puzzle games and about 33.9% of pre-services teachers preferred sport video games. This comparison among study findings shows that Saudi teachers' gaming preferences are generally aligned with preferences of others documented in the literature.

Regarding the difference between genders, the results revealed male teachers preferred fighting and sport video games while female teachers preferred puzzle, adventure, and strategy games. These results were supported by Alqurashi et al. (2015) and Miller (2008). The participants differed in their game preferences (Malone, 1981). As Miller mentioned, males prefer fighting games because some characteristics present in fighting games use short-term memory and repeated actions. In contrast, female students prefer adventure games because females are generally realistic and tend to solve problems without taking risks (Miller, 2008). Although the difference between gender about the type of preferring games is no important for this study, this difference proves the agreement between this study and previous studies. Also, this consideration will help the Ministry of Education in Saudi Arabia for designing the educational video games.

Regarding the reasons that attracted Saudi teachers to play video games, the results showed the most popular reason for playing video games among the participants was for enjoyment with 66.8% of the total answers. This was followed by leisure time--45.1%, playing video games for intelligence development--42.8%, playing for competition--37.5%, playing video games to develop talent--18.9%, playing video games for discovery--16.3%, and playing for communication--5.7% of all participants. While 15.2% of teachers played video games to join others, only 4.8% of teachers played video

games for curiosity. In general, the results showed most of the reasons for playing video games were similar between male and female teachers. The most popular reason for male teachers was competition, while the most reason for playing video games for female teachers was intelligence development.

Research Question 1

For the first research question, the findings revealed 53.3% of total participants did not play video games. This result aligned with prior studies conducted by Noraddin and Kian (2014), and FutureLab (2009). Noraddin and Kian (2014) found 44% of their sample did not play video games. Another study by FutureLab (2009) showed that of 1,628 primary and secondary teachers, 42% of the teachers never played computer games and 23% teachers reported they played computer games less than once a month. On the other hand, my results did not support prior studies conducted by Wu (2015) and Hsu and Chiou (2011) where only 15.5% and 3.2% of participants, respectively, had never played video games.

By contrast, the results showed 46.7% of participants played video games. These results were similar to results found in a study by Noraddin and Kian (2014) where 56.0% of the respondents played video games. While only about 3% of my sample played more than eight hours a week, 15% played the same number of hours in a study conducted by Jones, Copeland, and Kalinowski (2007) on pre-service teachers enrolled at a north Texas university.

The results from my survey showed that 27.5% of teachers play video games for one hour a week. My results agreed with findings by the FutureLab (2009) study, which showed 23% of the teachers played video games for about one hour a week. Also, the

findings of my study showed about 2% of teachers played video games for more than 10 hours a week. This percentage did not support a prior study by Wu (2015) whose results showed no teachers played video games more than 10 hours a week.

To implement video games in classroom, students need to be guided through the gaming activities. To do that, teachers need to have some experience about video games to be able to tutor and guide students to use video games in learning (Marklund & Taylor, 2015). However, having experience with video games is not mandatory. As stated by Bourgonjon and Hanghøj (2011), "Teachers don't necessarily need to become experts with every new medium, but at the very least need to know what is going on [...] in order to participate" (p. 71). Also, they said "the description of DGBL is an interplay between distinct but intermingling knowledge aspects, and the need for teachers to become anthropologists rather than gamers" (p. 67). Even though the results showed the majority of teachers do not play video games, there was no difference between the player and non-player teacher attitudes toward applying video games in classrooms. The mean of the attitudes of non-player teachers was 3.4 and the mean of the attitudes for player teachers was 3.7. Also, the researcher did not find any relationship between teachers' experience playing video games and their attitudes toward applying video games in classroom. In conclusion, Saudi teachers do not need to be gamers but the Ministry of Education should train them for using the video games before approving the application of their use in classrooms.

There was a significant difference in the means between male and female teachers in the number of hours games were played (males = 1.02, females = 0.8). This result was expected and complemented the literature because many studies also found similar

differences (Aliefendic, 2013; Alqurashi et al., 2015; Hofferth, 2010; Nippold, Duthie, & Larsen, 2005; Qudair, 2011; Tobias, Halter, & Newbauer, 2015; Winn & Heeter, 2009). There are many reasons for these differences. First, it could be that many games were designed for male players (Aliefendic, 2013). Miller (2008) said, "One of the arguments that often arises about girls and video games is that girls are not willing to devote as much time to playing as boys" (p. 63). Miller (2008) also stated, "Unfortunately, the current sophistication level of most video games cannot utilize girls' greatest weapons: communication and imagination" (p. 64). Finally, Tobias et al. (2015) provided five reasons for this gender discrepancy: "biases against women video game players; preferences of females for more social activities compared to males; less of a need for competitiveness, variety, and accomplishment compared to males; differentiation of play for females versus males; and differences in preferences regarding video game content or goals" (p. 26).

In my opinion, this difference of teachers' experiences in playing video games between gender does not impact the ability of applying video games in classrooms. Many previous works and this study results proved that male play video games more than female. However, the female teachers show more positive attitude toward applying video games in classrooms than male teachers. This proves that teachers don't need to be good gamer to employ video games in classrooms.

Research Question 2

The second research question used the Games in the Classroom Attitudes Survey (GCAS) developed by this researcher to identify Saudi teachers' attitudes toward video games in classrooms. It was based a 5-point Likert scale ranging from 1 = *Strongly*

Disagree, 2 = *Disagree*, 3 = *Neutral*, 4 = *Agree*, to 5 = *Strongly Agree*. Based on this scale, the mean score for Saudi teachers' overall attitudes toward video games was 3.6. This score indicated teachers' attitude toward video games was fairly positive. This mean is very close to the mean in the pilot study (3.7).

The GCAS was comprised of four sections. The first section determined a learning construct that contained 13 items about learning content and learning engagement. The learning construct had a mean of 3.51. This indicated Saudi teachers had positive attitudes toward games in teaching and learning for content knowledge, thinking skills, classroom performance, increased achievement, motivation and engagement, and effective learning. These results agreed with the pilot study, which had a 3.6 mean for this section.

The second section of the GCAS was the teacher impact construct, which had five items with a mean of 3.32. This section had the lowest mean among all sections; thus, this researcher could not assert that most teachers in Saudi Arabia believe games could improve teachers' performance, help teachers instruct students, support traditional teaching strategies, and guide teachers' instructional planning. Similarly, the mean for this section of the pilot study was 3.3.

The third section of GCAS formed the enjoyment construct and had a mean of 3.99. The enjoyment construct had the highest mean among all sections, indicating most Saudi teachers agreed that games could create enjoyment in the classroom and make learning fun and exciting. This mean was slightly lower compared to the pilot study's mean of 4.2.

