# Using Games in Online Education: Is it a Winning Strategy?

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#### Abstract

This study examined the impact of adding game elements on students' performances in an online learning setting. Two intact online graduate level course sections were chosen for this study. Each course sections had 18 students. The results of the study showed that there were significant differences in the time students spent in their courses and the number of posts between the course section with the game elements (treatment group) and the course section with the traditional design. However, there was no significant difference in grades students achieved in the course section with the game elements and the course section with the traditional design. The study was concluded with discussions and suggestions for further studies.

# Introduction

In recent years, the trend to include digital games or video games in educational settings has attracted the widespread attention of people working not only in education but also in the game industry (Garris, Ahlers, & Driskell, 2002; Squire, 2003; Shaffer, Squire, Halverson, & Gee, 2005; Van Eck, 2006; Moreno-Ger et al., 2008). According to Epper, Anne and Sean (2012), a search of the *Chronicle of Higher Education* archives alone presented more than 100 articles having the term "game- based learning" or "games in the classroom." Even so, Epper et al. (2012) make the point that true adoption and institutional implementation of games into American higher education are still at the experimental stage. In an effort to examine the literature surrounding the use of game-based learning in online learning settings, the authors found that empirical research related to this topic is limited. To this end, the current study aims to use an experimental design to examine the impact of adding game elements on students' performances in an online learning setting.

# Terminology

Since there are a number of differences in the terminology with the use of gaming techniques and strategies in education, we wish to clarify how this study will define "game." Several authors, follow Salters explanation which is "when a game is designed with a primary purpose other than entertainment, it is generally labeled a serious game" (Salter, 2011b, para. 3). Dickey (2011) provides an explanation of "the notion of 'game' as an ambiguous term used to describe

structured recreational activities. Typically, components of games include goals, rules, challenges and some form of interaction" (p. 458). Continuing the delineation of the term, Dickey stated:

while individual definitions may vary, games are primarily recreational, including challenges or some form of stimulation, and typically, in varying degrees, have some type of victory/loss conditions. In contrast, serious games are games designed with a purpose beyond that of recreation or entertainment. Serious games encompass games designed to educate, train, incite activism, inform. (p. 458)

Hirumi, Appelman, Rieber, & Van Eck (2010) differentiated educationally important games from other types of games by describing them as "'serious' and 'educational' [video] games..." (p 27). Torrente, Moreno-Ger, Martinez-Ortiz, & Fernandez-Manjon, (2009) stated that "game-based learning is a very broad field, with varied initiatives and heterogeneous approaches" (p. 362). In this study, the researchers shall use the term game or games and game-based learning to connote all of the following: serious games, instructional games, instructional video games, instructional computer games, structuring learning experiences in a gaming environment, and education games. It is the researchers' contention that when instructional content is presented to learners in a game-based learning environment or a game-based learning activity with the intention of facilitating learning and increasing the knowledge base of the learners, the definition of game is achieved.

# **Literature Review**

Game-based learning inclusion in courses, is not a particularly new teaching strategy; however, current research on its effectiveness is sparse, and the studies that have been conducted have disparate results. Citing a number of studies, Hess & Gunter (2013) concluded that "despite the fact that games appear to be a method of linking authentic, engaging and appealing learning activities to students' interests ... there are pros and cons for the use of games for educational purposes" (p. 374). Hirumi et al. (2010) noted that:

the number of games being designed specifically to facilitate learning in conventional, hybrid and totally online training and education settings is ... on the rise. The problem is, like many rapidly growing industries, advances in video game technology are far outpacing research on its design and effectiveness. Relatively little is understood about how to apply what we know about teaching and learning to optimize game-based learning. For the most part, instructional designers know little about game development and video game developers may know little about training, education and instructional design. As a result, instructional designers may not realize the potential of play, game, and story to create engaging and memorable learning experiences, and game developers may fail to apply basic pedagogical principles that are vital for facilitating learning. (p. 27)

Hess & Gunter observed that "little research exists comparing a serious game-based and nongame-based online courses" (p. 373) while Adachi & Willoughby (2013) conceded that "some researchers have proposed that ... games possess good learning principles and may promote problem solving skills. Empirical research regarding this relationship, however, is limited" (p. 1041). Within the scope of this study, the researchers examined the fostering of motivation and curiosity of gaming in online courses, key factors of successful game-based learning, the result of time of task in gaming, and the effect gaming has on academic performance.

