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The Effects of Regulatory Orientation on Subjective Task Values, Ability Beliefs, and Gameplay in a Grammar Editing Computer Game

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THE EFFECTS OF REGULATORY ORIENTATION ON SUBJECTIVE TASK VALUES, ABILITY BELIEFS, AND GAMEPLAY IN A GRAMMAR EDITING COMPUTER GAME

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ABSTRACT

- This study investigated mean group differences in composite subjective task values, ability beliefs, and gameplay behaviors between low promotion and high promotion English as a Second Language (ESL) postsecondary students while playing two versions of a grammar-editing computer game. First, students were categorized according to their scores on the General Regulatory Focus Measure. Next, students played two identical versions of the grammar-editing game; in the second game version, an independent variable was added in the form of an in-game punishment. In the middle of each game version, students completed a modified version of the Expectancy-value Questionnaire. Independent samples t-tests were conducted to determine any statistically significant group differences between groups in terms of subjective task values, ability beliefs, and gameplay behaviors. Results indicated no statistically significant differences between groups for any of the composite dependent variables tested. However, two individual items measuring utility and attainment value indicated significant group differences. The findings of this study both supported and contradicted aspects of regulatory orientation theory and previous regulatory orientation research. This research contributed to the need for motivation studies in the field of digital game-based learning utilizing well-established theoretical frameworks. In addition, this study offered researchers, teachers, instructional designers, and video game designers insights into the effects of regulatory orientations in the digital game-based learning context.

This work is dedicated to

my family, friends and teachers

who have made this research possible.

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CHAPTER ONE: INTRODUCTION

Research Gaps

The study of digital game-based learning (DGBL) and its effects on motivation and learning outcomes has received increased attention over recent years (Carenys & Moya, 2016). For example, Hwang and Wu (2012) examined the DGBL articles published in seven major technology-based learning journals from 2001 to 2010 and observed that the number of articles published on DGBL from 2006 to 2010 was four times the number published from 2001 to 2005 (Hwang & Wu, 2012). DGBL has been studied in a variety of contexts and subjects including: science, engineering, history, geography, nutrition, and language education (Hung, Chang & Yeh, 2016; Hwang & Wu, 2012; Tsai & Fan, 2013). DGBL has emerged as an educational approach and strategy in part due to the rapid advances in mobile technology that have driven the development of digital games (Chung & Chang, 2017). In addition, educational institutions have been compelled to explore new teaching methods related to DGBL due to its fit with student-centered educations models in higher education and the way in which the "millennial" generation has led to a need for novel approaches (MIT, 2014); this is in line with reviews of the literature indicating the most frequently selected sample for DGBL studies is students of higher education (Hung, Chang, & Yeh, 2016). Lastly, and perhaps most importantly, the field of DGBL has received increased research attention and is the focus of this study due to its positive effects on motivation.

Overall, the existing body of research that has analyzed the use of digital games in education generally shows a positive link between the use of DGBL and its motivational effects among learners (Prolux, 2017). For example, Connoly, Boyle, MacArthur, and Boyle (2012)

conducted a review of more than 70 empirical DGBL empirical research studies and found that motivation was one of the most observed positive outcomes. For the purposes of this study, motivation can be defined as "the process whereby goal-directed activity is instigated and sustained" (Pintrich & Schunk, 2002, p. 5). Motivation can also be defined as the reason for people's actions, desires, and needs or what causes a person to want to repeat a behavior *(*Ellliot, Covington, & Martin, 2001). In previous studies, increases in both intrinsic (from within the individual), and extrinsic (from outside the individual) motivational effects have been observed regarding individual's motivation to participate in DGBL (Connoly et al., 2012). Furthermore, Wouters, Nimwegen, Oostendorp, and Der Spek (2013) found that players are willing to spend more time and energy to complete DGBL activities because they see them as fun. In addition, digital games are associated with autonomy (the ability to make relevant choices) and competence (the task represents a challenge while being achievable), both of which have been shown to positively influence motivation (Wouters et al., 2013). The constructive trial-and-error gameplay included in digital games can also engage learners to repeat their efforts several times to complete the game (Chorianopoulos & Giannakos, 2014), allowing them to learn from their mistakes and utilize feedback to improve their performance. Previous research has found that a game's story can motivate students through goal realization (Bopp, 2007; Hsu & Wang, 2010). In addition, games can inspire interest, creativity and socialization among students (Squire, 2011) thereby increasing their intrinsic motivation. In general, DGBL has been shown to offer positive motivational benefits to learners in the DGBL context and shows promise as a valuable educational tool. DGBL research is increasing by the day and is helping to inform present and future educational practices.

However, despite the increased research focus on DGBL and apparent positive motivational outcomes reported, several noticeable research gaps remain, one of which being that the findings of positive motivational benefits of DGBL still lack consistency (Chen & Law, 2016; Filsecker & Hickey, 2014). This lack of consistency is demonstrated in several contrasting studies that have either found a link between the integration of DGBL and learner motivation, or have not (Proulx, Romero, Sylvester, & Arnab, 2017). In fact, some researchers have even observed decreased motivation among participants in DGBL, such as Vos, Meijden, and Denessen (2011), who studied how a game affected student's competence, interest, and efforts finding that the motivation of students who played the game actually dropped. In addition, if the games are not engaging or are too difficult, students may not be motivated to engage in the learning activities (Chen & Law, 2016). Furthermore, different types of measured motivation may also vary among DGBL study participants. For example, Tüzün, Yilmaz-Soylu, Karakus, Inal, and KizIlkaya (2009) found that students in the DGBL environment had higher intrinsic motivation, but lower extrinsic motivation compared to students in a traditional learning environment.

Adding to the difficulty of decluttering DGBL research, is the fact that misconceptions still abound regarding the inherent motivational properties of video games for education despite evidence that has proven otherwise. For instance, some practitioners and educators falsely assume digital games are, by themselves, inherently motivational regardless of the game design or how it fits into the educational context. However, this notion is refuted by researchers, such as Hoffman and Nadelson (2010), who concluded that the transfer of motivational engagement from entertainment contexts to educational contexts was unlikely to occur. In addition, several other researchers state that digital games cannot guarantee an increase in motivation by

themselves (Amadieu & Tricot, 2014; De Bruyckere, Kirschner, & Hulshof, 2015; Proulx et al., 2017).