The last construct was social interaction with a mean of 3.7. This indicated teachers thought games could enhance social interaction, help students interact with each others, and make a collaborative classroom. These results matched the pilot study's mean of 3.7 for this section.

All of these results agreed with many previous research studies about teachers' attitudes (Alrasheedi, 2009; Hsu &Chiou, 2011; Jones et al., 2007; Noraddin & Kian, 2014; Sobhani & Bagheri, 2014; Wu, 2015). Alrasheedi (2009) found the teachers in Kuwait had positive attitudes toward information and communication technology (ICT) since the mean score for overall teachers' attitudes was 3.35. Also, Noraddin and Kian (2014) noted the means for the perception of digital games ranged from 3.62 to 3.73. Sobhani and Bagheri (2014) mentioned the teachers had positive attitudes toward games and fun activities and the teachers were motivated in using games and fun activities in the classroom. Wu (2015) asked teachers about enjoying playing video games; the result showed a generally positive answer with 57.8% of teachers either strongly agreeing or agreeing compared to only 13.8% teachers disagreeing or strongly disagreeing.

The overall results showed there was a significant difference between teachers' attitudes according to gender. Results showed that female teachers had more positive attitude than male teachers. This result conflicts with the common thought that stated males were perceived to have higher attitudes toward computers than females (Alrasheedi, 2009; Liao, 1999; Sharp, 2005; Young, 1999). On the other hand, Noraddin and Kian (2014) and the pilot study did not find any significant difference between teachers' attitudes according to gender.

In general, both gender groups felt playing games was enjoyable, provided a challenge, allowed them to cooperate and develop useful skills and knowledge, and preferred to play video games alone. Clark and Ernst (2009) mentioned in their study that 74% of their participants agreed gaming was a valuable resource and learning tool for students. In contrast, female students felt video games filled their leisure time more than did male students while male students believed playing games was more exciting than did female students. The findings of this study align with existing literature, but also raise questions about potential connections among gender, game play, and implementation of gaming as a teaching and learning tool.

There was no statistically significant mean difference in teachers' attitudes among levels of teaching (elementary school, middle school, and high school) and teachers' years of experience (1-5, 6-10, 11-15, 16-20, more than 20 years). This was not surprising as many studies showed the same results. Noraddin and Kian (2014) noted no statistically significant mean differences in teachers' attitudes among the length of teaching experience, teachers' age group, and teachers' majors. This shows that years of teaching experience or grade level does not have significant influence on Saudi teachers' attitudes about video games as a teaching and learning too. This could mean that opportunities to introduce gaming strategies or gamification practices within Saudi educational environments could be successful as a means of teaching and learning, regardless of education instruction level or teacher experience.

Research Question 3

The third question asked about the relationship between teachers' philosophy and their attitudes toward video game use in the classroom. The results showed there was a

moderate negative correlation between behaviorism philosophy and teachers' attitudes (r = -0.3), a moderate positive correlation between cognitivism philosophy and teachers' attitudes (r = .331), and a high positive correlation between constructivism philosophy and teachers' attitudes toward video game use in the classroom (r = .49). These results aligned and supported a previous study that discovered a relationship between teaching philosophies and some kinds of educational games (Wu, 2015). Wu (2015) found a negative correlation between behaviorism and educational games design (r = - 0.30); a positive correlation between cognitivism and educational games design (r = 0.25); and a positive correlation between constructivism and educational game design tools (r = 0.23).

Behaviorism learning theory defines learning as knowledge in the form of observable behaviors and ignores what occurs in the learner's brain. Teachers who apply behaviorism theory are the opposite of applying learning objectives such as creativity and artifact creation. The findings of this study were congruent with what was previously stated since the teachers who applied behaviorism had a negative attitude toward using video games in classrooms. This could be due to the definition of this theory where the input and output of knowledge is in the form of observable behaviors and not based on cognitive learning offered by educational video games.

In contrast to behaviorism, cognitivism theory stresses internal mental (cognitive) processes that include thinking, language, memory, and problem solving. The main focus of the cognitive approach is to encourage the learner to use suitable learning strategies. My results showed teachers who followed cognitivism learning theory presented positive attitudes toward applying games in their classroom. This was considered relevant to the definition of this theory since educational video games develop a cognitive learning style

in the form of multitasked learning that includes exploration and discovery activities. Educational games can enhance cognitive learning when teachers use pedagogical practices with cognitive processing.

The learning process in constructivism theory is seen as a meaningful creation formed from experience. It is a constructive method where learners construct information based on their prior experience as well as culture to aid their learning. Similar to cognitivism, the findings of this study demonstrated a correlation between teachers who applied constructivism theory in their classroom and their attitudes toward using video games in classroom. As a consequence, educational game features include studied strategies and moves that require creativity, quick reaction, and construction.

Research Question 4

The last question tried to discover main factors that prevented Saudi teachers from using video games in their classroom among 25 categories of reasons based a 5-point Likert scale ranging from 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Neutral*, 4 = *Agree*, 5 = *Strongly agree*. Based on this scale, the overall mean score for the 25 categories of reasons was 3.84. This score indicated Saudi teachers fairly agreed with the 25 categories of reasons.

Six reasons had mean scores more than 4: “There is a lack of professional training of using video games for teachers,” “The high cost of purchasing educational games,” “Most Internet games run on high-speed networks but schools cannot provide adequate networks,” “Most teachers have no knowledge about how to teach with games,” “Lack of access to reference materials for teaching with games,” and “A side effect of integrating

games into teaching can be students' addiction to gaming." The mean scores for the rest were confined between 3.98 and 3.29. The lowest mean was with reason number 16: "Digital game-based learning cannot meet desired learning objectives."

This result was not surprising according to Wu's (2015) study in this area. Wu (2015) mentioned the cost of purchasing games got the highest mean score with 3.81 and number 16-- "Digital game-based learning cannot meet desired learning objectives" received the lowest mean with 2.71. In Baek's (2008) study, the mean scores for the most barriers rated between 3.99 and 3.08 and the highest mean was 4.15.

The researcher used two methods to find common factors. The first method was principal component analysis. The results showed there were five components. The first component was "The impact of education video games on student and learning process"; it had positive loadings for seven barriers: controlling students, students' knowledge in using a computer, students' perceptions toward games, providing feedback, meeting desired learning objectives, negative influences on students' behaviors, and student addiction. It explained 14.73% of the total variance.

The second component was "The cost, training, awareness, and technical issues of applying educational video games"; it had positive loadings for six barriers about cost, training, awareness, and technical issues. It explained 14.15% of the total variance.

The third component was "Required times and Ministry of Education issues of applying educational video games"; it had positive loadings for five barriers about time issues and Ministry of Education issues. It explained 11.35% of the total variance.