# **Motivation and Curiosity**

One of the most commonly agreed upon impact of games on students is the fact that they are motivational. Salter (2011c) declared that "...games can also inspire us to rethink our classrooms at a structural level, and particularly as sites for collaboration and playful learning that can extend long beyond a single lesson plan" (para. 1). She also suggested that educational games "encourage a different way of thinking–and can make an interesting start for bringing (your subject matter) into your classroom" (Salter, 2013, para 11). Game-based learning environments based on situational fantasy can also be motivational. Malone (1981) has identified fantasy as one of the key intrinsically motivating elements of games.

Researchers agree, then, that games are motivational; but their reasons vary. Robison (2013) noted that when using game-based learning environments, students tend to be less stressed than traditional environments due to the whimisical aspects of the games. De Freitas, et al (2010) explained that "the motivational capacities of game-play when brought together with the social interactions of online worlds may be a powerful teaching combination in the future" (p. 80). In her TED Talk video, McGonigal (2010) stressed that when involved in game-playing, learners are "motivated to do something that matters. Inspired to collaborate and cooperate" (3.70 minutes runtime). Brathwaite in another TED Talk (2011) agreed, stating that gaming is motivational because the content is not just abstract information, but can be truly inspiring. Dickey argued that the key element in the effectiveness of gaming is curiosity. Citing both Malone (1981) and Provenzo (1991) he discussed:

the importance of curiosity in game design as an element that promotes user engagement. In addition to being a component that helped in the transition between the learners' schema of an 'adventure game' and their experience in a game-based learning environment, in varying degrees, curiosity also played a key role in participants' perception and engagement. (p. 463)

According to Salter (2011c) Lee Sheldon posited that gamers were motivated by "opportunities for collaboration' and intrinsic rewards from helping others" (para. 3).

# Key Factors of Successful Game-based Learning

In addition to motivational factors, the researchers found that a number of studies discussed the salient factors that make game-based learning environments educationally effective. Del Blanco et al. (2012) noted instructional games require "...well-defined learning objectives and short expected completion time (around 15-45 minutes on average). This facilitates the design of game mechanics that focus on addressing a single goal (or a small set of goals) proposed for the activity" (p. 307). They cited:

...issues such as the role of the educator, how the game is integrated in the curricula, or how the informal learning that occurs when students collaborate and discuss about the game enhance the educational value. This is related to the idea of games considered as an additional activity that is not isolated but linked to other activities and contents, and where the game's outputs can influence the development of the learning process. (p. 306)

Additionally they suggested that specific tracking capabilities in order to effectively assess multiple aspects of the game-based learning environments "would alert educators about deviations from the desired goal" (p. 307). Another key factor in the success of gaming in learning is a definitive constructivist component to the game. The entire process of gaming requires the learner to build upon previous knowledge, develop his or her own knowledge base, and experience the game. Partlow & Gibbs (2003) noted in an instructional technology Delphi study, that focused game activities should be learner controlled (or at least have learner choices), collaborative, interactive, relevant, project-based learning tasks, and have cooperative group work (p. 82). An example of this type of game-based learning would be one of the first educational computer games, which was developed in 1971 and produced by the Minnesota Educational Computing Consortium (MECC) in 1974 – *The Oregon Trail*. Students/players had to make

choices in order to complete the game with the correct balance between ammunition, food, medicine and the like. Today's gaming environments, which include graphics, color, sound, etc. have the potential of maintaining students' interest longer than the old green screen, text only, *Oregon Trail* of yesteryear, though they are based on the same constructivist attributes.

Collaboration building is another success-making factor in using gaming in the classroom. Moreno-Ger, Burgos, Martinez-Ortiz, Sierra, & Fernández-Manjón (2008) suggest that "...games can be included as learning objects in units of learning based on communityoriented/collaborative learning strategies..." (p. 2539). Salter (2011a) affirmed that "games can bring a number of opportunities into the classroom, including: The opportunity to explore content from a new point of view ... (and) the reinforcement of teamwork and collaboration. (para. 4). Hess & Gunter (2010) pointed out that students will benefit from game-based leaning by promoting social collaboration (p. 373). Several studies certainly suggest that interaction between and among students and the teacher, as in a gaming environment, enhance the learning experience of online students (Pittinsky & Chase, 2000; White & Weight, 2000, Thorpe & Godwin, 2006).