Finally, in addition to inconsistent research findings and perpetuated motivational myths believed by some, the field of DGBL also lacks the application of specific theoretical models; very few DGBL motivation studies are grounded in well-established theories of motivation (Moos & Marroquin, 2010; Star, Chen, & Dede, 2015), and there is relatively little empirical evidence about whether motivational theories hold up in game-based learning environments (Star, Chen, & Dede, 2015). Without the application of well-established theories of motivation to DGBL, it is difficult to draw accurate conclusions or identify consistencies between studies, especially because the field of DGBL is so broad. Therefore, in this study, learner motivation is examined through the lens of expectancy-value theory (EVT) (Eccles, 1995) while simultaneously considering the regulatory orientations of the individuals via regulatory orientation theory (ROT) (Higgins, 1998). Utilizing legitimate motivational theories, such as EVT and ROT as the foundation for this DGBL research offers a consistent framework from which to draw investigative conclusions regarding motivation in the DGBL context. In addition, it helps to address gaps in the extant literature of each theory, such as a lack of studies that utilize an expectancy-value theory framework to study situation and task-specific tasks, and the group differences between regulatory orientations of students in terms of task values and ability beliefs.

Situational Expectancy-Value Theory

In this study, EVT is applied to two different game versions, which function as situations, rather than domains; doing so contributes to the current research because the application of EVT to situations is less prevalent than the its application to domains. For example, although EVT

generalizes regarding specific tasks, situation and task-specific experiences have rarely been studied using the EVT framework (Dietrich, Viljaranta, Moeller, & Kracke, 2017). Furthermore, according to Dietrich et al. (2017), the extent to which expectancies and values vary from one situation to another remains largely unknown because most previous studies have mostly concentrated on broader values and expectancies that students possess in broad domains or school subjects. The reason for this focus on domains may be that students do not seem to differentiate between general competence beliefs and task-specific expectancy (Eccles & Wigfield, 2002). In addition, only a handful of studies focus on intra-student situational differences (Dietrich et al., 2017). Therefore, using the EVT framework in this task-specific study contributes to this lacking area of research by comparing student's motivation on an intra-individual level between two DGBL situations/tasks.

For the limited number of empirical studies using EVT in task-specific situations, task values and expectancies have indeed been shown to vary between situations, and thus continue to be a point of interest for this study. For example, Tsai, Kunter, Lüdtke and Trautwein (2008) reported that 36–42% of the variance in secondary school students' interest was due to different learning topics in the same domain. In addition, Tanaka and Murayama (2014) found that 70% of the variability of student interest in university lectures was between topics. Furthermore, Martin, Papworth, Ginns, Malmberg, Collie, and Calvo (2015) found self-efficacy and value attributed to school varied throughout the day. In terms of expectancy beliefs, Malmberg, Walls, Martin, Little and Lim (2013) concluded that 78% of the variation in competence beliefs was due to situations, and Tsai et al. (2008) found 45–48% of the variance in competence beliefs was found at the intra-individual level. Therefore, expectancies and values are both stable characteristics, yet also malleable depending on the situational context. This study contributes to the dearth of

situation-specific EVT research by applying the EVT framework to two different learning situations (game versions) and measuring the resultant effects on subjective task values and expectancy beliefs. This study also contributes to the current DGBL research by utilizing regulatory orientation theory, as seen next.

Regulatory Orientations

Another major research gap featured in this study is group differences between promotion-oriented and prevention-oriented individuals in the DGBL context regarding subjective task values and ability beliefs. Several studies have supported the notion that learners will be more motivated by game goals and feedback that fit their regulatory focus (Heeter, Lee, Magerko, Cole, & Medler, 2012; Lee, Heeter, Magerko, & Medler, 2013; Magerko, Heeter, & Medler, 2010). For example, promotion-oriented players may be more motivated by instructions that focus on gaining as many points as he or she can. On the other hand, a prevention-oriented player may be more motivated by game rules emphasizing resource management. Despite the apparent link between regulatory orientation and gameplay, the number of DGBL studies with a focus on regulatory orientation is limited and offers opportunities for further research. For example, Lee et al. (2013) suggested that future regulatory orientation studies should focus on different games and take factors such as genre into account; they also suggested conducting studies that include direct measures of learning. Furthermore, according to Ozturkcan and Sengun (2016), further testing is required to determine if promotion-focused individuals perform better under awarding systems as opposed to prevention focused individuals performing better under punishing conditions in the DGBL context. Therefore, this study addresses these research gaps by investigating group differences between promotion-oriented and prevention-oriented

students in terms of subjective task values, ability beliefs, time spent on task, and question accuracy in two versions of a digital learning game. Investigating if an individual's regulatory orientation (prevention vs. promotion) affects their perceptions, gameplay, values, and ability beliefs offers valuable insights into how differences in regulatory orientation can affect perceptions and subsequent motivation in digital games. To investigate group differences in the DGBL context, a specific approach is needed to more clearly determine which part(s) of the games are responsible for such differences.

In this study, a narrower research approach is necessary to determine which part(s) of the digital learning games are responsible for the changes in motivation and performance as related to regulatory orientations, task values, and ability beliefs. Without isolating specific parts of a digital learning game, it would be impossible to determine which parts of a DGBL game trigger different responses and perceptions. Therefore, in this study, digital learning games are approached in terms of their fundamental parts, or "game elements". One game element is manipulated between each version of the grammar-editing digital learning game used in this study.

Game Elements and Motivation

Game elements are the fundamental parts of a game and play a significant role in gameplay (Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011). Game elements range from concrete (a visible part of the game interface such as an on-screen badge) to abstract (such as challenge, competition, or curiosity). Further examples of game elements include: the presence of levels, leader boards, game rules, virtual currencies, score keeping, in-game hints, time constraints, limited resources, clear goals, and enduring play. Serious games are made up of a

combination of most (but not necessarily all) of these game elements (Landers, 2014). However, there is still disagreement in the literature on the motivational effects of game elements.