The fourth component was “Characteristics of educational video games”; it had positive loadings for four barriers about quality of graphic and audio, quality in the design, Arabic language, and lack of access. It explained 11.22% of the total variance.

The fifth and final component was “Harmonization between the educational video games and teaching”; it had positive loadings for just three variables: match appropriate styles of teaching with games, locate a specific game related to the content, and combine fun and education. It explained 10.08% of the total variance.

The second method was principal factor analysis. The results showed there were five factors. The first factor was “The impact of education video games on student and learning process”; it had positive loadings for nine barriers: controlling students, students’ knowledge in using a computer, students’ perceptions toward games, providing feedback, compatible with curriculum, meeting desired learning objectives, negative influences on the students’ behavior, and students’ addiction. It explained 14.57% of the total variance.

The second factor was “Required times, cost, training, and technical issues of applying educational video games”; it had positive loadings for seven barriers about time, cost, training, and technical issues. It explained 13.04% of the total variance.

The third factor was “Characteristics of educational video games”; it had positive loadings for three barriers about quality of graphic and audio, quality in the design, and Arabic language. It explained 8.89% of the total variance.

The fourth factor was “Harmonization between the educational video games and teaching”; it had positive loadings for three barriers: matching appropriate styles of

teaching with games, locating a specific game related to the content, and combining fun and education. It explained 8.5% of the total variance.

The fifth and final factor was "Unawareness of educational video games"; it had positive loadings for three variables about teachers' knowledge and negative perceptions by parents and administrators. It explained 7.94% of the total variance.

In general, the results from both methods were the same since both methods gave five components and factors and both explained similar proportions, especially in the first and second components and factors. As can clearly be seem, the first factor ("The impact of education video games on student and learning process") was the strongest main factor and the real obstacle that prevented Saudi teachers from using video games in their classroom. Also, the findings of this study indicated the second factor ("The cost, training, awareness, and technical issues of applying educational video games") was considered another hurdle and a very important factor.
Conversely, the last factor ("Harmonization between the educational video games and teaching") was considered the weakest factor among all five factors.

My results supported prior studies (Baek, 2008; Egenfeldt-Nielsen, 2005; Kirriemuir & McFarlane, 2004; McLester; 2005; Wu, 2015). AlMulhim (2014) mentioned three barriers that hindered teachers from using information and communication technology in Saudi Arabia: (a) inaccessibility to information and communication technology, (b) lack of training, and (c) lack of time.

Baek (2008) found six factors that hindered teachers' use of games in the classroom: inflexibility of curriculum, negative effects of gaming, students' lack of readiness, lack of supporting materials, fixed class schedules, and limited budgets. Wu

(2015) found five barriers that hindered teachers from using games in education: mismatch between digital game-based learning and standardized curriculum, administrative and parental negative perceptions, lack of technology support and teacher preparation, short class periods, and low quality of educational digital games.

Regarding the gender difference, the result showed there was a statistically significant mean difference in the components and factors between males and females. However, in the first and second components and factors, which were considered the strongest factors, there were no difference between the genders; the difference appeared in the third and fifth components and the third and fourth factors. The results also showed there was no statistically significant mean difference in the components and factors between level of teaching (elementary school, middle school, and high school) and teachers' years of experience (1-5, 6-10, 11-15, 16-20, more than 20 years). These results supported findings reported by the Baek (2008) study.

Implications and Conclusion

The aim of this study was to discover Saudi teachers' experience with video games. Practice and having knowledge about the video games from teachers is important in helping students deal with educational video games. Shaffer (2006) stated,

> The only way you can help young people become a discerning player is to become literate yourself …. When you can't read, it is hard to tell whether a book is bad or whether you just don't know enough to read it. The same is true for games. (p.192)

This study also explored Saudi teachers' attitudes toward using video games in the classroom. In general, the results showed positive attitudes toward video games. This was a good indicator about Saudi teachers' readiness of employing educational video games in their classroom once it gets approved by the Minister of Educational in Saudi

Arabia. Saudi teachers need to adopt cognitivism and constructivism theories in their teaching, which will help them when applying video games in their classroom as was shown in the results. Game integration could be a catalyst for changing pedagogical practices. With positive attitudes should through the findings of this study, and a large portion of the population unknowing about gaming as it might relate to teaching and learning, introducing video games as a teaching and learning tool could have significant impact. Findings show that integration of gaming into classrooms would be a perceived positively. Initiatives from the Ministry could impact not only the integration of a new method, but the changing of educational approaches to embrace innovative theory and practice. It could enhance learning and should be attempted.

The findings of this study presented barriers that prevent Saudi teachers from applying video games in their classrooms. To remove those barriers, teachers, educators, and school principals need to collaborate to reduce those barriers. To overcome these barriers, teachers need to consider many points before integrating video games in their teaching style. First, they should consider students' readiness for this new style of learning including technology literacy, students' awareness of the game rules and levels of difficulty, and techniques students can use in the games. Also, teachers need to consider that students have various attitudes toward using games in their learning. Moreover, assessing students' achievement in educational video games will be difficult since their levels of game proficiencies are different. Therefore, teachers have to set guidelines for using the games effectively. While caution should be employed in all educational initiatives to ensure success, the barriers identified in this study show as obstacles not deterrents. Teachers want support and knowledge in meeting their students'

needs. Support from administration and other educators would allow barriers to be resolved for integration of games in teaching and learning.

On the other hand, and before involving video games in classrooms, teachers should be open-minded in using new approaches of teaching. The findings show positive tendencies and should be used to promote momentum. Also, teachers have to prepare themselves for using new technology corresponding to applying video games in classrooms by self-training or enrolling in training courses as well as some being casual gamers themselves. In addition, they need to gain self-organization skills to help them manage their classes when applying video games.

In addition, schools need to provide teachers with training courses to teach them how to deal with the new technologies, required devices to apply video games in classrooms, and new instructional methods. Also, technical support and the necessary hardware and software resources need to be available in the school. Additionally, schools have to provide teachers with appropriate time to apply the new technologies in the classroom. Reducing the teacher's number of lessons could do that.

Based on the results of this study, parents, educators, and the Saudi Arabia Ministry of Education should provide educational games that satisfy students' desires for challenge and knowledge. Programmers and designers should also be encouraged to provide good content for educational games that support Arabic language and culture. It is recommended that the Ministry of Education work with game producers to develop and provide educational games for students. The Ministry should gradually increase classroom use of games by assisting educators in understanding effective integration

methods. Finally, this data will be useful for making decisions regarding the use of games in education that provides good interactive content and teaching approaches.