# Time on Task

There is limited, but good research on the quantity of time that students spend on educational gaming; however, anecdotal evidence indicates that students are very comfortable with using gaming strategies. Today's students have grown up with the problem-solving skills developed by playing a variety of recreational computer games. Adachi & Willoughby (2013) pointed out that "... video game play has become ubiquitous among adolescents .... In terms of frequency, 31 %of adolescents play video games every day and another 21 % play games 3-5 days a week" (p. 1041). In a study of young adults, Lenhart, Kahne, Middaugh, MacGill, Evans, & Vitak (2008) found that 97 % of American adolescents aged 12-17 years play computer, web, and portable or console video games (p. 2). Lenhart, Jones, & MacGill, (2008) concluded that 81% of young adults, between 18-29 years of age also are involved with gaming (p. 1). Time-on-task is an important factor in learning material. Game-based learning environments assist students in spending more time on the problem at hand. Hess & Gunter (2013) found that students and teachers in the game-based courses believed the games were more desirable, more helpful and had fewer hindering aspects that their counterparts in the non-game-based course (p. 372). They also determined that the game-based course students spent 145.80 days on the class, while the non-game-based students spent only 112.63 days, concluding that "students in the game-based course were found to have ... taken significantly longer" working on the their class (p. 372). Lastly they found that students in the serious game-based course on average completed twice as many courses (mean of the game-based course = 12.1, mean of the nongame-based course = 5.11) and were enrolled in significantly more courses (2.30 vs. 1.30) than students in the nongamebased course (p. 376). Research has shown that playing content-related games will result in students who spend more time focusing on course content, completing more courses in the subject matter, more time problem-solving and strategizing, in short, will gain a deeper, more thorough understanding of the content.

# **Academic Performance**

Do game-based learning environments enhance students' academic performance in classes? A number of studies have indicated there is a connection. Assuming that higher grades indicate better performance, Hess & Gunter (2013) found "the results suggest that students in the serious game-based online course ... were found to have performed significantly higher ... than students in the nongame-based online course" (p. 381). Hess and Gunter were not alone in their findings. Shin, Sutherland, Norris, Soloway (2012) noted that "given two types of arithmetic games for practice, students who played a technology-based game outperformed those who played a paper-

based game, and students who played more outperformed those who played the game less frequently, regardless of student ability level" (para. 40). They also suggested that their finding "...provided evidence that the technology-based game influenced student's arithmetic learning" (para. 40). In a study of 1,492 adolescents over a four year high school program, Adachi & Willoughby ((2013) found

"the results showed that more strategic video game play predicted higher self-reported problem solving skills over time than less strategic video game play. In addition, the results showed support for an indirect association between strategic video game play and academic grades, in that strategic video game play predicted higher self- reported problem solving skills, and, in turn, higher self- reported problem solving skills predicted higher academic grades. (p. 1041) Despite the research showing that educational gaming results in higher academic performance, not all teachers are willing to use gaming in their classrooms. Kim (2006) noted that in a survey for online instructors, while a majority acknowledged that interactive online activities are effective, "a significant gap separated preferred and actual online instructional practices" (p. 23). To put it simply, many teachers have difficulty accepting games as educationally valid.

Though research in the area of the effectiveness of educational gaming is sparse, the researchers are not alone in the quest to better understand the effective uses of gaming. Dickey addressed the issue by stating "the design of digital games is a rich topic of study for educational researchers and instructional designers studying ways in which game design can be appropriated, borrowed and re-purposed for the design of educational materials" (p. 457). There is every reason to believe that game-based learning environments and activities will only become more prevalent in a very short time. Since instructional games are an area of potential growth in education, there is a need for researchers and practitioners to know how and why students will benefit.

# Methodology

Since the scope of game-based learning is quite broad as discussed in the literature review, this study is narrowed to only one aspect of game-based learning by examining the impact of adding game elements on students' performances in an online learning setting. Specifically, the researchers designed a study in order to address the following questions:,1) is there any significant difference between the course section with the game elements (treatment group) and the course section with the traditional design (control group) in term of the time learners spent in the course, 2) Is there any significant difference between the course section with the traditional design (control group) in term of the number of students' posts, and 3) is there any significant difference between the course section with the game element the traditional design (control group) and the course section with the game elements (treatment group) in term of the number of students' posts, and 3) is there any significant difference between the course section with the game elements (treatment group) and the course section with the game elements (treatment group) in term of students' posts, and 3) is there any significant difference between the course section with the game elements (treatment group) and the course section with the game elements (treatment group) and the course section with the game elements (treatment group) and the course section with the game elements (treatment group) and the course section with the game elements (treatment group) and the course section with the game elements (treatment group) and the course section with the game elements (treatment group) and the course section with the game elements (treatment group) and the course section with the game elements (treatment group) and the course section with the game elements (treatment group) and the course section with the game elements (treatment group) and the course section with the game elements (treatment group) and the course section with the game elements (treatment gro