For example, according to Chen and Law (2016), the impact of educational games elements on motivation is still unclear. In fact, some game elements within the same game could be associated with motivational effects for certain students, while other elements could even hinder motivation (Groff, Howells, & Cranmer, 2010; Proulx et al., 2017). For example, some students may be motivated by leaderboards, which are based on normative comparisons, whereas other students may not be as motivated because they are not driven by competition with other students. Even though motivation is clearly important for learning, there is limited agreement on which specific elements of games make them motivating (McClarty, Orr, Frey, Dolan, Vassileba, & McVay, 2012). In response to the lack of game element research, Clark, Tanner-Smith, and Killingsworth (2016), who conducted a recent meta-analysis reviewing research on digital games and learning for K–16 students proposed that researchers should:

> shift their emphasis from proof-of-concept studies ("Can games support learning?") and media comparison analyses ("Are games better or worse than other media for learning?") to cognitive-consequences and value-added studies exploring how theoretically driven design decisions influence situated learning outcomes for the broad diversity of learners within and beyond our classrooms. (p.14)

Furthermore, Landers (2014) suggested that the impact of each game element on learning outcomes must be explored systematically to determine the influence of each element in isolation. Therefore, there is a need for further study of how individual game elements affect the motivation of those who play serious learning games.

Addressing the Research Gaps

Overall, due to the contradictions found in the general DGBL literature, lack of theoretical frameworks being applied to DGBL studies and the need for more research on isolated game elements, it is necessary to take a more specific and standardized approach in understanding what makes digital games motivating. Therefore, in this study, one game element is added as an independent variable to measure its effects on composite task values, ability beliefs, and gameplay of students playing a digital learning game; doing so isolates one game element and its effects on students' game perceptions and subsequent motivation. The chosen element added in this study is a game rule that results in a negative consequence (punishment) for incorrect answers. This element was chosen because the gain and loss of points parallels the gain and loss scenarios focused on in regulatory orientation theory. When students answer a question incorrectly, it triggers a negative reaction - losing points from their score and prompting an "attack" from the enemy. All other game elements between the two game versions remain identical. The motivational effects of adding this single game element are observed via expectancy-value theory using the Expectancy Value Questionnaire (EVQ) (Eccles & Wigfield, 1995) and are analyzed for group differences among student in terms of their regulatory orientations (Higgins, 1998) as measured by the General Regulatory Focus Measure (GRFM) (Lockwood, Jordan, & Kunda, 2002). Analyzing these effects gives insights into how the addition of a single game element can affect an individual's perception, motivation and gameplay, as well as how an individual's regulatory orientation (promotion vs. prevention) can affect these outcomes in different learning situations. Studying these effects can assist educational game designers in understanding how individual differences among players affect

their perceptions of games in gain and loss scenarios. It can also support their designs of learning games that are more customized to the player's regulatory orientations.

Investigating DGBL motivation in this grammar-editing game offers benefits to teachers, game designers, researchers, and instructional designers alike. For example, educators and trainers can become more aware of how differences in regulatory orientations among their students or trainees play a role in their subsequent learning motivations, especially when using DGBL as part of their teaching curriculum. Game designers can use these insights into player differences when designing educational games for optimal motivation based on more personalized player needs. Instructional designers can apply the awareness of differing motivational profiles when developing course materials. Lastly, researchers can use these finding to build upon previous DGBL motivation studies, such as (Heeter, Lee, Magerko, Cole, & Medler, 2012; Lee, Heeter, Magerko, & Medler, 2013; Magerko, Heeter, & Medler, 2010: Ozturkcan & Sengun, 2016)).

Utilizing motivational theories, such as EVT and ROT, as the foundation for this DGBL research offers a consistent framework from which to draw investigative conclusions. Investigating the group differences in terms of gameplay, task values, and ability beliefs between the two regulatory orientations directly contributes to the need for further testing of whether interindividual differences in DGBL. Lastly, isolating a single game element in two versions of a digital learning game offers a narrow approach to determining its motivational effects.

Research Questions

Three research questions guided this study:

I. Will the comparison groups differ in composite subjective task values and ability beliefs for each game version?

II. Will the comparison groups differ in task-values or ability beliefs *between* game versions?

III. Will the comparison groups differ in gameplay behaviors (score, time spent on task, and help button access) for each game version?

CHAPTER TWO: LITERATURE REVIEW

Introduction

Chapter Two provides a literature review focused on the relevant definitions, theories and contexts involved in this study. First, it begins with a definition of digital game-based learning (DGBL) and digital gamed based language learning (DGBLL) and how they relate to motivation and learning. Second, expectancy-value theory (EVT) is discussed and how it is applied to measuring the constructs involved in this study. Third, the review presents research regarding regulatory orientation theory and how it relates to motivation and value creation in the digital game featured in this study. Lastly, an explanation for the design of the game used in this study is presented supported by research literature.

Digital Game-Based Learning

Definition

The study of game-based learning is made challenging by the lack of definitive taxonomy available to classify the multitude of definitions and concepts related to the field (Tobias & Fletcher, 2012). Therefore, for this research, the definition of digital game-based learning (DGBL) is defined as "any marriage of educational content and computer games" or "any learning game (played) on a computer or online." (Prensky, 2007, p. 23). Digital games possess goals that players are required to achieve, which gives the players motivation to spend time playing them (Presnsky, 2001). Digital game-based learning is an extension of game-based learning and furthers the engagement and interaction using computers and online media (Chung & Chang, 2017). There are two main categories of DGBL based on whether the game is specifically designed for learning and teaching purposes. Those that are developed for

educational purposes are referred to as educational games, or "serious games", and those designed for entertainment are referred to as commercial off-the-shelf (COTS) games (Alyaz & Genc, 2016). The digital game used in this study is considered a serious game.

Serious Games

Serious games can be defined as "any form of interactive computer-based game software for one or multiple players to be used on any platform and that has been developed with the intention to be more than entertainment" (Ritterfeld, & Vorderer, 2009, p. 6). Serious games have existed for several decades (Halter, 2006) and began transitioning from mainly military purposes to education and business purposes in the second half of the 20th century (Deterding, Dixon, Khaled, Nacke, 2011). In education, serious games developed outside of formal education environments, combining aspects from other sectors such as simulation in the military, motivation in the entertainment industry, visualization in the sciences, thinking from cognitive science, and collaboration from the field of communications (Hirumi, Appelman, Rieber, & van Eck, 2010). Well-designed serious games have been shown to be powerful learning tools due to their ability to encompass theories of engagement and learning (Dede, 2009).

