What's in a Game's Name?

Task Framing, Learning, and Enjoyment in an Educational Game

by

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ABSTRACT

This study explores the influence of framing and activity type on expectations of learning and enjoyment as well as performance in a paraphrase identification task. In the first experiment, 80 students played one of three activities framed as either a "play" or "learning" task. Students then completed one of three activities; learning only, an educational game, or a play only activity. Results showed that the play frame had an effect on learning expectations prior to completing the activity, but had no effect after completing the activity. Students who completed the educational game scored significantly higher on the posttest learning assessment than those in the play only activity. Pairwise comparisons also indicated that students who completed the educational game performed just as well as the learning only activity when given the posttest learning assessment. Performance in the paraphrase identification task was collected using data logged from student interactions, and it was established that although there was an interaction between performance and activity type, this interaction was due to a significant difference during the second round. These results suggest that framing can influence initial expectations, and educational games can teach a simple writing strategy without distracting from the educational task. A second experiment using 80 students was conducted to determine if a stronger frame would influence expectations and to replicate the effect of activity type on learning and enjoyment. The second study showed no effect of framing on expected or reported enjoyment and learning. The performance results showed a significant interaction between performance and activity type, with the interaction being driven by the first round that students completed. However, the effect of

activity type was replicated, suggesting that game features can enhance student enjoyment and are not a detriment to learning simple strategy-based tasks.

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INTRODUCTION

Digital games have become ubiquitous in American culture. Much like books with the invention of the printing press and videos with the invention of the personal camcorder, digital games have become easier to access and create with the advent of cheaper and better technology. The increase in the use of digital games as a medium provides an environment for instructors to distribute information, give feedback, and administer assessments within a less formal context than a textbook or quiz (Gee, 2008). Unfortunately, this increase is a double-edged sword. The ubiquity of games in society may not only make games easier for students and teachers to approach, but previous experience with games may also influence users' expectations of games as fun or useful. This thesis addresses the utility of games as tools for learning, and also how students' expectations may be influenced by how games are framed by different contexts.

This thesis focuses specifically on the implementation of games within the Writing Pal intelligent tutoring system, and how different types of practice potentially influence strategy learning and enjoyment when practicing an educational task. This thesis also addresses the issue of how context can influence student perceptions of educational tasks and game-based practice. Two experiments were designed to examine the effect of practice type on learning and enjoyment as well as how framing an educational task can affect expected enjoyment and learning. Both experiments compare the effect of game-based versus non-game-based practice. These experiments also address how emphasizing play or learning before an activity (i.e., *framing)* may or may not influence students' expected enjoyment and learning.

Learning Strategies

Strategies are procedures or techniques that can facilitate the completion of a task (Alexander, Graham, & Harris, 1998). These strategies can involve simple mnemonics to enhance retention of information, or more complex behaviors that involve synthesizing new information based on what is being learned. Learning strategies have been shown to enhance performance (Graham & Harris, 2006), and they have been studied across numerous domains from writing to science comprehension (e.g., McNamara, 2004). Strategy knowledge has also been linked to academic achievement (Vanthournout et al., 2012). Healy, Schnieder, and Bourne (2012) discuss the importance of basic cognitive processes that underlie training as well as several different factors that influence the effectiveness of strategy training. These factors include students' allocation of cognitive resources, the context in which the training is taking place, and the difficulty of the task being trained. This perspective illustrates the importance of not only the learner and the content, but also the context in which training is being conducted.

It has been demonstrated that the *way* students learn strategies is important (Askell-Williams, Lawson, & Skrzypiec, 2012). A student is more likely to use a strategy when they are properly instructed in its use and the appropriate times to use it. This emphasizes the importance of consistent strategy instruction. While human tutors have been shown to be an effective method for teaching students learning strategies (McNamara, 2004), they are often resource intensive and difficult to train consistently. Intelligent Tutoring Systems (ITSs) have been demonstrated to be just as effective for teaching students learning strategies (Woolf, 2010) and can provide more equivalent experiences for students.

Intelligent Tutoring Systems

One major advantage of ITSs is the flexibility they afford the user as well as the designer. Students can progress at their own pace as they complete assignments or review material. ITSs can also be adapted much more quickly than human tutors by updating the student model being used for training. ITSs have been developed for a variety of domains from computer hardware (AutoTutor; Graesser, Chipman, Haynes, & Olney, 2005) to reading comprehension strategies (iSTART; McNamara, Jackson, Boonthum, Deng, & Xiangyou, 2012). It is this sort of flexibility in administering training that is so useful for teaching students learning strategies. Another important factor to consider is whether students attend to the instruction being provided.

Managing attention is a major component in effective training, especially in tasks that are more prone to fatigue effects (e.g., attending to objects for an extended period). One suggestion for alleviating problems with fatigue is to provide variable training in the form of diverse types of practice or to simply alter the amount of time that students practice a task (Healy et al., 2012). ITSs often implement different forms of practice for students in the form of scaffolded quizzes or questions that prompt students to generate an answer. Although this can provide a form of varied practice, there are only so many forms of quiz or short form answer that ITS designers can implement. McNamara, Jackson, and Graesser (2010) propose games can be used as tools for practice in ITSs and suggest several different effects they could have on how students interact with ITSs.

Games as Tools in Learning Environments

Digital games have become more important as a medium for educational content. An advantage in designing educational games in educational environments is that

mechanics are easily manipulated without changing the core components of the task being trained. A game designed for practicing math may be presented as an epic adventure (Zombie Division; Habgood, 2005) or as a simple minigame (Prime Climb; Conati, & Manske, 2009). Educational game designers can create numerous short games that can be implemented in a learning system to keep students engaged over longer periods of time, providing educators with a diverse set of games focused on teaching a single set of concepts. For example, iSTART-ME (McNamara et al., 2012) focuses on providing students with reading comprehension strategies using self-explanation. Rather than using a single game to teach different strategies, iSTART-ME provides the student with multiple, shorter games designed to provide practice identifying different types of self-explanation or producing their own self-explanation. Although task completion is similar across many of the games, the game goal changes. This provides the student with a varied context to practice self-explanation.

As teaching tools, the appeal of videogames is two-fold, not only can videogames provide a structured environment for students to receive feedback on their performance, but they can also evoke a sense of "play" that can promote engaged practice over a longer period of time (Malone & Lepper, 1987; Piaget, 1951). This sense of playful learning that is supported by games, as defined by Malone and Lepper (1987), can serve as a source of intrinsic motivation, which in turn influences students' approach to learning. Intrinsic motivation in this case is the motivation to complete without the use of external reward or punishment. For entertainment games, the act of playing the game is itself a motivator, and the goal of learning games is to associate that "playing for the sake of playing" with the learning task. The influence games have on intrinsic motivation could be described as

"fun", and is one reason that games are so appealing (Dondlinger, 2007; Young et al., 2012).

There are numerous reasons that games could be useful when applied to a larger learning system, from providing diverse forms of feedback to affording educators with the ability to dynamically adjust difficulty (McNamara, et al. 2010). This thesis focuses on the use of games as motivational tools and how games can potentially enhance student enjoyment by providing incentives to complete learning tasks. Although enjoyment is the main focus of this thesis, it is important to consider how student enjoyment of a task influences motivation (Isen & Reeve, 2006) and how motivation is an important factor in educational games research.

Educational Games, Motivation, and Engagement

There are numerous approaches to using games to influence student motivation and one important distinction is between the use of games as intrinsic or extrinsic motivators (Garris, Ahlers, & Driskell, 2002). This distinction is important not because educational games can be labeled as either intrinsic or extrinsic, but because games can influence both types of motivation depending on how they are associated with a learning goal. A game may include puzzles to be solved, which could prompt students' curiosity. The same game may also increase the difficulty after each puzzle completed in order to prevent the puzzle-tasks from becoming too boring. In the context of a game these types of "incentives" could be considered to be intrinsic motivators because they promote interest in the game itself (Malone & Lepper, 1987). Educational games present a unique opportunity in that the game that is attached to the educational content becomes an extrinsic motivator. A puzzle game becomes an extrinsic incentive when it is associated

with a vocabulary task if a student is looking forward to playing the game after they complete the task. Although extrinsic rewards may not be as effective as intrinsic ones, it is important to note that extrinsic rewards can still positively influence learner behavior (Garris et al., 2002). These sources of motivation are important factors in game design because one of the goals for any game is to induce the user to continue to play.

The promotion of persistence that games afford is one of the most important components in making learning more enjoyable. However, designing educational games that are not only enjoyable but effective practice is a daunting task, and different game design components must be considered when using games to make learning environments more enjoyable. Thus, it is important to consider not only the content that students are being taught but also the context in which the games are played. Is the game itself the full educational intervention, or are the educational games just a part of a larger pedagogical system? This thesis focuses on brief minigames designed for the Writing Pal intelligent tutoring system (Roscoe, Brandon, Snow, & McNamara, 2014) as an incentive to practice content taught in throughout the tutor's nine different modules. While motivation is important in the long term, a major concern in the Writing Pal tutor is inducing students to engage with different writing strategies in the first place.

Engagement is related to motivation in that when students are not engaged they do not properly attend to material as they are interacting with it. This lack of engagement decreases the chances that the student will persist long enough to learn effectively. The importance of engagement in learning has been demonstrated in numerous studies (Craig, Graesser, Sullins, & Gholson, 2004; Cordova & Lepper, 1996) and many educational games have been shown to improve students' engagement and motivation (Malone &

Lepper, 1987; Colby & Colby, 2010; Lee & Probert, 2010; Johnson & Valente, 2009). How are such outcomes achieved? What aspects of educational games most impact student engagement? Some research focuses on particular game components, such as feedback and narrative, which can increase users' enjoyment (Garris et al., 2002). Other studies have found that *expectations* of technology may influence whether a student will be motivated to complete a task (Jackson, Graesser, & McNamara, 2009). Likewise, *previous game experience* influences expectations of games for learning (Bourgonjon, Valcke, Soetaert, & Schellens, 2010). Thus, students' expectations should be considered when attempting to design and implement educational games.

Framing Expectations

Students' expectations may be affected by how educational games are *framed*: an activity described as a tool for learning rather than as a form of entertainment. Framing can influence individuals' appraisals by focusing attention on particular attributes of an object or decision (Levin, Gaeth, Schreiber, & Lauriola, 2002). The framing effect occurs when the description of a situation or decision is put in either negative or positive terms. In this case, when students are asked about the same alternative, they are likely to rate it differently based on the valence of the frame (Levin, Schneider, & Gaeth, 1998). If the frame is positive, students are more likely to rate an attribute or decision more positively, and more negatively when the frame is negative. The framing effect has been demonstrated in areas involving decision-making and threat assessment of an immediate kind (Highhouse & Paese, 1996; Fagley & Miller, 1997) as well as more extensive, health-related decisions (Meyerowitz, & Chaiken, 1987). However, decisions regarding whether to play a game do not have stakes as high as deciding between money and death.