# **Research Participants**

Two intact online graduate level course sections were chosen for this study. These two course sections were offered online for graduate students at a Midwest university. The same instructor was in charge of both the two sections with the same course design, content, requirements and expectations. Both course sections ran on the weekly lecture and assignment basis. Each week, both of the course sections had a new lecture and assignments related to that week's topic. In total, there were 16 lectures and assignments during a 16 week-long semester. Each course section had 18 graduate students who were mainly in-service teachers.

# **Research Procedure**

After the two course sections completed the fourth week of the semester, the instructor continued to use the regular course design and delivery approach that he had used in the previous weeks in

course section 2; however, the instructor included many game elements into the week 5 lecture for course section 1. To clarify, the students in course section 1 were the treatment group and the students in course section 2 were the control group. The game elements used in course section 1 was the independent variable. Both course sections were made available to students at the same time and still had the same assignment requirements. Students in the two course sections could log into the course any time to learn at their own pace and submit the assignments before the deadline. The dependent variables were the number of learners' posts in course forums, the time learners spent in the course during a week, and the week 5 assignment grades.

The number of learners' posts in the course forums was used as one of the criteria to measure students' learning performances in this study because, as emphasized by Pittinsky and Chase (2000), the frequency of interactions among learners and between learners and the instructor greatly affected the instructional value of online learning. White and Weight (2000) asserted that online learning was structured around the dynamics of human communications and it featured the asynchronous equivalents of traditional face-to-face class discussions and learners' interactions. In addition, Thorpe and Godwin (2006) found that interactions in online learning helped to expand the learning relationships available. Interactions also helped generate cognitive processes of explanation, reflection and internalization. The learners' grades were also included in this study to measure learners' progress. Given the current age of emphasized accountability for stakeholders, learners' grades are a basic starting point for examining the effectiveness of the course and/or an activity. Finally, the time learners spent in the course was also used to measure learners' learning performances in an online course. More specifically, it reflects, to some extent, the learners' interest in the course by the frequency and the regularity of their logging into the course. The researchers made an experience-based assumption that if the course in general, or a particular activity in the course, was not interesting, learners would not log into it frequently nor spend a lot of time in their course. In addition, it has been reported that there is actually a positive and significant relationship between the time learners spend in their online courses and the grade they achieve in the courses (Coldwell, Craig, Paterson, & Mustard, 2008; Rodgers, 2008; Ryabov, 2012).

In course section 1 with the game elements (the treatment group), the course started with a warmup activity in the form of an online mini game designed by the instructor as shown in Figure 1 below. Students clicked a True/False option to answer the question that appeared on the screen. There were five questions in the game and all of the questions were related to that week's topic, which was "*Emerging Technologies in K-12 Education: Gamed-Based Learning*". Upon completing the game, students would see their scores. These scores did not affect their assignment's grades or final grades. The purpose of this activity was to warm up students before starting a new topic and also help them pre-test their knowledge about game-based learning. After this activity, students participated an optional activity in the form of discussing a controversial topic about the use of games in K-12 classroom setting. Instead of using a traditional online discussion forum in the Blackboard learning management system (LMS), the instructor created a game-like discussion forum right below the warm-up activity so that students could free-type and share their ideas on the discussion board as illustrated in the Figure 1 below.



Figure 1. Screenshot of Course Section 1 with Game Elements

Next, the students watched the video lecture and answered the questions that popped up during the video lecture. They had to answer the questions correctly to be able to continue watching the lecture. The instructor embedded those questions into the video lecture in order to increase the interactions between the lecture and the students. In addition, right below the video lecture, there was a real time synchronous chat box for the learners to interact with each other in real time while watching the video lecture as shown in the Figure 2 below. Those discussion forums actually simulated discussion or message boards in popular video games in which participants could interact or chat with each other in real time and see how many participants were in the session at the same time.