Game Elements

Serious games also include a combination of game elements. Game elements are the fundamental parts of a game found in most (but not necessarily all) games and play a significant role in gameplay (Deterding et al., 2011). Bedwell, Pavlas, Heyne, Lazzara, and Salas (2012) presented a definition of game elements that encompassed 19 game attributes relevant to learning and are categorized into nine categories: action language, assessment, conflict/challenge, control, environment, game fiction, human interaction, immersion, and rules/goals. Bedwell et al. (2012)

noted that the attribute categories described in their taxonomy are generally present in all serious games, but vary in how they are expressed and to what extent (Landers, 2014). The game featured in this study is considered a serious game and encompasses many of the attributes described in taxonomy proposed by Bedwell et. al (2012). Because the digital game featured in this study focuses on language learning, a literature review was also conducted to identify the current state of digital game-based language learning (DGBLL), which is a subset of DGBL, and a field of research that offers many opportunities for further study.

Digital Game-Based Language Learning

Definition

Digital game-based language learning (DGBLL) is a subset of DGBL and refers to "the design and use of a diverse array of digital games for the purpose of learning or teaching a second or foreign language" (Peterson, 2010, p. 273). DGBLL research and development has been present since the early years of computer-assisted-language learning (CALL) (Cornillie, Thorne, & Desmet, 2012). Like DGBL, the field differentiates between two main categories of DGBLL based on whether the game was specifically designed for second language (L2) learning and teaching purposes, or not. Those that are developed for educational purposes with an L2 teaching and learning focus are referred to as educational games, or serious games, and those designed for entertainment are referred to as commercial off-the-shelf (COTS) games (e.g. World of Warcraft) (Alyaz & Genc, 2016). The game developed and used in this study is a serious game designed specifically for L2 learning and teaching purposes.

DGBLL Research Trends

Overall, DGBLL has received increased attention. The number of empirical studies on serious language learning games has increased significantly in recent years with 30 of 39 DGBLL game studies having been carried out after 2010. 23 out of 39 of these serious games-studies focused on the instructional potential of serious games and their integration into second language (L2) learning processes; the studies also examined teacher and learner attitudes towards digital games (Alyaz1, Spaniel-Weise & Gurso1, 2017). Among the current literature, there are indications that DGBLL provides many benefits to the language learning process, and positively affects language learning motivation. However, more diverse research is needed in terms of the number of DGBLL studies and the types of games involved in DGBLL studies. For example, Hung, Chang, and Yeh (2016) conducted a literature review to identify the emerging trends of DGBLL articles published in four prominent research journals between 2010 and 2014. These journals included: *Language Learning & Technology (LLT), Computer Assisted Language Learning (CALL),* the *ReCALL* journal, and the *CALICO* journal. Their approach categorized games by the types of gameplay (e.g. adventure, fighting, sports, strategy), the actions a player carries out, and language learning opportunities. Overall, their research made several conclusions. First, only 4% of the articles they reviewed were related to DGBLL, suggesting that more empirical studies on DGBLL are necessary to advance this area of research. Second, most researchers used commercial off-the-shelf (COTS) massively multiplayer online role-playing games (MMORPGs) in their research. In addition. most of the DGBLL empirical studies have investigated the L2 learning potential of player–player interactions in COT MMORPGs, and very few have examined other game-centered interactions or gaming genres (Ibrahim, 2017). The fact that most DGBLL studies have focused on MMORPGs with player-player interactions

indicates that other game genres such as puzzle games, strategy games, adventure games, action games, and simulation games should be studied in future DGBLL research contexts with a focus on the player-game interaction. Therefore, this study features an understudied form of DGBLL – an action/puzzle game with a focus on player-game interactions.

Benefits of DGBLL

DGBLL games have been found to have positive effects on the L2 learning process. For example, Reinders and Wattana (2015) concluded that DGBLL encourages second language interaction by lowering affective barriers; this may be because DGBLL games include certain environments, characteristics and design features that provide a low-stress atmosphere that in turn aids learners in feeling relaxed, confident, and motivated to use L2 (Anyaegbu, Ting & Li, 2012). Participation in MMORPGs provide language learners with immersive (Gee, 2007; Zhao & Lai, 2009), linguistically rich, and cognitively-challenging environments (Sylvén & Sundqvist, 2012). They also provide ample opportunities for interactions with native English speakers (Peterson, 2010, 2012); these interactions promote language learning such as negotiation of meaning (Peterson, 2012b), and improve learners' communicative abilities by playing with people from different countries (Rama, Black, & Warschauer, 2012). Digital games in general have also been shown to benefit successful vocabulary acquisition (deHaan, Reed & Kuwada, 2010; Milton, Jonsen, Hirst & Lindenburn, 2012; Ranalli, 2008), improve university students' reading skills and reading efficacy (Lu, Lou, Papa & Chung, 2011), and help to develop listening skills (deHaan, 2005). Again, it is important to note that most of the L2 learning benefits of DGBLL have been identified in COT MMORPOG games, and thus there is a need to focus on

the other categories and genres of digital learning games, such as the grammar-editing action/puzzle games used in this study.

DGBLL and Motivation

DGBLL has also been shown to have positive effects on students' motivation. For example, high motivation and positive learner attitudes towards serious language learning games have been reported in several studies (Alyaz, Spaniel-Weise & Gursoy, 2017; Doe, 2014; Howland, Urano, & Hoshino, 2012; Jantke & Hume, 2015). Nieto and Carbonell (2012) reported that most learners who played the English learning games in their study were highly motivated and enthusiastic. Furthermore, Anyaebu, Ting, and Li (2012) investigated the motivational effects of playing the game 'Mingoville' among 229 Chinese university students. The study found most students felt motivated due to Mingoville because it was fun, made them feel relaxed, and created a good learning environment that allowed learners to increase their interest in the content while receiving language-learning feedback. According to Sorenson and Meyer (2007), the reason for high motivation in DGBLL is the transition from drill-based materials, to contextualized simulations that involve real language interaction and student engagement between individuals. As mentioned earlier, most empirical DGBLL studies have investigated the L2 learning potential of COT MMORPGs with a player-player focus, and very few have examined other game-centered interactions or gaming genres. Therefore, this study offers further insights on motivation in non-MMORPG games with a focus on the player-game interaction, without any player-player interaction.