Future Study

There are many recommendations for future research on similar topics. Since this study covered attitudes of Saudi teachers at the elementary, middle, and high school levels, future study could address attitudes of educators at the kindergarten level or at universities. The future study could research students' attitudes toward using games in education since their viewpoint is fundamental when applying video games. Furthermore, future research could study the attitudes of Saudi parents toward using games in the classroom. Future research could also focus on using games in a specific context to measure effective pedagogical uses. On the other hand, future studies may need to find methods to help teachers overcome barriers mentioned in this study. Once these questions will be answered, it will give clear picture about utilize educational video games in the classrooms in Saudi Arabia.

REFERENCES

Abdul Razak, A., & Connolly, T. (2013). Using games-based learning: how it influences the learning experience and outcomes of primary school children. *iJET, 8*(2), 47-54.

Adkins, M. (2014, March). How video games and digital literacy impacts student achievement and development: an analysis of synergistic integration. *Society for Information Technology & Teacher Education International Conference, 2014*(1), 1-5.

Ajzen, I. (2005). *Attitudes, personality and behavior* (2nd ed.). New York: McGraw-Hill International.

Alharbi, O. M. (2010). The effectiveness of the instructional electronic games on academic achievement in math course (Unpublished doctoral dissertation). Makkah, Saudi Arabia: Umm AlQura University.

Al-Hadlaq, A. A. (2011). *The advantages and disadvantages of playing electronic games and motives of the playing from the viewpoints of public education students in Riyadh City.* Riyadh: King Saud University.

Aliefendic, J. (2013). *The correlation between the time spent playing educational video games and students' performance on standardized mathematics tests by fifth-grade students* (Doctoral dissertation). Retrieved from http://dmc.tamuc.edu/cdm/ref/ collection/p15778coll7/id/80/.

Aljuhani, A. S. (2011). *The effectiveness of the instructional electronic games on*

academic achievement in English course for the students of intermediate level (Unpublished master thesis). Jeddah, Saudi Arabia: King Abdulaziz University.

Al Mulhim, E. (2014). The barriers to the use of ICT in teaching in Saudi Arabia: A review of literature. *Universal Journal of Educational Research, 2*(6), 487-493. doi:10.13189/ujer.2014.020606

Alotaibi, A. M. (2006). *Barrier education*. Retrieved from https://theses.ju.edu.jo/Original_Abstract/JUA0635714/JUA0635714.pdf

Alqurashi, M., Almoslamani, Y. & Alqahtani, A. (2015, June). *Middle school students' digital game experiences in Makkah in Saudi Arabia*. Proceedings from the Second International Conference on Education, Social Sciences and Humanities, Istanbul, Turkey.

Alrasheedi, H. (2009). *Information and communication technology (ICT): Effects of gender and training among Kuwait teachers.* Retrieved from http://eric.ed.gov/?id=ED513840

Alsaiah, T. (2014, May). *Variation in the schools and students distribution between Saudi Arabia regions.* Retrieved from http://www.aleqt.com/2014/05/30/article_853066.html)

Alshammary, G. (2014). *Electronic games!!* Retrieved from http://www.alyaum.com/article/4030423

Altuna, J. & Lareki, A. (2015). Analysis of the use of digital technologies in schools that implement different learning theories. *Journal of Educational Computing Research, 53*(2), 205–227.

Alzaghoul, A. (2012). The implication of the learning theories on implementing e-

learning courses. *The Research Bulletin of Jordan ACM, 11*(11), 27-30.

Al-Zoyoodi, M. (2015). *Electronic games and their educational implications on the pupils of Madinah primary schools as perceived by their teachers and parents.* Retrieved from http://repository.taibahu.edu.sa/bitstream/handle/123456789 /13833/2. pdf?sequence=1

Amory, A., Naicker, K., Vincent, J. & Adams, C. (1998). *Computer games as a learning resource*. Retrieved from http://www.editlib.org/j/EDMEDIA/

Ashton, D. (2011). Play stations and workstations: Identifying and negotiating digital games work. *Information Technology & People, 24*(1), 10-25.

Attitude. (2016a). In *Cambridge Dictionary Online*. Retrieved from http://dictionary. cambridge.org/us/dictionary/english/attitude

Attitude. (2016b). In *Oxford Dictionary online*. Retrieved from http://www.oxford dictionaries .com/definition/english/attitude

Austin, K., Orcutt, S., & Rosso, J. (2001). *How people learn: Introduction to learning theories.* Retrieved from http://www.stanford.edu/class/ed269/hplintrochapter.pdf

Baek, Y. K. (2008). What hinders teachers in using computer and video games in the classroom? Exploring factors inhibiting the uptake of computer and video games. *CyberPsychology & Behavior, 11*(6), 665-671.

Barriers. (2016). In *Merriam English Dictionary*. Retrieved from http://www.merriam-webster.com/dictionary/Barriers

Beck, J. C., & Wade, M. (2004). *Got game: How the gamer generation is re-shaping business forever.* Boston, MA: Harvard Business School Press.

Bednar, A. K., Cunningham, D., Duffy, T. M., & Perry, J. D. (1991). Theory into

practice: How do we link? In T. M Duffy & D. H. Jonassen (Eds.), *Constructivism and technology of instruction: A conversation* (pp. 17-35). Hillsdale, NJ: Lawrence Erlbaum Associates.

Bouras, C., Igglesis, V., Kapoulas, V., Misedakis, I., Dziabenko, O., Koubek, A., …Sfiri, A. (2004). Game based learning using web technologies. *Int. J. Intell. Games & Simulation, 3*(2), 70-87.

Bourgonjon, J., Valcke, M., Soetaert, R., & Schellens, T. (2010). Students' perceptions about the use of video games in the classroom. *Computers & Education, 54*(4), 1145-1156. doi:10.1016/j.compedu.2009.10.022

Bourgonjon, J., & Hanghøj, T. (2011). *What does it mean to be a game literate teacher? Interviews with teachers who translate games into educational practice*. Paper presented at the 5th European Conference on Games-Based Learning (ECGBL'11), Athens, Greece.

Boyer, M., Akcaoğlu, M., & Pernsteiner, S. (2015, June). *Connecting game and instructional design through development*. EdMedia: World Conference on Educational Media and Technology, 1660-1669. Retrieved from http://www.editlib.org/search/?q=Connecting +game+and

Burton, J. K., Moore, D. M., & Magliaro, S. G. (1996). Behaviorism and instructional technology. In D.H. Jonassen (Ed.), *Handbook of research for educational communications and technology* (pp. 46-73). New York: Macmillan.

Chee, Y. S., & Lee, L. H. (2009). *Game-based learning as a vehicle for developing science inquiry skills using the Centauri 7 Learning Program*. Proceedings from the 17th International Conference on Computers in Education, Hong Kong.