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Digital Games & Learning

Another tool in your learning/teaching repertoire

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<ul> <li>awesome</li> <li>I have used Splashtop! That was encouraging, as I consider myself behind the technology curve. I liked how he was thorough in his explanations, as some people (myself) don't already " know" things most other people do about technology.</li> <li>I am going to try Splashtop this week!</li> </ul>	Me 3 viewers	* * * *
Please click on "Sign in" to share your comments and/or ideas while watching the video clip. Thanks!	6 online	
Sign in		

Figure 2. Screenshot of Course Section 1 with Game-Based Design

In the previous weeks, students also had the similar video lecture format but those previous video lectures did not have any embedded questions or a real time chat feature. In other words, the previous video lectures were static video clips. A PowerPoint presentation about that week's topic was integrated into the lecture right after the video lecture. Following the video lectures and PowerPoint presentations were required reading materials and optional reading materials. The course ended with a wrap-up activity also in form of an online mini game. Directly below that week's lecture in the discussion board was an assignment instruction section. Both course sections 1 and 2 had the same assignment instructions and requirements, which included reviewing of the articles, responding to their peers' posts, and a game reviewing or creating task.

In the course section 2, which had the traditional course design (the control group), the course started with a short introductory paragraph as shown in the Figure 2. Directly below the introductory paragraph in the discussion board was a static video lecture. Like course section 1, course section 2 also had a PowerPoint presentation about that week's topic. Following the introductory paragraph were required reading materials and optional reading materials. The course ended with a wrap-up paragraph. Immediately below that week's lecture in the discussion

board was an assignment instruction for that week. Both course sections 1 and 2 had the same assignment instructions and requirements.

Educational games are games explicitly designed with educational purposes, or which have incidental or secondary educational value. They are games that are designed to teach people about certain subjects, expand concepts, reinforce development, understand an historical event or culture, or assist them in learning a skill as they play. Before discussing this week's topic, let's start with the video lecture below.



Figure 3. Screenshot of Course Section 2 with Traditional Online Course Design

The students' demographic information, time spent in the course sections, the number of posts in the course forums, and' grades in week 4 were used to test the equivalence between the two groups. By pulling out learners' login data in week 4 from the learning management system log, the researchers identified the following data in two course sections. As shown in the tables below, the learners in course section 1 and 2 were quite equivalent in terms of demographic backgrounds, students' average time spent in course section, number of students posts, and students' grades.

# **Table One**

Learners'	demog	graphic	inform	ation
		,		

Course See	ction 1	Course Section 2		
Job	Gender	Job	Gender	
In-service teachers		In-service teachers		

	09				11		
Librarians	05			Librarian	03		
Technology coordinators	01			Technology coordinator	0		
Graduate students without current job	03			Graduate students without current job	04		
Total	18	13 Female	05 Male	Total	18	11 Female	07 Male

# **Table Two**

Learners' Activities in Both Course Sections in Week 4

Student' time spen sect	s average t in course ions	Number of st	Students grades Week 4		
Section 1	Section 2	Section 1	Section 2	Section 1	Section 2
3.97	4.01	03	03		
hours/week	hours/week	posts/student/week	posts/student/week		
		- -	-	92/100	91.15/100

After week five was completed, the learners' login data for week five in both sections 1 and 2 were extracted from the Blackboard LMS. Collected data were arranged into three categories: the students' average time spent in the course section, the number of students posts, and the students' grades. Categorized data were then analyzed using Statistical Package for the Social Sciences (SSPS) version 16 to find the answers to the research questions.

# Results

Research question 1: Is there any significant difference between the course section with the game elements (treatment group) and the course section with the traditional design (control group) in term of the time learners spent in the course?

An independent-samples t-test was conducted to compare the time learners spent in the course section with the game-based design (treatment group) and the course section with the traditional design (control group). As shown in the tables 3 and 4 below, there was a significant difference in the time students spent in their courses for the course section with the game-based design (treatment group) (M=6.06, SD=1.55) and the course section with the traditional design (control group) (M=4.83, SD=1.09); t (34) =2.73, p = .01. These results suggest that the game-based design had an effect on the time students spent in the online course. The students in the game-based designed course section tended to spend more time in the course than their peers in the traditionally designed course.