In the case of educational games, students' decisions are usually regarding whether or not they decide to continue playing a game (e.g. continuing to play because of an enjoyable experience or continuing to play to complete a particularly difficult challenge).

Games usually involve some sort of reward versus investment system, so in the case of frames and gaming, students must choose whether an investment of time and energy will yield an equal or positive return. Dufwenberg, Gächter, and Hennig-Schmidt (2011) demonstrated this effect of frames on decision-making in games for the public good. Their results demonstrated that a simple manipulation of "give" or "take" influenced students' tendency to give or take different amounts of money while playing an economic game. They showed that a social frame designed to influence beliefs about concepts like "give" and "take" influenced actual give or take behavior measured as amount of money given or taken.

For educational games, students have no choice but to participate in the game if they have been assigned by a teacher, but highlighting either the learning or play attribute of an educational game may influence the decisions that students make regarding how much they expect to enjoy an educational game. In an educational game, frames may influence the salience of various tasks, pedagogical elements, and game elements. Thus, framing may influence how students evaluate educational games if a "learning" or "play" attributes are emphasized.

For the purposes of this study, the effect of framing on either the learning or play attribute of an educational game will be examined and how framing may influence expected enjoyment and expected learning. This experiment also addresses the effect of educational games on learning and reported enjoyment when compared to a non-game

educational task. It is hypothesized that frame will influence student expectations of enjoyment and learning, depending on whether they are told they will "play a game" or "complete an educational task." It is also hypothesized that students who interact with an educational game will report higher enjoyment than those students who interact with a learning only activity. Another question involves the effectiveness of educational games as tools for learning, and whether games are just as effective practice as non-game practice.

Chapter 2

EXPERIMENT 1

Methods

Students. Students included 80 students from the Arizona State University Introductory Psychology subject pool. Eight students, similar in demographic to the full sample, were excluded from the final analysis due to failure to follow directions. Of the remaining students, 19 (26%) were female and 53 (74%) were male. The age of students ranged from 19-25 (M=20.5). There were 44 Caucasian, 11 Hispanic, 9 Asian, and 8 students of other ethnicity. Students were predominantly native English speakers with 22% (n=16) who self-identified as English Language Learners. Students reported their GPA range with 66 students reporting a GPA of 2.1 or greater.

Design. The experiment utilized a 2 (frame: learning, play) x 3 (activity: learning only, educational game, play only) between-subjects factorial design. Students were randomly assigned to condition. The training domain chosen involved the identification of paraphrase types that are taught in the Writing Pal intelligent tutoring system (see Table 1). All students were provided with a set of paraphrase definitions to remove the need to train students for the learning task. The definition page consisted of four paraphrase techniques (*change words, change structure, split, and condense;* see Table 1) and was accessible at any point during the experiment from the beginning of the pretest to the end of the posttest.

Table 1
Paraphrasing Instructions

Instruction Type	Paraphrasing Instructions
General Instruction	Paraphrasing is the restructuring or rewording of a sentence.
Change Words	The Change Words Strategy has been used when some of the original passage's words are replaced with synonyms. A synonym is a word that has the same or similar meaning as another word. The Change Words Strategy helps writers avoid repeating the same words too often.
Changing Structure	The Change Structure Strategy has been used when parts of the original passage have been rearranged. This might involve moving clauses or switching the order of sentences
Condensing	The Condensing Strategy has been used when the original passage is condensed to form a shorter passage. This might be used when a sentence is too long or sentences are too choppy
Splitting	The Splitting Strategy is used to divide long sentences, or run-on sentences, into two or three normal sentences. This may be used in the case of run-on sentences or when a sentence is too long.

Procedure. The experimental procedure comprised four phases: pre-survey, frame, activity, and post-survey. The measures included in this experiment are described in greater detail in the Measures section.

Pre-survey. Students began the experiment by completing a brief pre-survey that contained demographics information as well as questions pertaining to the frequency of students' computer use, their prior gaming experiences, and their perceptions of game usefulness and usability in the classroom.

Frame. After completing the pre-survey, students were shown one of two frames (learning or play) and rated their expected enjoyment and learning for the session. The frame consisted of a brief welcome to the experiment along with either the play or learning frame (see Table 2 for framing instructions).

Table 2
Play and Learning Frames

Frame	Question Type	Frame Instructions
Play Frame	General Instructions	After completing a survey rating on enjoyment and learning you will *play* a skill-based *computer game* 4 times. Please click the button below to continue.
	Expected Enjoyment	How much do you think you will enjoy the *game* you are about to *play*?
	Expected Learning	How much do you think you will learn from the *game* you are about to *play*?
Learning Frame	General Instructions	After completing a survey rating on enjoyment and learning you will *complete* a skill-based *learning task* 4 times. Please click the button below to continue.
	Expected Enjoyment	How much do you think you will enjoy the *task* you are about to *complete*?
	Expected Learning	How much do you think you will learn from the *task* you are about to *complete*?

Note. Differences between frames are italicized for reference; they did not appear italicized during the experiments.

Activity. During the activity phase, students interacted with one of three activities: an educational game, a learning only activity, or a play only activity. The educational game consisted of a paraphrase identification task along with the simple strategy game, *Map Conquest*. The learning only activity consisted of the same paraphrase identification task along with a color match task. The play only activity was comprised of the color match task and the *Map Conquest* strategy game.

Educational game activity. The educational game activity was originally designed for the Writing Pal writing strategy tutor. It was designed to provide students with game-based practice concerning four different paraphrase techniques. The task of identifying types of paraphrasing was paired with the resources in the *Map Conquest* game to promote enjoyment. During the paraphrase identification task, students were shown an

original passage with an example paraphrase created using one of the four paraphrase techniques provided (*change words, change structure, split, and condense*). Researchers trained in how to effectively use each of the paraphrasing techniques created the example paraphrases. Students were instructed to identify which paraphrase technique was used to generate the example paraphrase (see Figure 1).

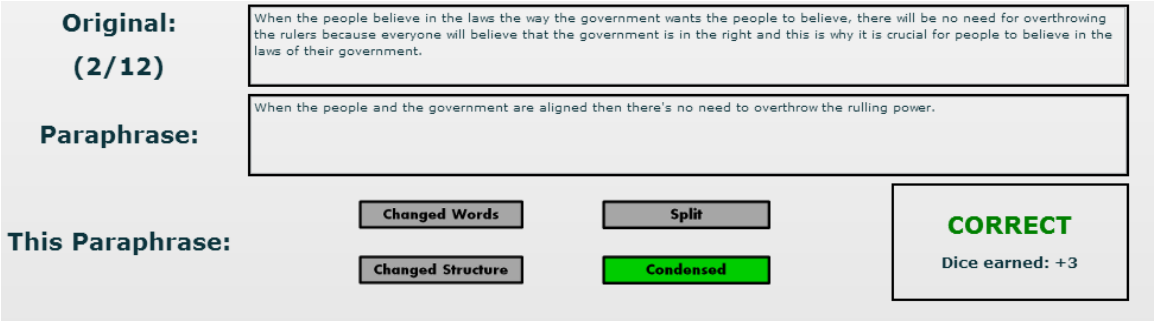

Figure 1. Feedback on the paraphrase identification task.

Students had three chances to choose the correct paraphrase technique for each set. Incorrect selections received the feedback, "Try Again!" while correct responses received the feedback, "CORRECT." In the educational game activity the paraphrasing identification task was attached to the *Map Conquest* game by awarding dice based on the amount of attempts students took to identify the correct paraphrase type. Students earned three dice for correct selection on the first try, one die on the second try, and no dice if they selected the correct answer on the third try. After identifying four different paraphrases, students then moved to the *Map Conquest* portion of the activity.

The map conquest game was similar to the popular game *Risk* in which each player assigns troops to different territories on the board and attempts to overpower the others. The *Map Conquest* game consisted of a resource-based territory control game in which the user places "flags" to strengthen currently owned territories (see Figure 2).

Figure 2. Placing flags in Map Conquest.

In this version of the game, the number of available flags was determined based on the performance on the paraphrase identification task, with better performance earning more flags. Flags were placed onto territories and could then be used to conquer territories owned by one of the two computer opponents. During each attack, both territories roll a set of dice equivalent to the number of flags in their respective locations (see Figure 3).

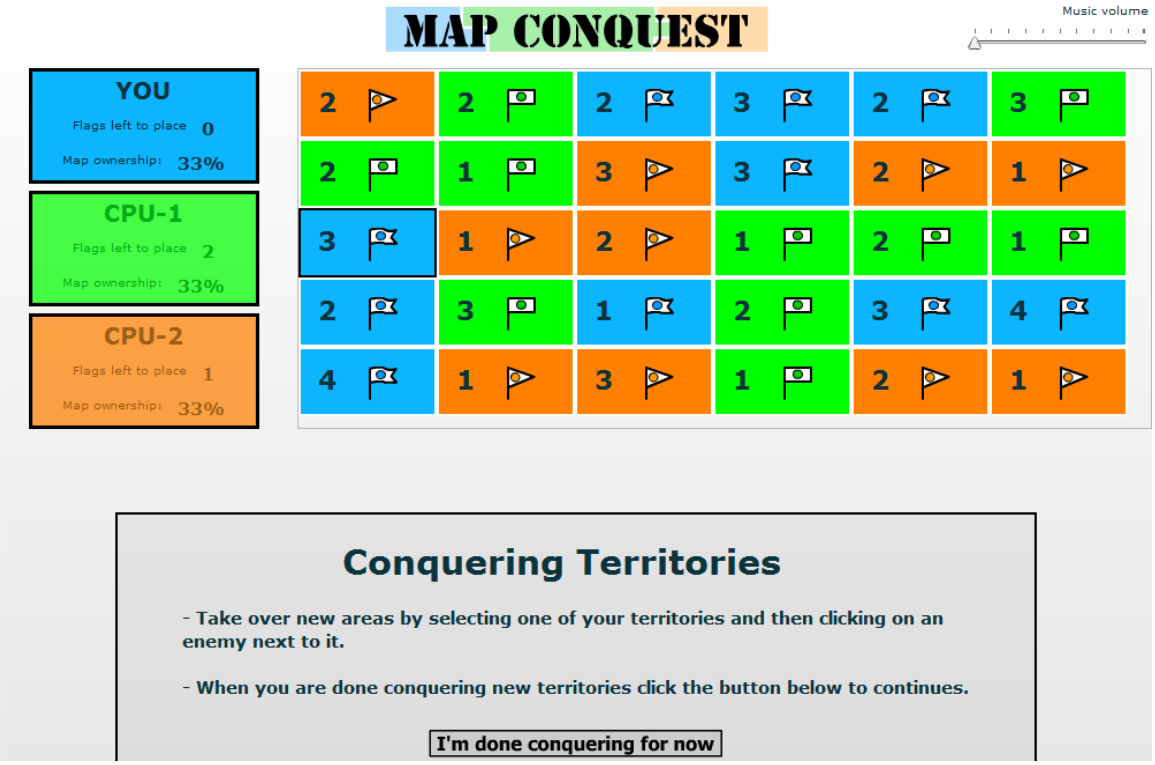

Figure 3. Attacking a territory in Map Conquest.