Christopher, T. V. (2011). *Using game theory techniques and concepts to develop proprietary models for use in intelligent games*. Retrieved from http://0-search.proquest. com. source.unco.edu/docview/864734679?accountid=12832 (864734679).

Clark, A. C., & Ernst, J. V. (2009). Gaming in technology education. *Technology Teacher, 68*(5), 21-26.

Clyde, J., & Wilkinson, G. R. (2012). More than a game. Teaching in the gamic mode: Disciplinary knowledge, digital literacy, and collaboration. *History Teacher, 45*(1), 45-66.

Communications and Information Technology Commission. (2010). *Reports and studies.* Retrieved from http://www.citc.gov.sa/arabic/Reportsandstudies/Reports/Documents/IT%20006%20A%20-%20IT%20Report%202010.pdf

Communications and Information Technology Commission. (2014). *Annual* r*eport*. Retrieved from http://www.citc.gov.sa/arabic/MediaCenter/Annualreport/Documents/PR_REP_ 010A.pdf

Connolly, T. M., Stansfield, M., & Hainey, T. (2011). An alternate reality game for language learning: ARGuing for multilingual motivation. *Computers & Education, 57*(1), 1389-1415. doi:10.1016/j.compedu.2011.01.009

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Upper Saddle River, NJ: Pearson Education.

Del-Moral Pérez, M. (2014). Videogames: Opportunities for learning. *Journal of New Approaches In Educational Research, 3*(1), 1.

De Houwer, J., Barnes-Holmes, D., & Moors, A. (2013). What is learning? On the nature and merits of a functional definition of learning. *Psychonomic Bulletin & Review, 20,* 631–642.

De Grove, F., Bourgonjon, J., & Van Looy, J. (2012). Digital games in the classroom? A contextual approach to teachers' adoption intention of digital games in formal education. *Computers in Human Behavior, 28*(6), 2023-2033. doi:10.1016/j.chb.2012.05.021.

Driscoll, M. P. (2005). *Psychology of learning for instruction* (3rd ed.). Boston: Pearson Allyn and Bacon.

Egenfeldt-Nielsen, S. (2005). *Beyond edutainment: Exploring the educational potential of computer games.* Retrieved from http://education.ucf.edu/insttech/docs/ egenfeldt.pdf

Entertainment Software Association. (2015). *Improving what matters*. Retrieved from http://www.theesa.com

Ertmer, P. A., & Newby, T. J. (2013). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly, 26*(2), 43-71.

Fazio, R. H. (1986). How do attitudes guide behavior? Handbook of motivation and cognition. *Foundations of Social Behavior, 1,* 204-243.

FutureLab. (2009). *Using computer games in the classroom.* Retrieved from http://www.futurelab.org.uk/resources/documents/project_ reports/becta/ Games_and_Learning_survey_analysis.pdf Gibson

Gee, J. P. (2005, September). What would a state of the art instructional video game look like? *Innovate: Journal of Online Education, 1*(6).

Grabinger, R. S. (1996). Rich environments for active learning. In D. H. Jonassen (Ed.), *Handbook of research for educational communications and technology* (pp. 665-692). New York: Macmillan.

Greenwald, A. G. (1989). Why are attitudes important? *Attitude Structure and Function, 3*, 1-10.

Greitemeyer, T., & Osswald, S. (2010). Effects of prosocial video games on prosocial behavior. *Journal of Personality and Social Psychology, 98*(2), 211-221.

Hanghj, T. (2011). Clashing and emerging genres: The interplay of knowledge forms in educational gaming. *Designs for Learning, 4*(1), 22-33.

Hayes, E., & Ohrnberger, M. (2013). The gamer generation teaches school: The gaming practices and attitudes towards technology of pre-service teachers. *Journal of Technology and Teacher Education, 21*(2), 154-177.

Hellström, C., Nilsson, K., Leppert, J., & Åslund, C. (2012). Influences of motives to play and time spent gaming on the negative consequences of adolescent online computer gaming. *Computers in Human Behavior, 28*(4), 1379-1387. doi: 10.1016/j.chb.2012.02.023

Hofferth, S. L. (2010). Home media and children's achievement and behavior. *Child Development, 81*(5), 1598–1619.

Howard, C., Morgan, M., & Ellis, K. (2006). Games and learning ... Does this compute? In E. Pearson & P. Bohman (Eds.), *Proceedings of World Conference on Educational Media and Technology 2006* (pp. 1217-1224). Waynesville, NC: Association for the Advancement of Computing in Education.

Hsu, T. Y., & Chiou, G. F. (2011). *Preservice science teachers' prior game play experience and their perceptions of digital game-supported learning.* Retrieved from https://www.researchgate.net/publication/268347194_Preservice_ Teachers'_Awareness_of_Digital_Game-Supported_Learning

Johnson, B. (2015). *Teacher development … What is your educational philosophy?* Retrieved from http://www.edutopia.org/blog/what-your-educational-philosophy-ben-johnson

Jones, J. G., Copeland, B., & Kalinowski, K. (2007). *Pre-service teacher's attitudes towards computer games*. Paper presented at the American Educational Research Association, Chicago, IL.

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika, 39,* 32-36.

Kebritchi, M., Hirumi, A., & Bai, H. (2010). The effects of modern mathematics computer games on mathematics achievement and class motivation. *Computers & Education, 55*(2), 427-443.

Khoo, A. (2012, December). Video games as moral educators? *Asia Pacific Journal of Education, 32*(4), 416-429.

Kirriemuir, J., & McFarlane, A. (2004). *Literature review in games and learning: A NESTA Futurelab research report.* Retrieved from http://www2.futurelab.org.uk/ resources/ documents/lit_reviews/Games_Review.pdf

Klemetti, M., Taimisto, O., & Karppinen, P. (2009). The attitudes of Finnish school teachers towards commercial educational games. In M. Kankaanranta & P. Neittaanmäki (Eds.), *Design and use of serious games* (pp. 97-106). Jyväskylä, Finland: Springer.

Laerd Statistics. (2015a). *One-way ANOVA using SPSS statistics: Statistical tutorials and software guides*. Retrieved from https://statistics.laerd.com/

Laerd Statistics. (2015b). *Pearson's product-moment correlation using SPSS statistics: Statistical tutorials and software guides*. Retrieved from https://statistics. laerd.com/

Laerd Statistics. (2015c). *Principal components analysis (PCA) using SPSS statistics.* Retrieved from https://statistics.laerd.com/

Laerd Statistics. (2015d). *One-way MANOVA using SPSS statistics.* Retrieved from https://statistics.laerd.com/

Learning. (n.d.). In *Merriam-Webster Online*. Retrieved from http://www.merriam-webster.com/dictionary/learning

Lee, I., & Kwon, H. J. (2005). *Relations among flow, information processing strategies, and performance in a computer-based simulation game*. Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications, Chesapeake, VA.