# Table Three

Descriptive Statistics of Time Learners Spent in the Course Section 1 and 2

				Std.	Std. Error
	Section	Ν	Mean	Deviation	Mean
Time	Section 2	18	4.83	1.10	.26
	Section 1	18	6.06	1.55	.37

#### Table Four

Indepe	Independent Samples Test							
		t-	t-test for Equality of Means					
					95%			
					Confidence			
					Interval of			
					the			
		Sig. (2-	Mean	Std. Error	Difference			
		tailed)	Difference	Difference	Lower			
Time	Equal variances assumed	.010	-1.22	.45	-2.13			
	Equal variances not assumed	.010	-1.22	.45	-2.14			

Research question 2: Is there any significant difference between the course section with the game-based design (treatment group) and the course section with the traditional design (control group) in term of the number of students' posts?

An independent-samples t-test was conducted to compare the number of posts learners posted to the course forums in the course section with the game-based design (treatment group) and the course section with the traditional design (control group). For week 5 assignments, the students in both course sections were required to post at least one post in the form of a review of a selected reading article, and one post in the form of a response to their peers' posts. In total each student had two required posts, while additional posts were optional and voluntary. In addition, in this study, students' posts and/or comments in the game-like discussion following the warm-up activity and video lecture in the game-based designed course section were not counted. The researchers believe that if those posts and/or comments were included, the result would have been skewed because this activity was not included in the traditionally designed course section.

As shown in tables 5 and 6 below, there was a significant difference in the number of posts between the course section with the game-based design (treatment group) (M=4.78, SD=1.83) and the course section with the traditional design (control group) (M=3.39, SD=1.15); t (34) =2.73, p = .01. These results suggest that the game-based design had an effect on the number of posts students posted to the course forum in the online course. Students in the game-based designed course section tended to interact with each other in the course more than their peers in the traditionally designed course.

# Table Five

Descriptive Statistics of the Number of Posts Learners Posted to the Forums in the Course Section 1 and 2

				Std.	Std. Error
	Section	N	Mean	Deviation	Mean
Posts	Section 2	18	3.39	1.14	.27

Section 1 18	4.78	1.83	.43
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#### Table Six

Independent Samples Test							
		t-	t-test for Equality of Means				
					95%		
					Confidence		
					Interval of		
					the		
		Sig. (2-	Mean	Std. Error	Difference		
		tailed)	Difference	Difference	Lower		
Posts	Equal variances assumed	.010	-1.39	.51	-2.43		
	Equal variances not assumed	.011	-1.39	.51	-2.43		

Research question 3: Is there any significant difference between the course section with the game-based design (treatment group) and the course section with the traditional design (control group) in term of students' grades?

An independent-samples t-test was conducted to compare the grades students achieved during week 5 in the course section with the game-based design (treatment group) and the course section with the traditional design (control group). In week 5, although the two course sections were designed differently, the assignment requirements and instructions were identical. The first assignment was to post an article review to the course forum and a response to peers' reviews. The second assignment was to write a game review or create a mini game for classroom use. Each assignment had 50% of the weight of the weekly grade. The instructor used the same rubric to evaluate the students' assignments. The rubrics were posted along with the assignment instructions and requirements so students could know what they were expected to include in the assignments.

As shown in the tables 7 and 8 below, there was no significant difference in grades students achieved during week 5 in the course section with the game-based design (treatment group) (M=91.44, SD=4.78) and the course section with the traditional design (control group) (M=91.11, SD=4.52); t (34) =0.22, p = .83. These results suggest that the game-based design really did not have an effect on the grades students achieved in the online course.

# Table Seven

Descriptive Statistics of the Grades Learners Achieved in the Course Section 1 and 2

				Std.	Std. Error
	Section	N	Mean	Deviation	Mean
Grades	Section 2	18	91.11	4.53	1.07
	Section 1	18	91.44	4.78	1.13

# Table Eight

Independent Samples Test						
	t-test for Equality of Means					
				95%		

		Sig. (2-	Mean	Std. Error	Confidence Interval of the Difference
		tancu)	Difference	Difference	Lower
Grades	Equal variances assumed	.831	.33	1.55	-2.82
	Equal variances not assumed	.831	.33	1.55	-2.82

# Discussion

The finding of the first research question indicated that there was a significant difference in the time students spent in their courses between the course section with the game-based design (treatment group) and the course section with the traditional design (control group). In other words, students in the game-based designed course section tended to spend more time in the course than their peers in the traditionally designed course. While these findings support the data reported by Hess and Gunter (2013) on the impact of game-based learning on the amount of time students spent in their courses, it is important to remember that the current study was conducted in an online learning setting and the Hess and Gunter study was conducted in a traditional face-to-face course.