Expectancy-Value Theory

Introduction

In this study, the theoretical framework of expectancy-value theory (EVT) (Eccles & Wigfield, 1995, 2000) was applied in order to ground this research in a well-established motivational theory and provide a consistent framework that can be reproduced in future experiments. In this section of the literature review, the basic components of EVT are described. EVT is then discussed in the context of digital games, and then the application of EVT to this study is explained.

Expectancy-Value Theory Foundations

Expectancy-value theory (EVT) was developed by Eccles (1983) and stated that the expectancies and the values students attribute to a domain determines their achievement, persistence and choices in that domain. In educational research, expectancy beliefs and task values are considered important predictors of student academic performance and behavior choices (Eccles,1983; Eccles & Wigfield, 1995; Wigfield & Guthrie, 1997). Eccles and colleagues have tested the theory primarily in the fields of mathematics, science, and engineering to evaluate psychological and social factors that lead to gender differences in decision making (e.g., Eccles, 1983, 1987, 1989, 1993; Wigfield, 1994; Wigfield & Eccles, 1992, 2000, 2002). Elementary and middle-school students are the most studied groups that have been involved in expectancy-value motivation studies (Eccles, 1983; Eccles & Wigfield, 1995; Wigfield, Tonks, & Klauda, 2009; Zhu & Chen, 2010). However, the EVT model has also been applied to diverse contexts (Wigfield et al., 2009; Wigfield, Tonks, & Klauda, 2009) such as explaining physical education persistence (Xiang, McBride, Guan, & Solmon,), STEM course selection (Anderson & Ward,), persistence of students in graduate school (Peters & Daly, 2013) and a field relevant

to this study, DGBL (Hopp & Fisher, 2017; Star, Chen, & Dede, 2015; Verhagen, Feldberg, Hoof, Meents, & Merikivi, 2011; Vernadakis, Kouli, Tsitskari, Gioftsidou & Antoniou, 2014).

Expectancy-Value Theory and DGBL

EVT has been applied to the field of digital games for both learning and entertainment. For example, Star, Chen, and Dede (2015), successfully described how the EVT framework was applied to the design of a digital game intended to promote students' interest in and motivation to pursue science, technology, engineering, and mathematics (STEM) careers. In addition, Hopp and Fisher (2017) recently explored the relationship between gender, game performance factors, and player enjoyment of a first-person shooter video game using the EVT framework. Furthermore, Vernadakis, Kouli, Tsitskari, Gioftsidou and Antoniou (2014) used Eccles' expectancy-value model as a framework to examine university students' expectancy beliefs and task values in an exercising video game compared to those in traditional physical education classes. Lastly, Verhagen, Feldberg, Hoof, Meents, and Merikivi (2011) used EVT to define and test an integrated model of experiential system value satisfaction in a virtual world game. However, despite the recent increase in video game studies featuring EVT, very few DGBL motivation studies are grounded in well-established theories of motivation (Moos & Marroquin, 2010; Star, Chen, & Dede, 2015), and there is relatively little empirical evidence about whether motivational theories hold up in game-based learning environments (Star, Chen, & Dede, 2015).

Expectancy Beliefs

The first primary component of the theory involves expectancy beliefs, defined as student's expectations for success in a future task as well as the broad beliefs an individual has about their competence in each domain (Eccles, 1983, 1995). Expectancies deal with the

individual's beliefs regarding whether or not they think they can achieve a task by asking themselves "Can I do this?"; these beliefs are based on their sense of competence, which is very similar to the construct of self-efficacy, developed and described by Bandura (1997) as "the belief in one's capabilities to organize and execute courses of action required to produce given attainments" (p. 3). Self-efficacy is a powerful influence on motivation and achievement and possesses a task-specific nature (Bandura, 1986). Similarly, expectancy beliefs have a powerful influence on motivation in EVT; however, EVT typically measures expectancy beliefs in a general domain rather than a specific task.

Expectancies can be either positive or negative and play a key role in the shaping of experience (Kirsch, 1999). When an individual possesses negative expectancies regarding a task or domain, it becomes more likely they will draw less value from the experience and are less likely to initiate or persist in a domain-related task. On the other hand, in situations in which an experience is accompanied by positive or optimistic expectancies, evaluations are more likely to be positive in nature (Hopp & Fisher, 2017). Consequently, individuals are more likely to engage in a task for which they have higher expectancy beliefs. Overall, an individual's expectancy beliefs is an essential part of EVT and is used in conjunction with value attribution to determine an individual's motivation.

Values

In addition to expectancies, values are a core component of EVT and are equally essential for adequate levels of motivation to take place. For an individual to be motivated to do something, they must not only believe they have the competence to do it, but also need to see the value of doing it. For instance, even if a student is highly capable at advanced mathematics, they

will not exert the necessary effort to succeed in the domain of mathematics unless they find value in dedicating their time to this pursuit. In EVT, the construct of value is divided into four distinct dimensions: intrinsic/interest value, attainment value, utility value and cost (Eccless & Wigfield, 2002). Among the four dimensions of value, intrinsic, attainment, and utility value have been shown to be highly inter-correlated; therefore, they have often been collapsed into a single, more general values construct (Dietrich, Viljaranta, Moeller, & Kracke, 2017; Eccles, Wigfield, Harold, & Blumenfeld, 1993), as was done in this study.