The player with the highest total on the dice roll wins that territory. If the attacker wins, then all flags are moved to the new territory except for one, which remains in the original location. If the defending player is successful, then the territory is retained and the attacking territory is reduced to one flag. The final score for the *Map Conquest* game is determined by the total number of flags earned and the total number of territories conquered.

Learning only activity. For the learning only activity students alternated between the paraphrase identification task and the color match task. Students identified four example paraphrases and then switched to the color match task. The color match task served as an intervening task between sets of paraphrases. For each round of the color task, the name of one of four colors was presented and students were asked to click the

corresponding colored button. Students clicked the start button and a color name was displayed in the box above the color buttons (see Figure 4).

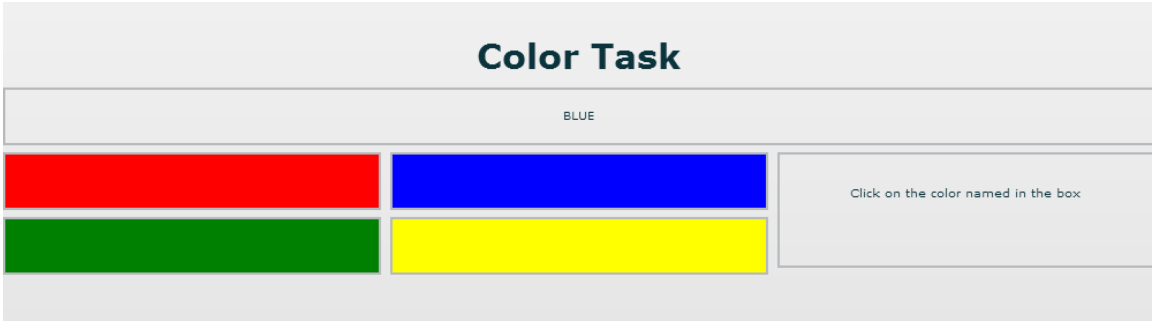

Figure 4. Picture of the color matching task.

After completing the color match task four times, students returned to the paraphrase identification task. A round consisted of completing four paraphrase identifications and four color matches. One activity consisted of three total rounds.

Play only activity. In the play only activity, students interacted with both the color task and the *Map Conquest* game. The color match task was the same as the one used in the learning only activity. For the play only version of the *Map Conquest* game, the number of available flags was determined based on the reaction time performance within the color match task. Dice were awarded based on a speed threshold that was tested during development of the task. If the participant clicked the correct color in 250 milliseconds (ms) or less they were rewarded with three dice. A reaction time between 250 and 500 ms was rewarded one die. Any reaction time slower than 500 ms was not rewarded any dice. All other aspects were the same.

Post-survey. Students were asked to report how much they enjoyed the activity and how much they thought they learned. The game usefulness and ease of use measures were also included in the post-survey, along with a paraphrase identification assessment.

Measures and Log Data. Survey measures were collected during the pre-survey, the frame, and the post-survey phases of the experiment. Data about student performance of the paraphrase identification task was also collected during the first training session in the learning only activity and the educational game.

Demographics. The demographics (see Appendix A) included questions about students' current grade point average (GPA), their gender, their ethnicity, their current year in university, the name of their English arts professor if they were currently enrolled in an English course, and whether English was their first language. Those students who reported being English Language Learners were asked several questions about their experience and use of the English language in writing.

Computer usage. Basic information about computer usage was assessed with 9 questions including questions about the amount of time spent using a computer at home and at school for work or play. Students were also asked to rate on a 1-6 Likert scale how much computers frustrate them and how much a computer could help them learn new concepts (Jackson, Graesser, & McNamara, 2009; see Appendix B).

Prior game experience. The prior game experience questionnaire (Bourgonjon et al., 2010; see Appendix B) consisted of 5 items and asked students to rate how they compare to others regarding their experience with video games. The game experience scale is part of a larger survey used to predict video game acceptance and acceptance in education ($\alpha = 0.895$; Bourgonjon et al., 2010).

Game usefulness and ease of use. The usefulness of games questionnaire (see Appendix B) asked students about how useful they thought games were in the classroom

(4 items; α =0.926; Bourgonjon et al., 2010). Students were asked to rate their ease of interacting with games in the classroom (3 items; α = 0.871; Bourgonjon et al., 2010).

Expected Enjoyment and Learning. After the frame was presented, students rated their expected enjoyment on a scale from 1 to 100 using an enjoyment meter that was adapted from the "Funometer" used by Read, Macfarlane, and Casey (2002). Similarly, students rated their expected learning on a scale from 1 to 100.

Paraphrase identification task performance. Performance on the paraphrase identification task was collected from both the learning only activity and the educational game. Performance data for all four rounds was extracted to be used as a measure of paraphrase identification performance.

Reported enjoyment and learning. The self-reports of enjoyment and learning were the same as the ratings used in the frame section but with any frame specific wording removed from the instructions.

Paraphrase identification assessment. In addition to the self-report surveys, students completed a 12-item paraphrase identification assessment that mirrored the paraphrase identification task. The paraphrase identification assessment presented an original phrase with a corresponding paraphrase (see Appendix C). Students were then asked to identify the technique used to generate each example paraphrase.

Results

Computer usage. Computer usage was included in the pre-survey to determine the amount of time that students used computers and how comfortable they feel using them. All students had computer access at either home or at school (see Table 3).

Table 3
Computer Access at Home/School – Experiment 1

Measure	*Yes*	*No*
Do you use a computer at school?	71	1
Do you have a computer at home?	72	0
Do you expect computer systems to be helpful for learning hard material?	66	6

Table 4
How many hours per day do you play video/computer games?

	Experiment 1				
	None	*Less than 1 hour*	*1 - 2 hours*	*3 - 4 hours*	*5 or more hours*
Responses	13	34	18	4	3
	Experiment 2				
	None	*Less than 1 hour*	*1 - 2 hours*	*3 - 4 hours*	*5 or more hours*
Responses	27	22	13	6	3

When students were asked how many hours per day they played video/computer games, 65 (90%) responded that they played fewer than two hours per day (see Table 4). When asked how often students played games that help them learn, 31 (43%) responded that they never use games to learn and 24 (33%) responded that they only play games to learn one time a month or less (see Table 5).

Table 5
How often do you play games that help you to learn?

	Experiment 1						
	Never	*Once per Year*	*Once a Month*	*2-3 Times a Month*	*Once a Week*	*2-3 Times a Week*	*Daily*
Responses	31	11	13	9	4	2	2
	Experiment 2						
	Never	*Once per Year*	*Once a Month*	*2-3 Times a Month*	*Once a Week*	*2-3 Times a Week*	*Daily*
Responses	32	10	19	6	3	0	1

The mean response when asked whether computers are frustrating (on a scale from 1-Strongly Disagree to 6-Strongly Agree; see Table 5) was 2.4 (*SD* = 1.25). Students' mean response for the question about whether computers help learn difficult concepts (see Table 6) was 4.6 (*SD* = 0.91).

Table 6
Frustration and Utility of Games – Experiment 1

Measures	*Strongly Disagree*	*2*	*3*	*4*	*5*	*Strongly Agree*
Computers frustrate me.	19	27	10	10	6	0
Computers can help me to learn difficult course concepts.	0	1	5	27	26	13

Expected, reported, and assessed variable analyses. Separate 2 x 3 analyses of variance (ANOVAs) including the between-subjects factors of frame (learning, play) and activity (learning only, educational game, play only) were conducted on expected enjoyment and learning, self-reported enjoyment and learning, and performance on the post-survey paraphrase identification task. A regression was also performed to determine whether participant characteristics significantly predict expectations.

Expected enjoyment and learning. No differences as a function of activity were found in terms of expected enjoyment, F (2, 69) = 1.43, p = 0.25, or expected learning, F (2, 69) = 0.56, p = 0.58. Differences were not predicted between the 3 activities because these expectation ratings occurred before the students were exposed to the environments.

Table 7

Expected Enjoyment and Learning – Experiment 1: Means (Standard Deviations)

	Frame		
	Learning	Play	Mean
Expected Enjoyment	56.02 (21.26)	61.92 (16.88)	59.45
Expected Learning	52.39 (22.68)	60.86 (20.37)	57.42

Note: Rating scale = 1 - 100

Contrary to what was predicted, there was also no effect of frame on expected enjoyment, F (1, 70) = 2.34, p = 0.13 (see Table 7). By contrast, there was an effect of frame on expected learning, F (1, 70) = 4.55, p = 0.03. Interestingly, students expected to learn more when upcoming tasks were framed in terms of play rather than learning. Two 2 x 3 ANOVAs were conducted to check for interactions between activity and frame. There were no interactions between frame and activity on expected enjoyment, F (2, 66) = 0.01, p = 0.99, or learning, F (2, 66) = 0.69, p = 0.50.

To rule out the possibility that game experience might drive students' expectations, regression analyses were conducted to predict expected enjoyment from the subscales in the Prior Game Experience Questionnaire (Bourgonjon et al., 2010). Students' expected enjoyment and learning were separately regressed onto students' prior game experience, game usefulness, and ease of use. The regressions were not significant

for expected enjoyment or learning, F (3, 68) = 1.58, $p > .05$, F (3, 68) = 0.51, $p > .05$, respectively. This analysis demonstrated that these participant characteristics were not significant in determining expected enjoyment or learning.

Reported enjoyment and learning. Separate 2 x 3 (frame x activity) ANOVAs were performed on self-reported enjoyment (see Table 8) and self-reported learning (see Table 9). There were no interactions between frame and activity on reported enjoyment, F (2, 66) = 1.27, p = 0.29, or learning, F (2, 66) = 2.15, p = 0.12. There was also no main effect of frame on reported enjoyment, F (1, 70) = 0.01, p = 0.94, or reported learning, F (1, 70) = 1.30, p = 0.26. Hence, prior framing did not affect the students' enjoyment or learning.

Table 8
Reported Enjoyment - Experiment 1: Means (Standard Deviations)

		Activity			
		Learning Only	Educational Game	Play Only	Mean
Frame	Learning	37.75 (23.63)	76.16 (19.80)	74.25 (28.88)	62.75
	Play	50.17 (30.26)	64.75 (28.61)	71.83 (24.61)	62.25
	Mean	43.96	70.46	73.08	

Note: Rating scale = 1 - 100

Table 9
Reported Learning - Experiment 1: Means (Standard Deviations)

		Activity			
		Learning Only	Educational Game	Play Only	Mean
Frame	Learning	44.42 (33.09)	71.75 (19.05)	64.50 (24.24)	59.89
	Play	55.92 (31.34)	54.00 (29.78)	47.41 (24.41)	52.44
	Mean	50.16	62.88	55.46	

Note: Rating scale = 1 - 100

By contrast, there was an effect of activity on reported enjoyment, F (2, 69) = 9.12, $p < .01$, $\eta^2 = 0.209$. Tukey's HSD comparisons indicated a significant difference

between the learning only and educational game activities. The learning only activity was significantly lower than both the educational game ($p < .01$) and the play only activities ($p < .01$). There were no significant differences between the educational game and play only activities ($p > .05$). Thus, students found the educational game as enjoyable as the play activity.