Similarly, the result of the second research question indicted that there was a significant difference in the number of posts between the course section with the game-based design (treatment group) and the course section with the traditional design (control group). This result suggests that the game-based design had an effect on the number of students' posts in the course forum in the online course. While the researchers were unable to find any research comparing the use of gaming in classes—face-to-face or online—to an increase in student postings, in one of few studies about this topic, Salter (2011d) noted that "ideally, adding game elements means an opportunity to … allow for collaborative and personal engagement with the material in a different way. I hope to see students rise to some of these challenges …" (para. 9).

It is commonly agreed that one of the disadvantages of online learning is the lack of interactions among online learners (Aoun, 2011; Boulos, Taylor & Breton, 2005; Vu & Fadde, 2013). The current findings indicate that there is a potential for game-based learning to increase interaction in the online learning setting. It is noteworthy that in this study there was a significant difference in the number of posts between the course section with the game-based design and the course section with the traditional design, even without counting the extra posts from the game forums. This is good news for online learning because it appears that the game features of the online course under study promoted student-to-student as well as student-to-teacher interactions. Thorpe and Godwin (2006) assert that interactions in online learning help to expand the learning relationships available, which in turn help to generate the cognitive processes of explanation, reflection and internalization, characteristics which have been long considered lacking in online learning.

Finally, the finding of the last research question revealed that there was no significant difference in grades students achieved during week 5 in the course section with the game-based design and the course section with the traditional design. Essentially, the game-based design did not have an effect on the grades students achieved in the online course. It would seem logical to assume that students who spend more time focusing on course content and interacting with others within the course (regardless of the format) would perform better than those who spend less time and have less interaction. Indeed, the findings of the current study differ from what has been reported in the literature, which points to a positive and significant relationship between the time learners spent in their online course and the grade they achieved in the course (Coldwell, Craig, Hess & Gunter, 2013; Paterson, & Mustard, 2008; Rodgers, 2008; Ryabov, 2012), as well as connecting the frequency of interactions among learners with the instructional value of online learning (Pittinsky & Chase, 2000). While the findings in the current study indicate that the amount of time students spent in their online courses does not necessarily correlate with better performance, they may instead reflect the learners' *interest* in the course, their need to spend more time in the course in order to learn how to play the game, a lack of correlation of the game with desired student outcomes, or a combination of these factors. Additionally, it is plausible that the short amount of time monitored in this study does not reflect the impact games would make in student performance over the course of an entire class. The researchers believe that more research is needed to examine the impact of game-based learning on students' performance and grades in the online learning setting.

An important consideration in studying the impact of using games in an online setting is the fact that it could attract learners to play and learn at the same time. If we look at the students' demographics presented in table 1, it may be concluded that students in this study were mature and self-motivated graduate students. According to a report by the Entertainment Software Association (2013), the average age of game players is 30. The age range of the students in this study was 30 to 40. Both the results of the first and second research questions, as well as the findings in the literature, suggest that game-based learning has potential for getting and keeping the attention of learners in an online educational setting.

# Conclusion

This research is one of the very few attempts to explore the potential of integrating games and their mechanism into online learning settings through an experimental design in an authentic online learning environment. As indicated in the literature, the lack of empirical research on game-based learning in education, especially in the online learning environment, has resulted in the hesitance of teachers to integrate games into their online instruction. Although this study showed that there was no significant difference in grades students achieved during week 5 between the course sections, including game-based learning in the online setting is still worth considering. The game helped motivate students to frequently enter the course and get more engaged in the course forums. Based on the literature, the mechanism of improving students' performances should be "game-based learning > students' interest/motivation > the amount of time students spending on the course > high performances in the form of scores". The findings of this study indicated that more longitudinal studies are needed to examine the impact of gamebased learning on students' academic performance in the form of scores and to examine whether the nature of the assignments and/or subject areas make any difference in the impact of gamebased learning on students' grades. In summary, the authors conclude that integrating games into the online learning setting may be a valuable addition to online courses. It has the potential to elevate learning to a new level, helping students achieve a higher degree of engagement in their online courses.

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Online Journal of Distance Learning Administration, Volume XVII, Number IV, Winter 2014 University of West Georgia, Distance Education Center Back to the Online Journal of Distance Learning Administration Contents