Intrinsic value denotes the interest an individual has in an activity or the enjoyment they derive from performing it. Intrinsic value is a construct similar to the construct of intrinsic motivation (Ryan & Deci, 2000a). In DGBL, intrinsic value can be related to the inherent interest students have regarding the educational content, or due to a combination of the external game elements such as storylines, game rules, or challenges featured in the game. Furthermore, the concept of interest is highly related to the strength of engagement in an activity. According to Higgins (2006): "The state of being engaged is to be involved, occupied, and interested in something. Strong engagement is to concentrate on something, to be absorbed or engrossed with it." (p. 442). Consequently, strength of engagement contributes to the intensity of the motivational force an individual experiences, which leads to increased value of his or her desired target (Higgins, 2006). Engagement increases the power of the motivation that is experienced by the individual, separate from hedonistic experience, and thus, the desired outcome becomes more valuable to the individual. It doesn't matter if the strength of engagement is due to a positive or negative experience, but rather that the intensity of the engagement increases. In the context of DGBL, when students are more interested and engaged in a game, they should experience a

higher degree of motivational force, and therefore place more value on the outcome they are trying to achieve.

Next, attainment value refers to the importance of doing well on a task as it relates to an individual's identity, or self-schema, which can be derived from gender role stereotypes, cultural stereotypes, and prior experiences (Burgoon, White, & Greene, 1997; Eccles & Harold, 1991). When people engage in pursuits that are inconsistent with their self-schemas or are inconsistent with their histories of reinforcement, they may perceive the experience as less rewarding, less valuable, and, ultimately, less enjoyable (Brown, Hall, Holtzer, Brown, & Brown, 1997). For example, in this study, students who identify themselves as "skilled gamers" may have past experiences of success in digital games and consider success in digital games to be an important part of their self-concepts; in this case, they would be expected to be more motivated to succeed at a game than those who do not view being good at digital games as an important part of their identity. Likewise, students who view themselves as being skilled in the domain of written grammar-editing and consider this to be an important part of their academic self-concept, would be expected to find more attainment value in succeeding at the grammar editing computer game because it aligns with the importance they place on the task as it relates to their academic self-schema.

Another dimension of value is utility value, which refers to the perceived usefulness of the task related to the individual's current and future goals. Utility value refers to how useful an individual perceives a domain or task to be in their pursuit of future or current goals (Eccles & Wigfield, 2002). For example, if a university student majoring in English literature is required to take an algebra course in his freshmen year and doesn't believe he will utilize algebraic functions in the future, he will attribute a low utility value to the domain of algebra. In this study, utility

value is recorded by measuring students' perceived usefulness of each version of the grammar editing game.

Cost

The last component of value in EVT is cost. Cost is the negative consequences perceived by the individual for engaging in a specific task. Recent studies have provided a more detailed depiction of the construct of cost, dividing it into emotional cost, effort cost, and opportunity cost (Gaspard et al., 2015; Perez, Cromley, & Kaplan, 2014). Cost has also been proposed as being a distinct component altogether alongside expectancy and value (Flake, Barron, Hulleman, McCoach, & Welsh, 2015). In this study, some examples of cost associated with the grammar editing computer game are time, which could be spent on other activates; energy, which could be used towards other pursuits; and emotional costs, such as boredom, confusion, or frustrations associated with playing the game.

Regulatory Orientation Theory

Introduction

Regulatory Orientation Theory (ROT) was used in this study to examine how individual characteristics of students play a role in student's motivational value attributions in a DGBLL game. This section of the literature review outlines several important aspects of ROT relevant to this study. First, an overview of ROT is presented with a delineation between the two regulatory orientations – promotion and prevention. Next, the effect of regulatory fit is defined and discussed as a possible influence on value. Lastly, the effects of regulatory fit are discussed regarding previous research studies and the context of DGBL.

Regulatory Orientations

Regulatory Orientation Theory (ROT) focuses on how individuals go about pursuing a goal. The theory distinguishes between two individual regulatory orientations – prevention and promotion (Higgins, 1998, 2000). These orientations can be chronic or task contingent. A *prevention focus* means that an individual is concerned with the absence and presence of negative outcomes and emphasizes security and safety by following the guidelines and the rules (Higgins, 1998). On the other hand, *a promotion orientation* is concerned with the presence and absence of positive outcomes with a focus on advancement, aspirations, and accomplishments (Higgins, 1998). Furthermore, there are several measurement instruments used to assess an individual's regulatory orientation including The Regulatory Focus Questionnaire (RFQ) (Higgins, 2001), and the General Regulatory Focus Measure (GRFM) (Lockwood, Jordan, & Kunda, 2002), which has been adapted and used in this study.

An individual's regulatory orientation can determine how he or she approaches a goal. For example, Higgins (2000) differentiated between two primary manners in which individuals approach a goal - an eager manner, or a vigilant manner. Eagerness strategies (e.g. doing extra reading for a class) are preferred by those with a promotion focus because these strategies emphasize aspirations and accomplishments. On the other hand, vigilance-related strategies (e.g., avoiding distractions while studying), are preferred by those with a prevention focus because they fit with their concern for protection, security, and avoiding negative outcomes (Crowe & Higgins, 1997; Higgins, 2000). An example of this is two students in the same course who are working to achieve an "A"; the student who views an "A" as an achievement he hopes to attain possesses a promotion orientation and may study more to improve his future test scores. On the other hand, the student who views an "A" as something he believes he should or ought to attain,

is exercising a prevention focus orientation, and may instead be more vigilant and careful to *not* receive a bad score.

Regulatory Fit Theory

In addition to ROT, Higgins (2000) is credited with developing a related theory, Regulatory Fit Theory (RFT). According to RFT, regulatory fit occurs when individuals experience a fit between the manner of engagement in an activity and their motivational orientation. This fit makes people "feel right" about what they are doings and engage in what they are doing to a higher degree (Avnet & Higgins, 2006; Higgins, 2000). Individuals who experience regulatory fit tend to perceive their tasks as more important, regardless of the outcome (Freitas, Liberman, & Higgins, 2002; Higgins, 2000). Previous studies indicated that regulatory fit affects judgments and decision making, attitudes, behaviors, value attribution, and task performance (Higgins, 2005).

The way in which regulatory fit determines motivation is indirect; the direction of a motivational force is not determined by regulatory fit; however, regulatory fit can affect the strength of engagement individuals experience, and thus can affect the subsequent motivational force and value of a task as perceived by the individual. In other words, regulatory fit does not directly create value or motivational direction, but rather increases the strength of value experienced, either positive or negative, independent of pain or pleasure associated with the object or outcome (Higgins, 2005). In the context of the DGBL game used in this study, students' regulatory orientations were compared with their reported subjective task values in two versions of the same game; this was done to determine if there were significant group differences between regulatory orientations and reported levels of values for each game version. Different reported values were expected to be found between each regulatory orientation due to the

contrasting nature of prevention and promotion orientations and the phenomenon of regulatory fit.