To rule out the possibility that game experience might drive students' expectations, regression analyses were conducted to predict reported enjoyment and learning from the subscales in the Prior Game Experience Questionnaire (Bourgonjon et al., 2010). The regressions were not significant for reported enjoyment or learning, F (3, 68) = 1.40, $p > .05$, F (3, 68) = 0.54, $p > .05$, respectively. This analysis demonstrated that participant characteristics were not significant in determining reported enjoyment or learning.

Paraphrase identification assessment. Performance on the paraphrase identification assessment is presented in Table 10.

Table 10
Paraphrase Identification Assessment – Experiment 1: % Correct (Standard Deviation)

		Activity			
		Learning Only	Educational Game	Play Only	Mean
Frame	Learning	81.25 (19.17)	81.25 (19.18)	59.72 (24.57)	74.07
	Play	77.77 (17.88)	83.33 (20.72)	68.05 (12.72)	76.39
	Mean	79.51	82.29	63.89	

There were no interactions between frame and activity on assessed learning, F (2, 66) = 1.05 $p = 0.35$. While there was no effect of frame on the posttest paraphrase identification assessment, F (1, 70) = 0.23, there was an effect of activity, F (2, 69) = 6.56, $p < .05$, η^2 = 0.16. Tukey's HSD comparisons indicated that students in the play only activity did not

perform as well as those students who completed the educational game ($p < 0.01$) and the students in the learning only activity ($p < 0.01$). However, the educational game and learning only activity were not statistically different ($p > .05$). Hence, the educational game was as effective as the learning-only activity in providing instruction to students on identifying different types of paraphrases.

Effect of time spent on activity. Several analyses were conducted to determine the effect of time spent (see Figure 5) on reported enjoyment and learning as well as assessed learning. A single factor ANOVA indicated that time spent was significantly different between each activity, $F\ (2, 69) = 8.96$, $p < .001$, $\eta^2 = 0.21$. Tukey's HSD comparisons indicated that time spent in the play only activity and educational game activity were not statistically different ($p > 0.05$). However, time spent in the learning only activity was shorter than both the educational game ($p < .001$) and the play only activity ($p = .02$). Performance on the paraphrase assessment, reported learning, and reported enjoyment were each regressed onto time spent on activity. A regression indicated that time spent on activity was not predictive of performance on the paraphrase assessment, $F\ (1, 70) = 1.19$, $p > .05$, or of reported learning, $F\ (1, 70) = 0.77$, $p > .05$. However, time spent on activity was predictive of reported enjoyment, $F\ (1, 70) = 14.04$, $p < .001$, $R^2 = 0.17$, suggesting that the more time students spent on the activity the more they reported to enjoy it.

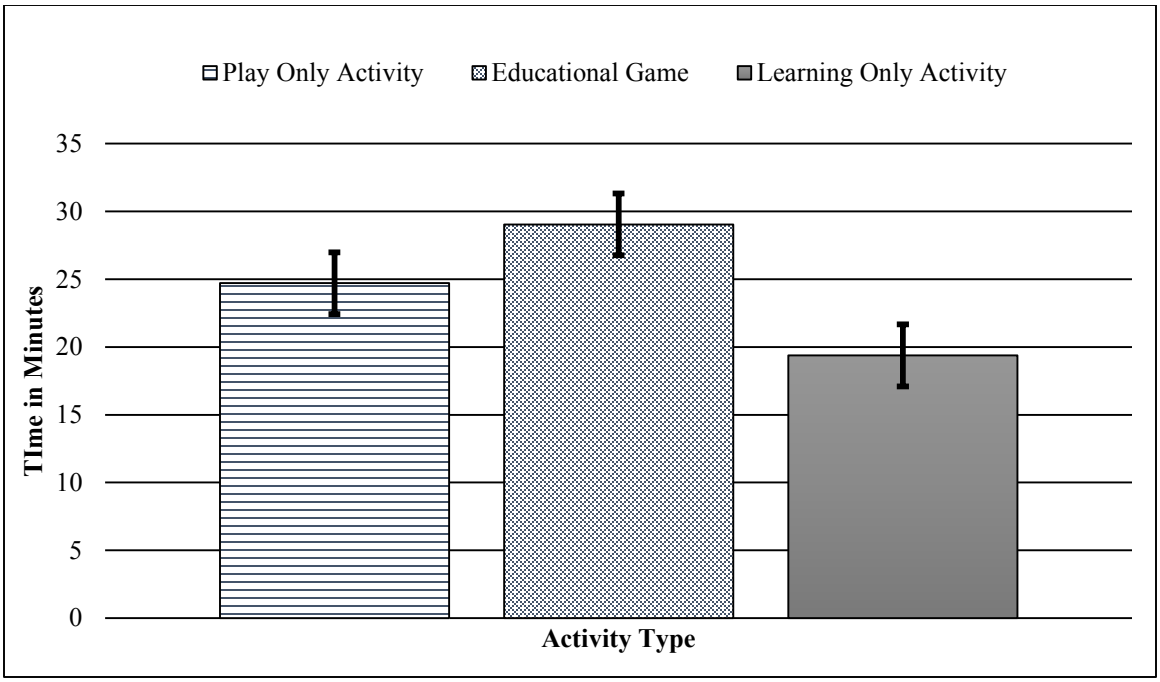

Figure 5. Time spent on activities in Experiment 1.

Paraphrase identification performance. A mixed model ANOVA was conducted to investigate the differences between the educational game and the learning only activity regarding performance on the paraphrase identification task. A 2 (activity) x 2 (frame) x 4 (round) mixed-model ANOVA was conducted on paraphrase identification accuracy during training with round as a within-subjects variable and frame and activity as between-subjects variables. Round was defined using performance on the paraphrase task in each of the four rounds completed by students.

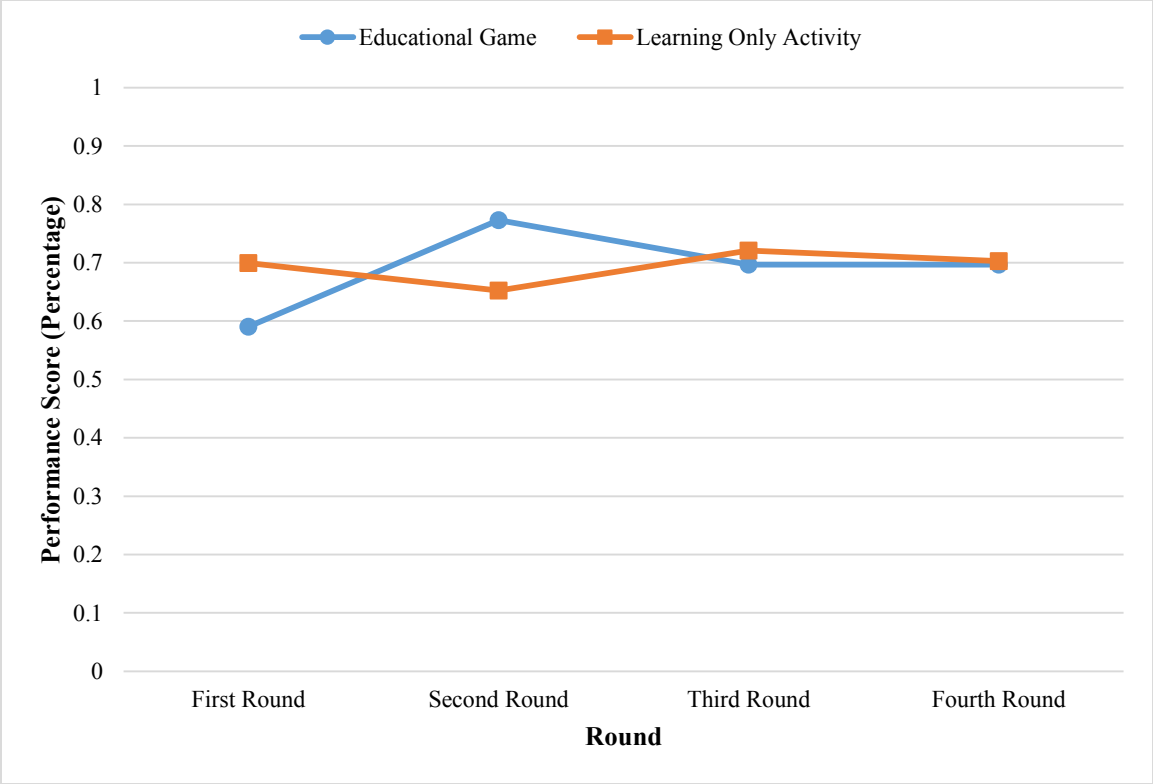

Figure 6. Paraphrase identification performance in Experiment 1.

As displayed in Figure 6, the main effect of activity was not significant, F (1, 41) = 0.002, $p > .05$. There was also no main effect of frame, F (1, 41) =0.23, $p > .05$. The effect of round was marginally significant, F (3, 39) =2.34, $p = .09$. There was a significant interaction between round and activity, F (3, 39) = 6.59, $p = .001$, η^2 = 0.34.Four t-tests were conducted to establish the extent to which the interaction between activity and round was due to significant differences between specific rounds. It was a determined that differences in performance between conditions during the second round, t (1, 39) = 2.05, $p = .049$, were driving the interaction. Two 2 (round) x 2 (frame) mixed model ANOVAs were conducted to determine if there was a significant change in performance from round one to round two for each condition. The interaction between

round and frame was not significant for both the educational game, F (1, 20) = 0.08, p > .05, and the learning only activity, F (1, 21) = 0.82, p > .05. However, increase in performance for those students who completed the educational game was significant, F (1, 20) = 35.52, p < .001, η^2 = 0.64, indicating that students did improve from round one to round two. The slight decrease (see Figure 6) in performance for those students who completed the learning only activity was not significant, F (1, 21) = 1.19, p > .05, indicating that student performance remained consistent across rounds.

Discussion of Experiment 1 and Further Questions

Although there was an effect of activity on enjoyment, the strength of the frame used in Experiment 1 did not yield a statistically significant effect of frame on expected enjoyment or on reported learning and enjoyment. One explanation for this result may stem from the type of frame used in this experiment. In contrast, frame did have a significant effect on expected learning, but in the opposite direction. Students in the play frame conditions rated their expected learning higher than those students in the learning frame conditions. The frame used for Experiment 1 may be referred to as a Label Frame (Dufwenberg et al., 2011) in that it merely assigns the label of "game" or "task" with the assumption that students will use that label when making attributions about the activity.