Liao, Y. K. C. (1999). *Gender differences on attitudes toward computers: A meta-analysis.* Paper presented at the Society for Information Technology and Teacher Education International Conference, San Antonio, TX.

Malone, T. (1980). *What makes things fun to learn? A study of intrinsically motivating computer games.* Palo Alto, CA: Xerox.

Malone, T. (1981). Toward a theory of intrinsically motivating instruction. Cognitive Science, 5(4), 333-369.

Marín Díaz, V. & Martín-Párraga, J. (2014). Can videogames be used to develop the infant stage educational curriculum? *Journal of New Approaches In Educational Research, 3*(1), 20-25.

Marklund, B. B., & Taylor, A. S. A. (2015, October). Teachers' Many Roles in Game-Based Learning Projects. In *European Conference on Games Based Learning* (p. 359). Academic Conferences International Limited.

Maxwell, J. (1996) *Qualitative research design. An interactive approach*. Thousand Oaks, California: Sage.

McFarlane, A., Sparrowhawk, A., & Heald, Y. (2002). *Report on the educational use of games: An exploration by TEEM of the contribution which games can make to the education process*. Retrieved from http://www.diversaodigital.com/educacao/teem_gamesined_full.pdf

McLester, S. (2005). *Game-plan.* Retrieved from http://www.techlearning.com/news/0002/game-plan/58979

Means, B., & Olson, K. (1997).*Technology and education reform: Studies of education reform*. Washington, DC: U.S. Government Printing Office.

Miller, C. T. (2008). *Games: Purpose and potential in education*. New York: Springer.

Ministry of Education in Saudi Arabia. (2014, March 13). *Statistical reports* [Data file]. Retrieved from https://www.moe.gov.sa/Arabic/Ministry /Pages/Statistical-reports.aspx

Ministry of Education in Saudi Arabia. (2016, March). *Education departments.* Retrieved from http://www.moe.gov.sa/ar/PublicEducation/Pages/

Museum of Play. (2015). *Video game history timeline*. Retrieved from http://www.museum ofplay.org/icheg-game-history/timeline/

Narvaez, D., & Mattan, B. (2006). *Practicing goodness: Playing a prosocial video game.* Retrieved from https://cee.nd.edu/news/documents/Practicing GoodnessReport FINAL.pdf

Nippold, M. M. A., Duthie, J. K., & Larsen, J. (2005). Literacy as a leisure activity: Free-time preferences of older children and young adolescents. *Language, Speech, and Hearing Services in Schools, 36*(2), 93–102.

Noraddin, E. M., & Kian, N. T. (2014). Academics' attitudes toward using digital games for learning & teaching in Malaysia. *Malaysian Online Journal of Educational Technology, 2*(4).

Obafemi, S. T., & Eyono Obono, S. D. (2014). Educators' adherence to learning theories and their perceptions on the advantages and disadvantages of e-learning. *International Scholarly and Scientific Research & Innovation, 8*(11), 3385- 3392.

Oblinger, D. G. (2004). The next generation of educational engagement. *Journal of Interactive Media in Education*, *8*(1), Art. 10. doi: http://doi.org/10.5334/2004-8-oblinger

Ortega, M. (2012). *Technology in the educational setting past present and future.*

Proceedings of Society for Information Technology & Teacher Education International Conference 2012, Chesapeake, VA.

Pimenta Arruda, E., & Pimenta Arruda, D. (2014). Leisure, digital games and learning: Perspectives for school education. *International Journal on E-Learning, 13*(4), 467-482.

Poole, S. (2000). *Trigger happy: The inner life of videogames*. London: Fourth Estate.

Prensky, M. (2001a). Digital natives, digital immigrants. *On the Horizon, 9*(5), 1-6.

Prensky, M. (2001b). Fun, play and games: What makes games engaging. In *Digital game-based learning* (pp.16-47). New York, NY: McGraw-Hill.

Quaiser-Pohl, C., Geiser, C., & Lehmann, W. (2006). The relationship between computer-game preference, gender, and mental-rotation ability. *Personality and Individual Differences, 40*(3), 609-619.

Qudair, M. (2011). *The impact of electronic games on children behavior.* Unpublished master thesis, Algiers University, Algeria.

Reiser, R. A., & Dempsey, J. V. (2006).*Trends and issues in instructional design and technology* (2nd ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Ritzhaupt, A. D., Poling, N. D., Frey, C. A. & Johnson, M. C. (2014). A synthesis on digital games in education: What the research literature says from 2000 to 2010. *Journal of Interactive Learning Research, 25*(2), 263-282.

Roberts, N. (1976). *Simulation gaming: A critical review*. Retrieved from http://files.eric.ed.gov /fulltext/ED137165.pdf.

Sadiq, I. (2010). *Effects of online games on student performance in undergraduate*

physics. Proceedings from World Conference on Educational Multimedia, Hypermedia and Telecommunications, 3685–3691. Retrieved from http://www.editlib.org/p/35172/

Sandford, R., Ulicsa, M., Facer, K., & Rudd T. (2006). *Teaching with games: Using commercial off-the-shelf computer games in formal education.* Retrieved from https://www.nfer. ac.uk/publications/FUTL49/FUTL49.pdf

Schunk, D. H. (1991). *Learning theories: An educational perspective.* New York: Macmillan.

Shaffer, D. W. (2006). *How computer games help children learn*. New York: Palgrave Macmillan.

Sharori, M. (2008). *Electronic games in global age pros & cons*. Amman, Jordan: Almassira.

Sharp, V. (2005). *Computer education for teachers: Integrating technology into classroom teaching* (5th ed). New York: McGraw-Hill Companies, Inc.

Shuell, T. J. (1986). Cognitive conceptions of learning. *Review of Educational Research, 56*(4), 411-436.

Sobhani, M., & Bagheri, M. S. (2014). Attitudes toward the effectiveness of communicative and educational language games and fun activities in teaching and learning English. *Theory & Practice in Language Studies, 4*(5), 1066-1073.

Stevens, J. (1986). *Applied multivariate statistics for the social sciences.* Hillsdale, NJ: Lawrence Erlbaum.

Sutton-Smith, B. (1997). *The ambiguity of play*. Cambridge, MA: Harvard University Press.

Tabachnick, B. G., & Fidell, L. S. (1996). *Using multivariate statistics* (3rd) New York: HarperCollins.

Tabachnick, B., & Fidell, L. (2007). *Using multivariate statistics* (5th ed.). Boston: Pearson/Allyn & Bacon.