Regulatory Fit in Different Fields

Regulatory fit has been studied in a variety of settings including: consumer choices (Avnet & Higgins, 2006; Lee & Aaker, 2004; Spiegel, Grant-Pillow & Higgins, 2004), value evaluation (Camacho, Higgins, & Luger, 2003), reaction to incentives (Shah, Higgins, & Friedman, 1998), and health message design (Keller, 2006), For example, Spiegel, Grant-Pillow, and Higgins (2004), conducted a study in which participants were given two different versions of the same health message to consume more vegetables and fruits. One version focused on gains (promotion), while the other emphasized vigilant non-losses (prevention). The researchers found that participants who received messages that matched their regulatory orientation adopted the suggested behavior and consumed 20% more fruits and vegetables over 2 weeks. In addition to these fields, ROT has also been successfully applied in the context of DGBL. DGBL and ROT studies demonstrate how regulatory fit can be successfully applied to digital learning games and why DGBL is an appropriate context for this study.

DGBL and ROT

ROT has been applied to the DGBL context in several previous studies. For example, the findings of Lee, Heeter, Magerko and Medler (2013) support regulatory fit theory in the DGBL context. In their study featuring a civics-teaching digital game, learners played 26% longer time and demonstrated more learning-related behaviours, such as spending more time on feedback, when they experienced regulatory fit. Positive feedback was also found to motivate promotion-oriented learners; however, negative feedback did not demotivate prevention-oriented learners as

predicted (Lee, Heeter, Magerko & Medler, 2013). In addition, Heeter, Lee, Magerko, Cole, and Medler (2012) studied promotion and prevention-oriented individuals in a space-action digital shooting game and found that promotion-oriented players took significantly more shots and were less careful than prevention-oriented players. They also found that prevention-oriented players were more affected by external instructions.

In addition to these studies, Öztürkcan and Şengün (2016) stated promotion-focused individuals would find it easier to participate in games with rewards while prevention-focused individuals would be motivated by gaming rules and avoiding punishment. However, loss avoidance (punishment scenarios) generated more motivation than the rewards scenario for both promotion and prevention individuals. The rewards-only scenario in their experiment may not have been adequately challenging for the players, and thus did not meet their expectations for challenge in the game. The researchers concluded that further studies examining regulatory fit in narrower DGBL contexts is needed (Öztürkcan & Şengün, 2016). Therefore, there is a need for further research regarding the application of ROT to DGBL games, which is addressed in this study.

The DGBLL game used in this study is a suitable context to study the application of ROT and RFT to DGBL because the game features both positive outcomes (earning points) and negative outcomes (losing points and being attacked by an adversarial entity). According to Salen and Zimmerman (2004), the game elements of penalties and rewards are "the carefully crafted arc of rewards and punishments that draws players into games and keep them playing" (p.330); these penalties and rewards are present in the featured game in this study and are analyzed in terms of ROT and subjective task values to determine how individuals' regulatory orientations affect their values and motivation. Exploring the group differences between

regulatory orientations and subjective task values offers insights to educators, instructional designers and game designers because it demonstrates how individual differences can affect motivation in response to a single game element.

CHAPTER THREE: METHODOLOGY

Game Design Decisions

Introduction

For this study, an educational computer game was developed by the author instead of using a commercial-off-the-shelf (COTS) game. The choice to utilize a customizable original game design was chosen because it provided the ability to add and remove a specific game mechanism to measure its effects on reported subjective task values. In addition, the game was designed around the educational needs of the target population, considering their interests, educational needs, and preferred game genres. Because the featured game is an action/puzzle game designed solely for educational purposes, it is considered a "serious game" and therefore falls into the category of DGBL in need of further research. In addition, the developed game was designed around the player-game interaction, another type of game lacking empirical research. Although many studies demonstrate the benefits of COTSs for the purposes of language learning and motivation, such a game was not employed in this context because they are not typically designed to fit within the content and time constraints of classrooms (Moreno-Ger, Burgos, Martínez-Ortiz, Sierra, & Fernández-Manjón, 2008; Grove, Bourgonjon, & Van Looy, 2012), and do not fit the context of this study.

Learning content

The current study used Grammar self-editing as the instructional goal of the educational game. Grammar self-editing can be defined as the process of learners identifying and correcting errors in their own writing (Hegelheimer & Li, 2013). This instructional goal was chosen primarily because the target population demonstrated a need for grammar self-editing practice as

indicated by their written performance and ESL teachers' reports. In addition, there is a gap in the research regarding ESL students and self-editing practices because it has not been widely studied (Bitchener & Ferris, 2012; Diab, 2010, 2011). All grammar errors included in the featured game were from the categories of subject-verb agreement, tense, or article usage. These grammar errors were chosen because they are among the list of the most common errors made by ESL/EFL students, and among the eight grammar categories focused on by Ferris (2002). In addition, the featured errors were also chosen based on their frequent occurrence in the target population's writing samples, as verified by the author and four of their English instructors. The errors are featured in the grammar inventories used in several recent grammar-editing studies (Barzanji, 2016; Bushong & Mihai, 2014;). Therefore, the chosen content has practical, and historical relevance to ESL research.

The importance and benefits of grammar self-editing have also been discussed in the literature. For example, self-editing is an essential step in the grammar and writing development of L2 learners because it facilitates acquisition and promotes learner autonomy (Cresswell, 2000; Li & Hegelheimer, 2013; Suzuki, 2008;). Self-editing is a form of self-feedback and is considered the ultimate goal of the corrective written feedback provided by L2 writing instructors (Bitchener & Ferris, 2012). Grammar self-editing is valuable because it is one possible solution to reduce the need for written corrective feedback from the teacher which may be burdensome due to time constraints and the necessity to prioritize feedback of various error types (Hegelheimer &Li, 2013). Several studies have indicated that training or support of self-editing for ESL learners is necessary (Makino, 1993; Polio, Fleck, & Leder, 1998). One approach to help students with the grammar self-editing skill is to help increase students' awareness of the typical errors made at their proficiency level and present adequate practice

identifying and correcting such errors (Ellis, Basturkmen & Loewen, 2001; Li & Hegelheimer, 2013; Long & Robinson, 1998). Therefore, the game developed and used in this study also benefits the target population's learning needs for grammar self-editing practice.