In order to address potential effects of time on task, an analysis of time spent was conducted. The difference in time spent was most likely a consequence of the *Map Conquest* game component. Although students were able to proceed quickly through the color match task in the learning only and play only activity due to low task demands, the *Map Conquest* game required many more steps and some degree of strategy. Results from the analysis suggest that time was predictive of reported enjoyment but was not

predictive of performance on the paraphrase assessment. Because activities were controlled for number of complete training sessions rather than time spent, it is difficult to discern whether students rated the play only activity and educational game as more enjoyable because of the content of the *Map Conquest* game, or because they merely interacted with the activity for a longer period of time. This finding indicates that even though students spent less time in the learning only activity, they still rated it as being less enjoyable. Hence, the shorter duration activity was not necessarily associated with increased enjoyment. Future research might examine the extent to which both activity length and difficulty jointly influence task enjoyment.

An analysis of performance indicated that students in the learning only activity and educational game started at the same level of skill regarding the paraphrase identification task. The interaction between round performance and activity type was significant, it was determined that this was due to a significant difference between conditions during the second round of paraphrase identifications. While this interaction was due to differences within rounds, these results do suggest that students performed just as well during both activities, meaning that the educational game was not a detriment to completing the paraphrase identification task. It is also important to note the significant difference between round one and round two for the educational game. This difference may have been due to difficulty completing the game task in the educational game. Round one may have acted as a *game learning* phase for students, in which they learned how to play the game while trying to complete the paraphrase identification task.

One potential weakness of this experiment is that the frame was not strong enough to have its intended effect. The frame used for Experiment 1 is referred to as a

Label Frame (Dufwenberg et al., 2011) in that it merely attaches the label of "game" or "task" in the hopes that students will attribute that label to the activity without considering what previous experience students had with "game" or "task". A follow-up experiment (Experiment 2) was conducted to address this potential limitation by providing a stronger frame for the activities. The frame for Experiment 2 was designed to provide students with more cues to prime attributions about play or learning (Levin et al., 1998), which was hypothesized to increase the likelihood that students would think more about play or learning.

Chapter 3

EXPERIMENT 2

Methods

Experiment 2 included the same measures and activities as Experiment 1. The sole modification in Experiment 2 regarded the type of frame, described below.

Students. Students included 80 students from the Arizona State University Introductory Psychology subject pool. Nine students, similar in demographic to the full sample, were excluded due to incomplete data. There were 46 Caucasian, 10 Hispanic, 6 Asian, and 9 students of other ethnicity. Of the remaining students, 33 (46%) were female and 38 (54%) were male, and were 19-25 years of age (M=20). Students were all native English speakers. Students reported their GPA range with 69 students reporting a GPA of 2.1 or greater.

Design. The experiment utilized the same 2 (frame: learning, play) x 3 (activity: learning only, educational game, play only) between-subjects factorial design used in Experiment 1. Students were randomly assigned to condition.

Procedure. The experimental procedure was the same as in Experiment 1, with the exception of an additional measure of students' perception of videogames as learning tools in the pre-survey and post-survey and an altered framing method that is detailed below. The measures included in this experiment are described in greater detail in the Measures section.

Pre-survey. Students began the experiment by completing a brief pre-survey that contained demographics information as well as questions pertaining to the frequency of students' computer use, their prior gaming experiences, their perceptions of game

usefulness and usability in the classroom as well as a rating of the learning opportunities that videogames afford in the classroom.

Frame. The framing manipulation for Experiment 2 consisted of a frame of the pre-survey and expectations survey with scenes of students studying and completing schoolwork (see Figure 5) or of games being played (see Figure 6). This "picture frame" was only visible during the pre-survey and expectations survey, it was not present during the activity. This frame was designed to continue to associate the activity that will be completed with the pictures surrounding the survey.

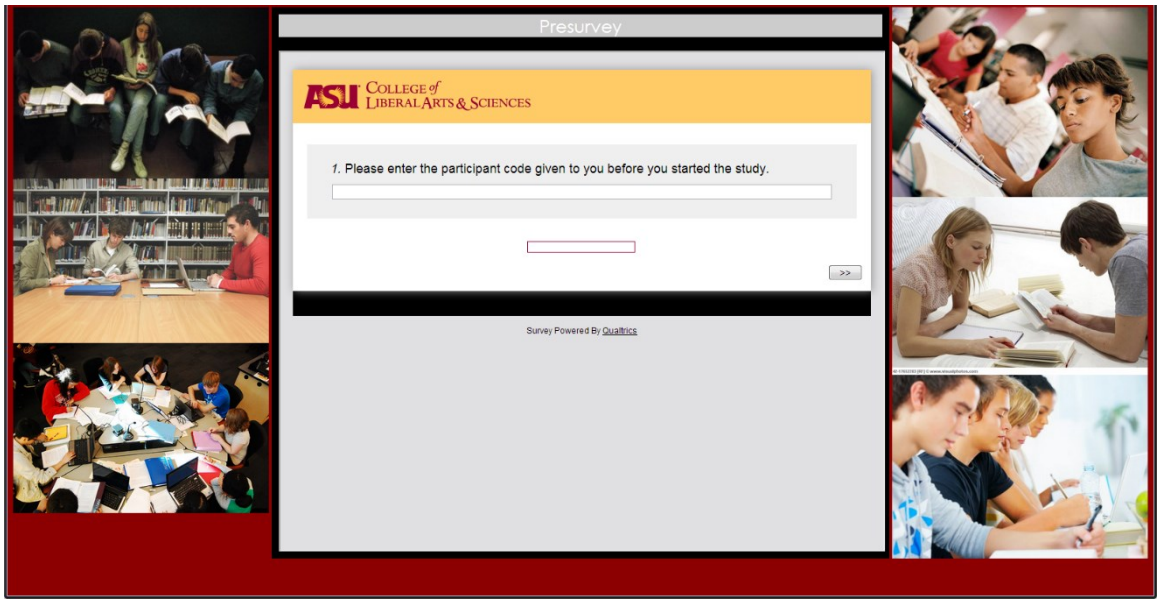

Figure 7. Screen shot of the learning frame.

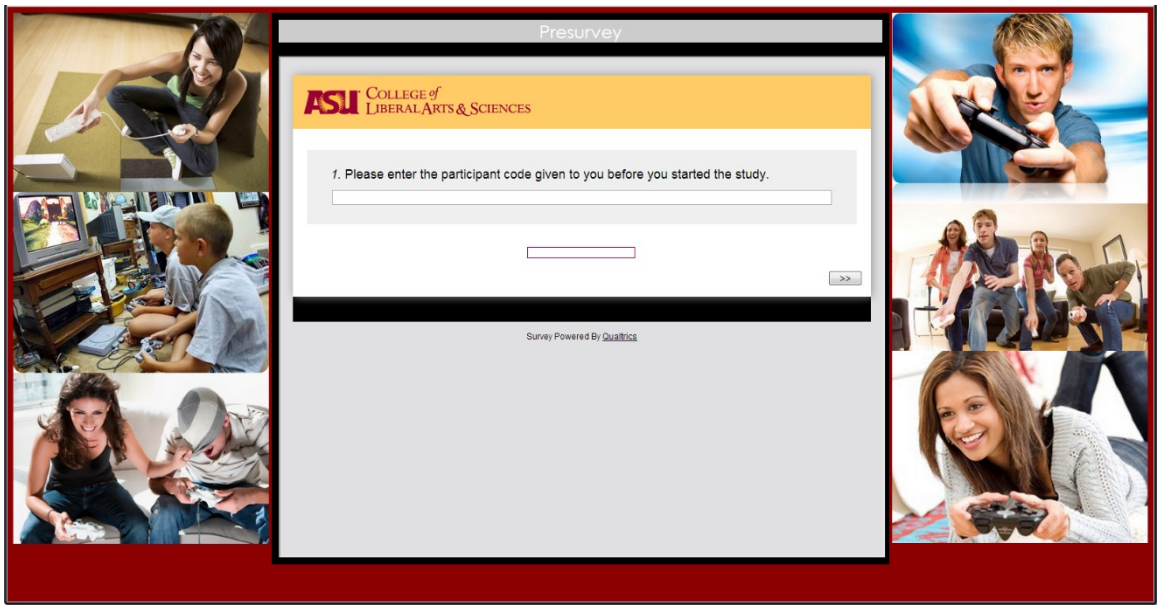

Figure 8. Screen shot of the play frame.

The frame from Experiment 1 was also included and students were told that they would complete either a "game" or a "task".

Activity. The same activities from Experiment 1 were used for Experiment 2.

Post-survey. Students were asked to report how much they enjoyed the activity and how much they thought they learned. The game usefulness, ease of use, and videogame learning opportunities measures were also included in the post-survey, along with a paraphrase identification assessment.

New measure. The measures used in Experiment 2 were identical to Experiment 1 except for the videogame learning opportunities measure included in the pre and post-test.

Videogame learning opportunities. The video learning opportunities measure ($\alpha = 0.895$; Bourgonjon et al., 2010) asked students to rate how much they agreed with statements about the affordances that videogames provide in the classroom. This measure

was included to assess whether students' perception of the utility of games in a learning environment would influence their expectations of learning and enjoyment.

Results

Computer usage. Computer usage was included in the pre-survey to determine the amount of time that students used computers and how comfortable they feel using them. All students had computer access at either home or at school (see Table 12).

Table 12
Computer Access at Home/School - Experiment 2

Measure	*Yes*	*No*
Do you use a computer at school?	69	2
Do you have a computer at home?	71	0
Do you expect computer systems to be helpful for learning hard material?	63	8

When students were asked how many hours per day they played video/computer games, 62 (87%) responded that they played less than two hours per day (see Table 3). When asked how often students played games that help them learn, 32 (45%) responded that they never use games to learn and 29 (40%) responded that they only play games to learn one time a month or less (see Table 4). The mean response when asked whether computers are frustrating (on a scale from Strongly Disagree-1 to Strongly Agree-6; see Table 11) was 2.5 (*SD* = 1.30). Students' mean response for the question about whether computers help learn difficult concepts (see Table 12) was 4.2 (*SD* = 1.09).

Table 13
Frustration and Utility of Games - Experiment 2

Measure	*Strongly Disagree*	*2*	*3*	*4*	*5*	*Strongly Agree*
Computers frustrate me.	18	23	12	12	5	1
Computers can help me to learn difficult course concepts.	1	4	11	20	29	6

Analysis of variance. Analyses of variance (ANOVAs) were conducted to examine the effects of framing and activity on expected enjoyment and learning, reported enjoyment and learning, and performance on the post-survey paraphrase identification task (see Tables 13-16).