Tham, R. & Tham, L. (2014). The effectiveness of game-based learning as an instructional strategy to engage students in higher education in Singapore. *International Journal on E-Learning, 13*(4), 483-496.

Thompson, G. (2015). *Smart classroom technologies … What's hot and what's not in ed tech for 2015.* Retrieved from https://thejournal.com/articles/015/01/05/wahts-hot-and-whats-not-in-ed-tech-for-2015.aspx

Tobias, S., Halter, J., & Newbauer, D. (2015). *Relationships between video game play and family environment among female university student game players living at home.* Retrieved from https://www.highbeam.com/doc/1P3-3700216921.html

Video game. (2016). In *Oxford English Dictionary* online. Retrieved from http://www.oxford dictionaries.com/definition/english/video-game?q=video+game

Williams, M. K., Foulger, T.S., & Wetzel, K. (2009). Preparing preservice teachers for 21st century classrooms: Transforming attitudes and behaviors about innovative practices with technology. *Journal of Technology and Teacher Education.* Retrieved from https://www.learntechlib.org/p/28216

Winn, J., & Heeter, C. (2009). Gaming, gender, and time: Who makes time to play? *Sex Roles, 61*(1-2), 1–13. doi:10.1007/s11199-009-9595-7

Winn, W., & Snyder, D. (1996). *Cognitive perspectives in psychology.* Available from https://www.researchgate.net/publication/252498564_Handbook_ of_ Research_on_Educational_Communications_and_Technology_Chapter_5_Cognitive_Perspectives_in_Psychology

World Economic Forum. (2015). *Global information technology report*. Retrieved from http://reports.weforum.org/global-information-technology-report-2015/

Wu, M. L. (2015). *Teachers' experience, attitudes, self-efficacy and perceived barriers to the use of digital game-based learning: A survey study through the lens of a typology of educational digital games*. Retrieved from http://gradworks.umi.com/37/14/3714969.html

Young, B. J. (1999). Gender differences in student attitude toward computers. *Journal of Research on Computing in Education, 33*(2), 204-216.

APPENDIX A

SURVEY INSTRUMENT

SURVEY INSTRUMENT

The purpose of this survey is to collect data about the Saudi Arabian teachers, their background and experience using video games. Also it will discover the Saudi teachers' philosophy regarding to every learning theory (behaviorism, cognitivism, constructivism) and the teachers' attitudes toward games in classroom. Finally it will examine barriers that prevent the Saudi Arabian teachers in using video games in the classrooms.

Part A: Demographic Information

This section seeks information about the teachers' background. Please, choose the answer that best applies to your situation.

1.What is your gender?

☐ Male ☐ Female

2.What is your region?

☐ North ☐ South ☐ East
☐ West ☐ Middle

3. Years of experiences in teaching:

☐ 1-5 ☐ 6-10 ☐ 11-15
☐ 16-20 ☐ More than 20 years

4. Level of teaching:

☐ Elementary ☐ Middle ☐ High

5. What is the average time each week you spend playing any games on digital devices? (Include: gaming consoles, tablets, cell phones, Internet, computers, etc.)

…….

6. Why do you play video games: (You can select more than one)

☐ Competition ☐ Join with others ☐ Enjoyable
☐ Curiosity ☐ Leisure Time ☐ Communication
☐ Discover ☐ Talent Development ☐ Intelligence Development
☐ Others ……..

7. What are your favorite games? (You can select more than one)

☐ Fighting Games. ☐ Strategy Games. ☐ Sports Games.
☐ Adventure Games. ☐ Puzzles Games. ☐ Other ……

Part B: Teachers' Philosophy

The purpose of this section of the questionnaire is to discover the Saudi's teacher's philosophy regarding to every learning theory (behaviorism, cognitivism, constructivism). Every theory has question and each question comes with three statements. Please, read the direction carefully and provide your response candidly in the format requested.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

1) **Teaching is most effective when using drills and practices to make sure student remember what they learned from class.**

1. I am likely to adopt this teaching philosophy. ① ② ③ ④ ⑤
2. The above statement aligns with my teaching philosophy. ① ② ③ ④ ⑤
3. The above teaching philosophy is good for my students. ① ② ③ ④ ⑤

2) **Teaching is most effective when understanding how individual student takes in information and helping them process and link that information to pre-existing knowledge to solve problem.**

1. I am likely to adopt this teaching philosophy. ① ② ③ ④ ⑤
2. The above statement aligns with my teaching philosophy. ① ② ③ ④ ⑤
3. The above teaching philosophy is good for my students. ① ② ③ ④ ⑤

3) **Teaching is most effective when parts of a learning activity the learning experiences are about constructing a meaningful product.**

1. I am likely to adopt this teaching philosophy. ① ② ③ ④ ⑤
2. The above statement aligns with my teaching philosophy. ① ② ③ ④ ⑤
3. The above teaching philosophy is good for my students. ① ② ③ ④ ⑤

Part C: Games

The purpose of this section of the questionnaire is to examine the teachers' attitudes toward games in classroom in Saudi Arabia. The questionnaires consist 26 items. Please, read the direction carefully and provide your response candidly in the format requested.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

	Learning attitude	
1.	Games are very important for teaching and learning.	① ② ③ ④ ⑤
2.	Games improve students' content knowledge.	① ② ③ ④ ⑤
3.	Games increase students' skills.	① ② ③ ④ ⑤
4.	Games improve individual learning.	① ② ③ ④ ⑤
5.	Games help students develop thinking skills.	① ② ③ ④ ⑤
6.	Games increase the students' classroom performance.	① ② ③ ④ ⑤
7.	Games help students to solve complex tasks.	① ② ③ ④ ⑤
8.	Games help students to achieve better grades.	① ② ③ ④ ⑤
9.	Games enhance students learning productivity.	① ② ③ ④ ⑤
10.	Games motivate students' engagement.	① ② ③ ④ ⑤
11.	Games motivate students learning.	① ② ③ ④ ⑤
12.	Games encourage deeper students learning.	① ② ③ ④ ⑤
13.	Games encourage effective students learning.	① ② ③ ④ ⑤
	Teacher Impact attitude	
14.	Games improve teachers' performance.	① ② ③ ④ ⑤
15.	Games help towards reaching instructional objectives.	① ② ③ ④ ⑤
16.	Games help teachers teach students.	① ② ③ ④ ⑤
17.	Games support traditional teaching strategies.	① ② ③ ④ ⑤
18.	Games guide teachers' instructional planning.	① ② ③ ④ ⑤
	Enjoyment attitudes	
19.	Students need to enjoy learning.	① ② ③ ④ ⑤
20.	Games make learning exciting.	① ② ③ ④ ⑤
21.	Games make learning fun.	① ② ③ ④ ⑤
22.	Games entertain students in the classroom.	① ② ③ ④ ⑤
23.	Games enhance social interaction in the classroom.	① ② ③ ④ ⑤
	Social Interaction attitudes	
24.	Games help students to communicate with each other.	① ② ③ ④ ⑤
25.	Games support active classroom activity.	① ② ③ ④ ⑤
26.	Games encourage participation among students.	① ② ③ ④ ⑤