Expected enjoyment and learning. No effect of activity was predicted or found in terms of expected enjoyment, F (2, 68) = 0.67, p = 0.31, or expected learning, F (2, 68) = 1.47, p =0.23. Similar to the results reported in Experiment 1, there was no effect of frame on expected enjoyment, F (1, 69) = 1.05, p = 0.31 (see Table 14). The effect of frame on expected learning was not replicated however, F (1, 69) = 1.61, p = 0.21.

As in Experiment 1, to rule out the possibility that game experience might drive students' expectations, regression analyses were conducted to predict expected enjoyment from the subscales in the Prior Game Experience Questionnaire (Bourgonjon et al., 2010). Students' expected enjoyment and learning were separately regressed onto students' prior game experience, game usefulness, ease of use, and videogame learning opportunities. The regressions analyses were not significant for expected enjoyment or learning, F (4, 66) = 2.47, $p > .05$, F (4, 66) = 1.81, $p > .05$. This analysis demonstrated

that these participant characteristics were not significant in determining expected enjoyment or learning.

Table 14

Expected Enjoyment and Learning – Experiment 2: Mean (Standard Deviation)

	Frame		
	Learning	Play	Mean
Expected Enjoyment	46.78 (20.37)	52.37 (25.39)	49.57
Expected Learning	42.72 (19.64)	49.86 (27.25)	46.29

Note: Rating scale = 1 - 100

Reported enjoyment and learning. Separate 2 x 3 (frame x activity) ANOVAs were performed on reported enjoyment (see Table 15), reported learning (see Table 16), and assessed learning (see Table 17). There were no significant interactions between frame and activity on reported enjoyment, F (2, 65) = 0.04, p = 0.96, or reported learning, F (2, 65) = 1.43, p = 0.25.

Table 15

Reported Enjoyment - Experiment 2: Mean (Standard Deviation)

		Activity			
		Learning Only	Educational Game	Play Only	Mean
Frame	Learning	33.63 (30.77)	73.43 (24.30)	69.08 (27.13)	58.71
	Play	24.50 (19.67)	64.90 (28.33)	64.36 (36.46)	51.25
	Mean	29.07	69.17	66.72	

Note: Rating scale = 1 - 100

There was no effect of frame on reported enjoyment, F (1, 69) = 3.18, p = 0.08, reported learning, F (1, 69) = 0.77, p = 0.38, or assessed learning, F (1, 69) = 0.35, p = 0.56. Hence, prior framing did not affect the students' enjoyment or learning.

Table 16

Reported Learning - Experiment 2: Mean (Standard Deviation)

		Activity			
		Learning Only	Educational Game	Play Only	Mean
Frame	Learning	27.13 (16.72)	71.57 (25.30)	51.85 (28.31)	50.18
	Play	39.50 (27.04)	65.36 (22.87)	44.64 (36.46)	49.83
	Mean	33.32	68.47	48.25	

Note: Rating scale = 1 - 100

By contrast, there was an effect of activity on reported enjoyment, F (2, 68) = 16.84, $p < .01$, $\eta^2 = 0.33$. Tukey's HSD comparisons indicated that reported enjoyment was significantly higher for the educational game ($p < .01$) and the play only activity ($p < .01$) when compared to the learning only activity. There was no significant difference between the educational game and play only activity ($p > .05$). This replicated findings from the previous experiment indicating that students found the educational game just as enjoyable as the play only activity.

Regression analyses were conducted to predict reported enjoyment and learning from the subscales in the Prior Game Experience Questionnaire (Bourgonjon et al., 2010). The regression analyses were not significant for reported enjoyment or learning, F (4, 66) = 0.21, $p > .05$, F (4, 66) = 0.85, $p > .05$, respectively. These analyses demonstrated that these participant characteristics were not significant in determining reported enjoyment or learning.

Paraphrase identification assessment. There was no significant interaction between frame and activity on assessed learning, F (2, 65) = 0.24, $p > .05$. However, there was an effect of activity on assessed learning (see Table 16), F (3, 67) = 8.23, $p < .05$, $\eta^2 = 0.10$. Students in the play only activity who did not receive training performed poorly on the paraphrase task when compared to those who participated in either the

educational game or the learning activity, F (2, 68) = 22.16, $p < .05$. At the same time, there was no difference in terms of percent correct on the paraphrase task comparing the educational game and the learning activity, F (2, 68) = 3.33, $p > .05$. Hence, the educational game was as effective as the learning-only activity in providing instruction to students on identifying different types of paraphrases.

Table 17
Paraphrase Identification Assessment – Experiment 2: % Correct (Standard Deviation)

		Activity			
		Learning Only	Educational Game	Play Only	Mean
Frame	Learning	80.21 (14.04)	88.69 (14.09)	63.46 (21.66)	77.45
	Play	81.55 (19.39)	93.18 (12.25)	65.91 (24.28)	80.21
	Mean	80.88	90.94	64.69	

Note: Scores shown out of 100%

Effect of time spent on activity. Several analyses were conducted to determine the effect of time spent (see Figure 8) on reported enjoyment and learning as well as assessed learning. Contrary to the results in Experiment 1, a single factor ANOVA indicated that time spent was not significantly different between each activity, F (2, 68) = 0.06, $p > .05$. Performance on the paraphrase assessment, reported learning, and reported enjoyment were each regressed onto time spent on activity. Time spent on activity was not predictive of performance on the paraphrase assessment, F (1, 69) = 3.01, $p > .05$, or of reported learning, F (1, 69) = 0.20, $p > .05$. Also in contrast with Experiment 1, time spent on activity was not predictive of reported enjoyment, F (1, 69) = 0.86, $p > .05$.

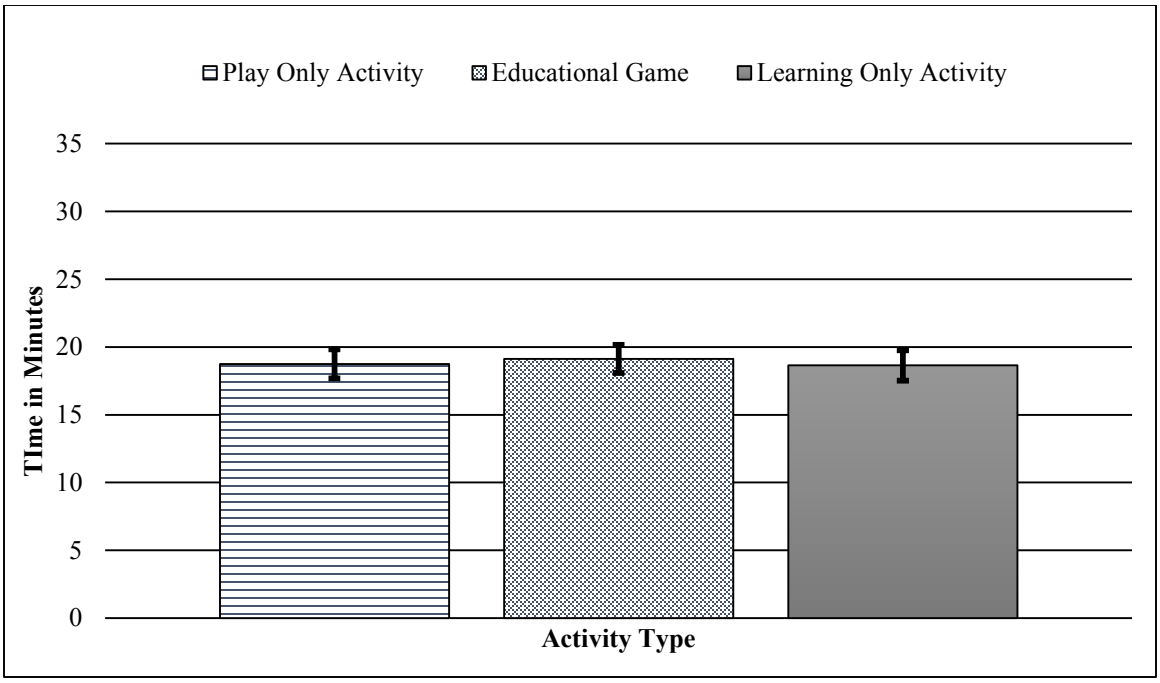

Figure 9. Time spent on activities in Experiment 2.

Paraphrase identification performance. A mixed model ANOVA was conducted to investigate the differences between the educational game and the learning only activity regarding performance on the paraphrase identification task. A 2 (activity) x 2 (frame) x 4 (round) mixed-model ANOVA was conducted on paraphrase identification accuracy during training with round as a within-subjects variable and frame and activity as between-subjects variables. Round was defined using performance on the paraphrase task in each of the four rounds completed by students.

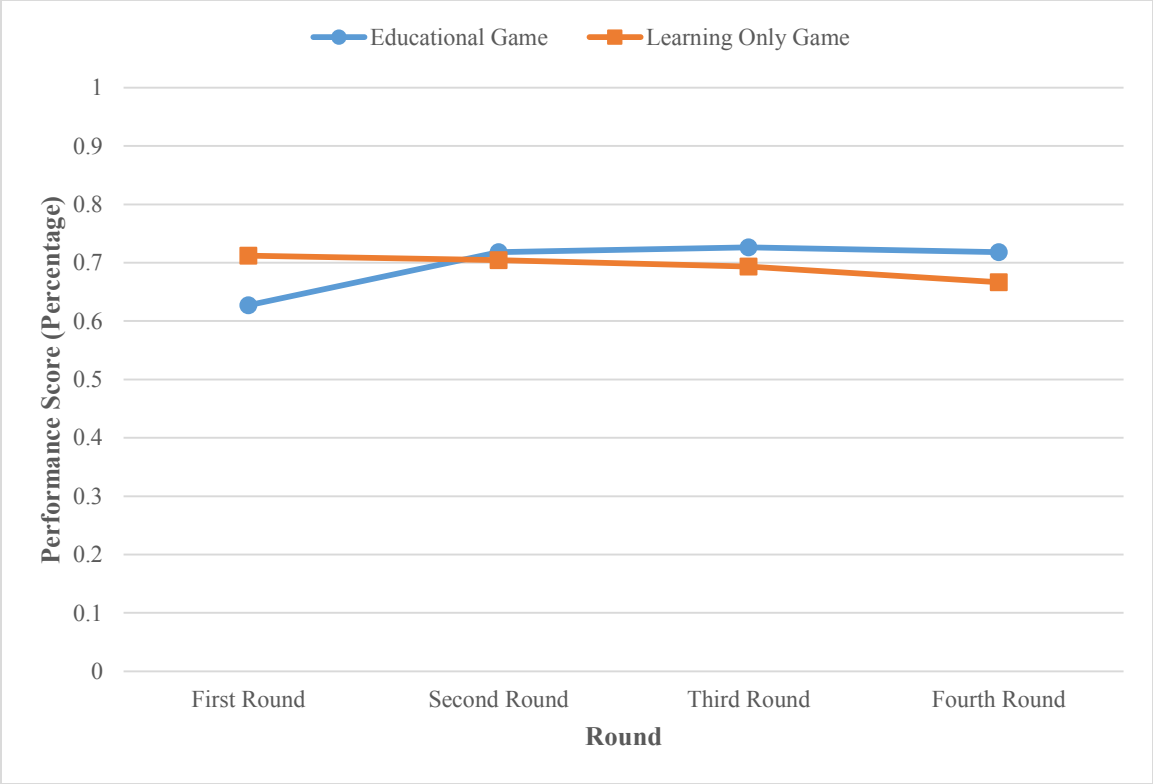

Figure 10. Paraphrase identification performance in Experiment 2.

As shown in Figure 10, the main effect for activity was not significant, F (1, 39) = 0.03, $p > .05$. There was also no main effect of frame, F (1, 39) =0.16, $p > .05$. However, there was a significant interaction between round and activity, F (3, 39) = 2.99, $p = .05$, $\eta^2 = 0.07$, suggesting that those students who completed the educational game gained more than those students who completed the learning only activity. A t-test was conducted to establish whether this interaction was due to significant differences between specific rounds. It was a determined that the first round, t (1, 39) =1.96, $p = .057$, was driving the interaction with students performing significantly better in the learning only activity. Two 2 (round) x 2 (frame) mixed model ANOVAs were conducted to determine if there was a significant change in performance from round one to round two for each

condition. The interaction between round and frame was not significant for both the educational game, F (1, 19) = 0.03, p > .05, and the learning only activity, F (1, 20) = 2.70, p > .05. However, increase in performance for those students who completed the educational game was significant, F (1, 19) = 6.26, p = .02, η^2 = 0.24, indicating that students did improve from round one to round two. There was no change (see Figure 10) in performance for those students who completed the learning only activity and the difference between round one and round two was not significant, F (1, 20) = 0.38, p > .05, indicating that student performance remained consistent across rounds.

Chapter 4

GENERAL DISCUSSION

The results from this study provide support for the use of games as tools for learning. The educational game increased reported enjoyment while at the same time providing equivalent performance gains compared to training without games. Thus, as with prior research, our findings suggest that games provide a successful motivational tool to promote practice of a simple learning strategy. Moreover, learning outcomes did not significantly differ between the educational game and learning activity. Hence, the game used did *not* distract from learning. This result points to the importance of further examining what types of game components distract from or inhibit learning and which do not.

Framing had little effect in both experiments. The play frame increased students' expectations of learning, which potentially speaks to the motivational power of games. However, whether the students were informed that the task would involve learning versus play had no effects on students' perceptions of how much they enjoyed or learned from the activities, nor did the frames affect assessed learning. Apparently, any effects that the frames may have had initially were overwhelmed by the effects of the actual tasks in which the students engaged or could possibly be overwhelmed by the content of the presurvey. One solution to the problem of order for the frame would be to administer the expectations survey at the beginning of the experiment. The lack of effect may also have been due to the strength of the frame, in that simple instructions may not influence expectations.

A remaining question regards the effectiveness of the frame. While Experiment 2 attempted to increase the saliency of the frame, it still had no effect. Could an even *more* effective frame successfully prompt students to think about playing a game or doing a learning task? For example, perhaps a frame would have stronger effects if it prompted students to think more critically about different components of an educational game, and whether they can be defined as *learning* or *play*. More likely, however, students' expectations and attitudes, with or without a frame, are driven by prior experiences (Bourgonjon et al., 2010).

Nonetheless, some researchers postulate that educational games will be less effective in motivating students if players perceive the game as a learning activity (Rieber, 1996). According to Rieber (1996), learning activities within educational games must be well integrated within the game and presumably the student should perceive the activity as a game rather than a learning task (e.g., Barab et al., 2010). However, no support for these assumptions was found in the current experiments. The game was not fully integrated with the learning task within the educational game used in this experiment. Nonetheless, students reported equivalent enjoyment from the play only activity and the educational game and students performed just as well in the educational game as they did in the learning only activity. Additional research is needed to replicate these findings, but these results indicate that the learning task does not necessarily undermine the motivational benefits of educational games and that the game task does not undermine the benefits of a learning task.

An interesting finding from this experiment is the effect of task on time spent. While there was an effect in Experiment 1, the time spent on task for Experiment 2 was

statistically indistinguishable. Because data was collected at two different points during the year, this may be a consequence of different populations within the undergraduate subject pool. This may have influenced how interested students were in completing the task to the best of their ability or in the most "timely" manner.

Results from both studies indicated that students performed significantly different on the paraphrase identification task. For Experiment 1, it was established that this effect may be due to differences during the second round. This difference may have been due to random chance, in that students in both conditions were randomly assigned paraphrase sets, and the students in the educational game condition may have received an easier set of paraphrases to identify. Future research could specify the difficultly of the educational task and control for difficulty across all conditions. In the case of Experiment 2, these results may have been due to non-germane information in the *Map Conquest* game. Students who interacted with the educational game had both the paraphrase identification task and the *Map Conquest* game to learn, while those students who completed the learning only activity had the much easier color matching task. The first round may have required more time and distracted more from the paraphrase task because the *Map Conquest* game requires more effort on the part of the student. The process of learning the game rules may have been a distraction while the student was learning how to complete the paraphrase identification task. However, this *game learning* phase did not persist throughout all rounds of practice, which indicates that students were able to overcome any difficulty they may have had with the game initially.

There are several implications considering the results of these experiments. One implication regarding the null effects of frame concerns how educational games are

studied within experimental contexts. Efforts to frame educational interventions may be over shadowed by students' expectations of the experimental context, and thus may not be worthwhile.

Another implication regards the simplicity of the game used in this study. Although a relatively simple game was used, it was enjoyed more so than was the learning task. It may not always be necessary to create overly elaborate games to teach content. Rather than attempting to create an entire narrative experience for a task that takes a much shorter amount of time to teach, a short and simple game may be sufficient.

By systematically implementing different game features into learning tasks, educational game researchers are not only able to approach the issue of motivation in educational games, but designers can also determine how games benefit learning. A component based approach, like the one used to design the activities in this study, is less resource intensive. It also allows for the rapid creation, testing, and adjustment needed to fine tune educational tools. The paraphrase activity used in this study began as a learning intervention and was adapted to be an educational game. The modular format of *Map Conquest* and the color matching task allowed for different components to be tested to determine their effects on enjoyment and learning. While this lends some appeal to rapid prototyping of educational interventions, the use of simple games does lose some of the richness of experience provided by much more complex, immersive games. Nonetheless, researchers should always consider the cost and benefit of more complex games and what simplification might buy them in terms of development and testing. As games research gains even more traction in the area of academic research, it is important to step back and consider what it is about games that makes them so appealing. Research into the

effectiveness of these games is even more important when considering the amount of time and money being spent to implement these games into classrooms on a larger scale. This makes it even more important that we address issues concerning how educational games are implemented and try to harness that to the benefit of students everywhere.

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APPENDIX A

DEMOGRAPHIC QUESTIONS

Please answer the following questions as completely and honestly as possible.
All of your responses will be kept confidential.

I am a...

- Male
- Female

What is your age?

What school do you currently attend?

Who is your English/language arts teacher? (if not currently enrolled please enter N/A)

What is your ethnicity?

- African American
- Caucasian
- Hispanic (Latin American)
- Asian
- Other

Is English your first language?

- Yes
- No

What is your native language?

How many years have you been studying English?

- less than 1 year
- 1 year
- 2 years
- 3 years
- 4 years
- 5 years
- 6 years
- 7 or more years

Please list the languages you have studied. (enter N/A for unneeded answer spaces)

Please list the languages that you speak. (enter N/A for unneeded answer spaces)

What types of texts do you generally write in English?
Please check all that apply.

- E-mails
- Letters
- Notes
- Essays
- Research Papers
- Reports
- Creative Writing
- Other _____

Do you like writing in English?

- I don't like it at all
- I don't like it
- I have no feelings about it
- I like it
- I like it a lot

I am in my...

- 1st year of College
- 2nd Year of College
- 3rd Year of College
- 4th Year + of College

My GPA is...

- 1.0(65%) or below
- 1.1(66%) - 1.5 (70%)
- 1.6 (71%) - 2.0 (75%)
- 2.1 (76%) - 2.5 (80%)
- 2.6 (81%) - 3.0 (85%)
- 3.1 (86%) - 3.5 (90%)
- 3.6 (91%) or above

I am _____ using a computer.

- very comfortable
- comfortable
- somewhat comfortable
- somewhat uncomfortable
- uncomfortable
- very uncomfortable

Do you use a computer at school?

- Yes
- No

Do you have a computer at home?

- Yes
- No

How many hours per day do you play video/ computer games (home and school combined)

- none
- less than 1 hour
- 2 hours
- 3 - 4 hours
- 5 or more hours

How many hours per day do you use a computer (home and school combined - for homework, games, internet, etc.)?

- none
- less than 1 hour
- 1-2 hours
- 3-4 hours
- 5 or more hours

APPENDIX B

SURVEY MEASURES

Experience with games

I like playing videogames
I often play video games
Compared to people of my age, I play a lot of video games
I would describe myself as a gamer
I play different types of video games

Preference for Video Games

If I had a choice, I would choose to follow courses in which video games are used
If I had to vote, I would vote in favor of using video games in the classroom
I am enthusiastic about using video games in the classroom

Video Games as Learning Opportunities - Video games offer opportunities to…

experiment with knowledge
take control over the learning process
experience things you learn about
stimulate transfer between various subjects
interact with other students
think critically
motivate students

Ease of Use

I would know how to handle video games in the classroom
It would be easy to for me to use video games in the classroom
My interaction with video games in the classroom would be clear and understandable

Usefulness – Using videogames in the classroom…

would improve my performance.
would increase my learning productivity.
would help me to achieve better grades.
would enhance my effectiveness.

Computer Usage Questions

Do you use a computer at school?
Do you have a computer at home?
How many hours per day do you play video/ computer games (home and school combined)
How many hours per day do you use a computer (home and school combined - for homework, games, internet, etc.)?

APPENDIX C

PARAPHRASE IDENTIFICATION TASK ITEMS

Prompt 1 - Imagination		
Some people say that because our modern world is dominated by science, technology, and industrialization, there is no longer a place for dreaming and imagination. Is this belief accurate or are dreaming and imagination still possible in a world where science and technology are common in our everyday lives?		
Original Passage	**Paraphrase Type**	**Paraphrase**
The need to be precise depends on the person. Precise does not mean to be better or worse, it simply means to be exact.	Change Words	The need to be precise depends on the individual. Being precise does not mean to be better or worse, it simply means to focus on accuracy.
	Change Structure	Being precise just means to be exact, it doesn't mean to be better or worse. The need to be precise also depends on the person.
Many works of science fiction describe worlds where humans cannot think for themselves and show no emotion. This is usually because they have given up on thought and creativity in favor of complacent reliance on technology.	Change Words	Speculative fiction often describes worlds where humans cannot think for themselves and show no feeling. This is usually because they have given up on original thought in favor of leisurely reliance on technology
	Change Structure	A world devoid of emotion and free thought may seem difficult to imagine, but that is just the type of world described in many science fiction novels.
The effect of technology in our everyday lives has made us into more productive individuals who can contribute more to society.	Change Words	The influence of technology in our day to day routines has made our society more productive.
	Change Structure	Our everyday lives have been made easier by technology, thus making us into productive and happy individuals.