Part D: Barriers

General: the purpose of this questionnaire is to examine the barriers that prevent the Saudi Arabian teachers in using video games in the classrooms in Saudi Arabia. The questionnaires consist of 25 items. Please read the direction carefully and provide your response candidly in the format requested.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

1.	It is difficult to match appropriate styles of teaching with games.	① ② ③ ④ ⑤
2.	It is difficult to locate a specific game related to the content or being taught.	① ② ③ ④ ⑤
3.	There is lack of games that combine fun and education.	① ② ③ ④ ⑤
4.	Teachers cannot control students once they are engaged in gaming.	① ② ③ ④ ⑤
5.	The level of students' knowledge in using a computer prevents teachers' implementation of games for learning.	① ② ③ ④ ⑤
6.	Students need sufficient time to become familiar with the rules and the techniques of a game.	① ② ③ ④ ⑤
7.	Limited class time does not allow enough time for game play.	① ② ③ ④ ⑤
8.	Video games require additional lesson preparing time.	① ② ③ ④ ⑤
9.	The Ministry of Education has not approved educational games.	① ② ③ ④ ⑤
10.	Games don't compatible with curriculum or academic standards of Ministry of Education.	① ② ③ ④ ⑤
11.	There is a lack of professional training of using video games for teachers.	① ② ③ ④ ⑤
12.	The high cost of purchasing educational games.	① ② ③ ④ ⑤
13.	Most Internet games run on high-speed networks, but schools cannot provide adequate networks.	① ② ③ ④ ⑤
14.	Efficient learning cannot be guaranteed when students' perceive instructional gaming as play.	① ② ③ ④ ⑤
15.	It is very difficult to give relevant feedback to a student according to his/her progress in a game.	① ② ③ ④ ⑤
16.	Digital game-based learning cannot meet desired learning objectives.	① ② ③ ④ ⑤
17.	A side effect of integrating games into teaching can be students' addiction to gaming.	① ② ③ ④ ⑤
18.	Playing video game may have negative influences on my students' behavior.	① ② ③ ④ ⑤
19.	Most teachers have no knowledge about how to teach with games.	① ② ③ ④ ⑤
20.	Parents' negative perceptions of video games for teaching and learning.	① ② ③ ④ ⑤
21.	Low quality of graphic and audio in educational games.	① ② ③ ④ ⑤
22.	Low quality in graphic or audio effects in educational games.	① ② ③ ④ ⑤
23.	Low quality in the design and play mechanics of educational digital games.	① ② ③ ④ ⑤
24.	Lack of educational video games in Arabic language.	① ② ③ ④ ⑤
25.	Lack of access to reference materials for teaching with games.	① ② ③ ④ ⑤

APPENDIX B

INSTITUTIONAL REVIEW BOARD APPROVAL

UNIVERSITY OF
NORTHERN COLORADO

Institutional Review Board

DATE:	April 25, 2016
TO:	Mohammed Alqurashi, PhD
FROM:	University of Northern Colorado (UNCO) IRB
PROJECT TITLE:	[889217-2] Saudi Teachers' Experiences And Attitudes Toward Integrating Video Games For Learning: Affordances And Constraints Of Using Video Games In Saudi Arabian Classrooms.
SUBMISSION TYPE:	New Project
ACTION:	APPROVAL/VERIFICATION OF EXEMPT STATUS
DECISION DATE:	April 23, 2016
EXPIRATION DATE:	April 23, 2020

Thank you for your submission of New Project materials for this project. The University of Northern Colorado (UNCO) IRB approves this project and verifies its status as EXEMPT according to federal IRB regulations.

Thanks for a well written request.

Please add the KSA Ministry approval to conduct the study to this IRB request as soon as you have it.

Best Wishes,

Dr. Maria Lahman

We will retain a copy of this correspondence within our records for a duration of 4 years.

If you have any questions, please contact Sherry May at 970-351-1910 or Sherry.May@unco.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Northern Colorado (UNCO) IRB's records.

APPENDIX C

CONSENT FORM TO PARTICIPATE IN HUMAN RESEARCH

UNIVERSITY of
NORTHERN COLORADO

CONSENT FORM FOR HUMAN PARTICIPANTS IN RESEARCH
UNIVERSITY OF NORTHERN COLORADO

Project Title: Saudi Teachers' Experiences And Attitudes Toward Integrating Video Games For Learning: Affordances And Constraints Of Using Video Games In Saudi Arabian Classrooms.

Researcher: Mohammed Alqurashi
Research advisor: Dr. Mia Kim Williams
Email: Mia.Williams@unco.edu Phone: (970) 351-2414

The purpose of this study will to investigate Saudi teachers' attitudes toward video game integration in education and explore teachers' experiences with video games at elementary, middle school, and high school levels in Saudi Arabia. It will also describe the current condition of video game usage; identify significant factors that prevent Saudi teachers from using video games in their classroom; and find the difference in teachers' experiences, attitudes, and hindering factors between gender and level of teaching and teaching experience. It will also investigate any relationship between teachers' philosophy based on three major learning theories (behaviorism, cognitivism, and constructivism) and their perspectives toward video game use in the classroom.

As a participant in this research, you will be asked to provide some information about yourself, including the gender, teaching level, and experiences in teaching. The questionnaire will take 20-30 minuets to complete. The data will be stored and secured electronically with a password. Only the primary researchers will have login credentials to access this data. Your identity will be anonymous. You will not have to supply any identifying information on the questionnaire. Data collected in this study will be erased three years after the study is completed.

The questionnaire will require you to consider your own experience and may pose very minimal potential risk by causing you to take time out of your day. These risks are no greater than what you may already be experiencing on a daily basis. However, there is a small potential benefit of better understanding your teaching styles by answering the questions. The results of this study may help educators better provide support to their students, thereby enriching the education and lives of the students.

Participation is voluntary. You may decide not to participate in this study and if you begin participation you may still decide to stop and withdraw at any time. Your decision will be respected and will not result in loss of benefits to which you are otherwise entitled.
Having read the above and having had an opportunity to ask any questions please complete the questionnaire if you would like to participate in this research. By completing the questionnaire you will give me permeation for your participation. You may keep this form for future reference. If you have any concerns about your selection or

treatment as a research participant, please contact the Office of Sponsored Programs, Kepner Hall, University of Northern Colorado Greeley, CO 80639; 970-351-2161.