Technology is often used as a tool to enhance human creativity and science taps the natural curiosity that all humans have and industrialization provides a base for all of production.	Condensed	Technology can be used to tap humanity's natural curiosity and industrialization provides a base for production.
	Split	Technology and science are important tools that can be used to enhance human creativity and curiosity. Industrialization provides the raw materials and enhances production for this process on a large scale.

Prompt 2 - Patience and Persistence		
Every important discovery results from patience, perseverance, and concentration--sometimes continuing for months or years--on one specific subject. A person who wants to discover a new truth must remain absorbed by that one subject, must pay no attention to any thought that is unrelated to the problem. Are all important discoveries the result of focusing on one subject?		
	Paraphrase Type	**Paraphrase**
Patience and perseverance are the keys to success: only when one remains focused at the task at hand, even when it seems impossible, can any task be successfully accomplished.	Change Words	Patience and perseverance are the only means to victory: when a person concentrates on at the task at hand, even when it seems too difficult, any task be successfully completed.
	Change Structure	Even a task that seems impossible can be successfully accomplished when one focuses on it with patience and perseverance.

Often, it is a sudden idea or stroke of luck that solves a problem. When someone keeps their eyes open to new ideas instead of just staying focused on one task, they can solve more problems.	Change Words Change Structure	Often, it is a sudden revelation or chance that solves a problem. When someone remains alert to new ideas rather than simply staying focused on one assignment, they can solve more problems. When someone keeps their eyes open to new ideas instead of just staying focused on one task, they can solve more problems by a sudden idea or a stroke of luck.
Imagination is just as important as facts and objectivity. Many times, it is through the use of imagination and ingenuity that new discoveries and inventions are made.	Change Words	Imagination is just as important as scientific evidence. Often, it is through the use of creativity and innovativeness that new findings and developments are made.
	Change Structure	Many times, it is through the use of imagination and ingenuity that discoveries and inventions are made; therefore, Imagination is just as important as facts and objectivity.
Facts are clearly more important than imagination, because it is facts that solve real-world problems like war, disease, and hunger, while imagination is a luxury of entertainment.		
	Split	Facts are clearly more important than imagination. Facts solve real-world problems like war, disease, and hunger while imagination is a luxury that dwells on what could be.
	Condensed	Facts are more important than imagination, because facts solve real-world problems while imagination is a luxury.

It is the government's responsibility to take care of the needs of its people, and if they do not do so, they are not performing their job and abusing the rights of the people.	Split	It is the government's responsibility to take care of the needs of its people. The government is abusing the rights of the people and not doing their job if they do not take care of the people's needs.
	Condensed	In order to perform their job, the government has to take care of the people.
It is unreasonable to expect that one never imitates the works of others and instead is always original; in fact, some of the most impactful or creative works have come about from those who imitate others.	Split	It is unreasonable to expect that one never imitates the works of others and instead is always original. In today's world, some of the most impactful or creative works have come about from those who imitate others.
	Condensed	Sometimes imitation creates the most creative forms of art.
When a person merely copies the works of others, they are never truly successful, because they owe any credit they have earned to those who came up with the original ideas before them.	Split	When someone simply copies the works of others they can never truly be successful. Any credit they earned for their copied work is owed to the person who came up with the original idea.
	Condensed	When someone only copies another's work they are never truly successful and they should always give the original credit.

Prompt 3 - Government and Rules		
People are often told to obey the rules. In reality, these rules are not permanent: what is right at a given point in time may be declared wrong at another time and vice versa. The world changes so rapidly that rules are out-of-date almost as soon as they are created. People cannot rely on established guidelines to determine what they should and should not do.		
Original Passage	**Paraphrase Type**	**Paraphrase**
Established guidelines may not be reliable, but as soon as people start to disagree with the government given rules the government's foundation can crumble.	Change Words	Established rules may not be dependable, but as soon as the citizens start to go against the government given laws, the government's basis can fall apart.
Anarchy may seem appealing when you look at all the mistakes governments have made, but destroying the foundation of our everyday life is much more complicated than that.	Change Structure	The government's foundation can crumble as soon as people start to disagree with the government given rules, even thigh established guidelines may not be reliable.
	Change Words Change Structure	Lawlessness looks like a good idea when you look at all the problems with the government, but dismantling what has taken so long to build is not as simple as it seems. Drastic changes to the structure of government is not a simple task, even when the government makes mistakes that make anarchy look like a viable option.

Some laws lose their value over time due to changes in society and technology, so the government should always be aware of what needs to be changed in order to make progress.	Change Words	Some laws may lose their value over time due to cultural and technological changes, so those with the power should always keep track of what needs to be changed to facilitate progress.
	Change Structure	The government should always be aware of cultural and technological change that may be affected by current laws, because sometimes old laws can get in the way.
When the people believe in the laws the way the government wants the people to believe, there will be no need for overthrowing the rulers because everyone will believe that the government is in the right and this is why it is crucial for people to believe in the laws of their government.		
	Split	It is crucial for people to believe in the laws of their government so that everyone will believe that the government is in the right. When the people believe in the laws the way the government wants the people to believe, there will be no need to overthrow the ruling power.

	Condensed	When the people and the government are aligned then there's no need to overthrow the ruling power.
It is the government's responsibility to take care of the needs of its people, and if they do not do so, they are not performing their job and abusing the rights of the people.	Split	It is the government's responsibility to take care of the needs of its people. The government is abusing the rights of the people and not doing their job if they do not take care of the people's needs.
	Condensed	The government should take care of its people, and not doing so is an abuse of human rights.
Citizens of a country should not expect the government to solve their problems for them, because this takes away the people's self-reliance and makes them too dependent on their governmental leaders.	Split	Citizens of a country should not expect the government to solve their problems for them. This takes away the people's self-reliance and makes them too dependent on their governmental leaders.
	Condensed	If citizens rely too much on the government to solve their problems then they won't be able to solve their own problems.

Prompt 4 - Individuals and Contributions		
It is wrong to think of ourselves as indispensable. We would love to think that our contributions are essential, but we are mistaken if we think that any one person has made the world what it is today. The contributions of individual people are seldom as important or as necessary as we think they are. Do we put too much value on the ideas or actions of individual people?		
Original Passage	**Paraphrase Type**	**Paraphrase**
Individual accomplishment drives progress and without genius level people a group can't accomplish much.	Change Words	Personal achievement drives progress and without exceptional intellect many groups cannot accomplish their goals.

It's unfortunate that the media always focuses on individual accomplishments when nothing would ever get done without a group effort and cooperation.	Change Structure	Groups can't accomplish much if they don't have exceptional people to drive them.
	Change Words Change Structure	It's sad that the media always reports on individual successes when nothing would ever get done without a collaborative effort. Group effort and cooperation are key components to any major accomplishment, and it's unfortunate that the media tends to focus on individual accomplishments.
Important individuals can't do all the work themselves, but there are often people who tip the scales in favor of an idea or invention.	Change Words	Although prestigious people can't do all the work themselves, there will always be people who push an idea or invention to be successful.
	Change Structure	There are often people who tip the scales in favor of an idea or invention, regardless of whether these individuals can't do all the work themselves.
Many people who are successful don't get to where they are on their own and without the help of a talented group of collaborators most projects never become successful.		

	Condensed	Many successful individuals wouldn't be where they are without a talented group of collaborators.
	Split	Many successful people don't get where they are on their own. It takes the help of a talented group of collaborators to become successful.
Sometimes the decisions of one person can change the way an entire society views a problem and sometimes the actions of one person can alter the course of history.		
	Condensed	Sometimes the decisions of one person can change the course of history.
	Split	The decisions of one person can change the way society views a problem. The actions of an individual can even alter the course of history.
Changes to policy are made slowly and by the efforts of a large number of people and without the joint effort of many things would never change.		
	Condensed	Change is only made through the joint effort of many people.
	Split	Changes to policy are made slowly and by the efforts of a large number of people. Without the joint effort of many, things would never change.

Prompt 5 - Individuals and Contributions - POSTTEST		
Many people deny that stories about characters and events that are not real can teach us about ourselves or about the world around us. They claim that literature does not offer us worthwhile information about the real world. These people argue that the feelings and ideas we gain from books and stories obstruct, rather than contribute to, clear thought. Can books and stories about characters and events that are not real teach us anything useful?		
	Paraphrase Type	**Paraphrase**
Fiction is a great way to describe situations that would be unlikely in real life. We can then use these descriptions to prepare ourselves for potential problems	Change Words	Fictional stories are a great way to describe circumstances that would be highly unlikely in the real world. These descriptions can then be used to prepare for potential problems.
Fiction only distracts us from problems in the real world and people should stop wasting time with silly stories and fake people.	Change Structure	Situations that are unlikely to occur in real life can be described in fiction. We can then prepare ourselves for potential problems by using these descriptions.
	Change Words Change Structure	Fiction is a distraction from the real world and people should stop wasting time with stupid stories and fictional people. People should stop wasting time with silly stories and fake people when they should be focusing on real world problems.
Fiction that is based on real world events can help promote interest in different topics. This interest can prompt people to learn more about how things actually happened.		

	Change Words	Fiction that is based on historical events could help increase interest in different topics. This interest can prompt people to investigate and learn more about the event that was written about.
	Change Structure	Interest in different topics can be increased through the use of fiction. This might prompt people to learn more about how things actually happened.
People who focus too much on imagining and writing what the world could be like if some even happened a different way are usually disconnected from reality and should try to think more about what the world is actually like.		
	Condensed	People who write fiction should worry less about their imagined world and focus more on the real world.
	Split	People who focus on writing fiction are usually disconnected from reality. They should think more about what the world is really like rather than wasting their time.
Developing a fictional character in a piece of fiction can be a difficult task and by doing so writers can learn to better understand others as well as themselves.		
	Condensed	Developing a fictional character can be an enlightening experience.

	Split	Developing a fictional character can be a difficult task. While developing that character writers can learn more about themselves and the people around them.
Fictional characters and events can be used to comment on current events and influential people, so fiction writers should be more aware of the influence they may have on the real world.		
	Condensed	Fiction can be a powerful tool in influencing events and people in the real world.
	Split	Fictional characters and events can be used to comment on current events and influential people. Writers should always be aware of the influence their writing may have on the real world.