Overall, grammar self-editing was chosen as the educational content for the developed game due to the three reasons mentioned. First, there was a demonstrated need for grammar self-editing practice among the target population. Second, there are gaps in the research regarding ESL students and self-editing practices because it has not been widely studied (Bitchener & Ferris, 2012; Diab, 2010; Li, Hegelheimer, 2011). Third, it is an important step in the second language (L2) writing process. Therefore, this study also contributes to current research by studying DGBL motivation in the context of a grammar-editing computer game.

Game Story

A storyline was included in the developed game used in this study due to the recognized benefits of stories on the learning process and in digital games. Stories have been shown to benefit the learning process in a variety of ways including: engaging students in meaningful learning, making learning more memorable, and helping students more easily understand and apply content knowledge (Novak, 2015). The ability of stories to increase motivation and engagement in digital learning has been acknowledged by researchers, educators and the military since the early 1990s (Iuppa & Borst, 2007). Prensky (2001) listed story as one of the primary strengths of DGBL for fostering immersion and surprise. Furthermore, Miller (2004) stated that a major benefit of digital storyline-enhanced learning versus traditional storytelling media like books and movies is the interactivity (Miller 2004); the interactivity changes the learning experience from passive reading or watching, to becoming actively involved in the storyline

content. Storytelling is considered an essential part of digital games taking into account three fundamental elements of learning games: learning, play and story (Göbel, Rodrigues, Mehm, & Steinmetz, 2009). Overall, storyline alone is not powerful enough to sustain player motivation and engagement throughout a game (Asgari & Kaufman 2004); however, it affects a player's decision to engage in the game. In games, *engagement* comprises concepts of enjoyment, immersion, flow, and presence (Boyle, Connolly, Hainey, & Boyle, 2012). Engagement can be distinguished from motivation in that engagement involves a conscious willingness to pursue a specific goal or demonstrate regulation of motivation (Wolters, 2003) towards a particular activity (Hoffman & Nadelson, 2010). For example, participants could be motivated to play a game, but if the game no longer offers adequate challenge, they may not be engaged by the game, potentially reducing future motivation to play (Leiker1, Miller1, Brewer1, Nelson1, Siow1 & Lohse, 2016)

Additional Considerations

There are some additional considerations the author examined when designing the game used in this study. First, storyline-enhanced learning requires higher working memory for learners who need to comprehend the information presented using various visual, audio, or linguistic inputs while suppressing information irrelevant to the learning task (Stevens & Bavelier, 2012); therefore, care was taken to design the game without superfluous information that may require more working memory; components such as character descriptions, game rules, and story plot were simplified in an effort to not overwhelm the learner and allow them to dedicate more attention to the educational content. In addition, because gender and ethnicity can affect student preferences for storyline narratives (Bittick & Chung, 2011; Moreno & Mayer,

2005), an informal psychographic analysis was conducted among forty members of the target population to determine their ages, languages, nationalities, preferences for story and game genres, and game type; doing so enabled the author to design a game that took the preferences of the learner population into account.

Lastly, Prensky (2001) cited strengths of DGBL other than story, such as clear rules and objectives, a rich and attractive learning environment, elements to foster immersion and surprise, instant feedback, a high level of interactivity, challenges, and competition; therefore, these attributes of DGBL were incorporated into the design of the game, except for competition, because this study focused solely on the player-game interaction. Primarily the same attributes described by Prensky (2001) were incorporated into the design of the game in several ways. First, the developed game featured clear rules that resulted in rewards and consequences based on the players' responses. In addition, the game included a visually stimulating interface to encourage and maintain interest of the players. In terms of feedback responses, feedback was given to the students in the form of audio being played for correct answers and point-loss/alien attacks for incorrect answers. Despite the importance of timely and specific feedback in the learning process, grammar-related feedback was not given for the actual grammar questions because doing so would have affected the grammar responses between game versions A and B. Lastly, the game featured a high level of interactivity and challenge in the form of grammar editing questions and game objectives. The strategic challenge component against an adversarial entity was included due to the psychographic analysis survey, which indicated the target population preferred a game that featured fighting, strategy, and science fiction.

Gameplay Overview

The educational game in this study featured 20 grammar editing questions. In each question, students were presented with a complete sentence that either contained one grammar error, or no grammar error at all. Students were instructed to locate and correct the one error in each of the 20 questions by selecting the sentence, changing the content via keyboard text entry, and pressing the enter key. Students were instructed to press the enter key, without changing any text, if they believed there was no error. The main goal of the game was for students to edit sentences correctly, gain points, and destroy the adversarial alien spaceship. There were two versions of the game, version A and version B. The addition of the negative consequence for incorrect answers in Game Version B was the only difference between Game Version A and Game Version B.

Game Version A

In Game Version A, when students answered a question correctly, they were awarded one attack point, 100 overall score points and the audio indicated a correct response with a "Correct!" voiceover (See Figure 1). If the question was answered incorrectly, the sentence changed to the next question and there were no points acquired or lost. When students acquired four attack points, they were prompted to click a button to fire an attack at the alien invader space ships and their attack point total returned to "0". Firing at the alien space ship caused the alien space ship to lose 1 health point. When the alien space ship's health reached zero, the alien ship would explode, and the player would advance to the next level. Despite the benefits of timely feedback, no specific grammar feedback was given for incorrect answers on Game Version A or Game Version B because it may have influenced the accuracy of the player's answers from one game to the next.

Game Version B

In Game Version B, when students answered a question correctly, the same response as Game Version A transpired. However, in Game Version B, an incorrect response prompted the alien space ship to launch a laser attack at the player's base, causing the player to lose 100 points from their overall score (including negative points for players with a score of "0" or less), and no attack points were gained. The addition of the negative consequence for incorrect answers in Game Version B was the only difference between Game Version A and Game Version B.

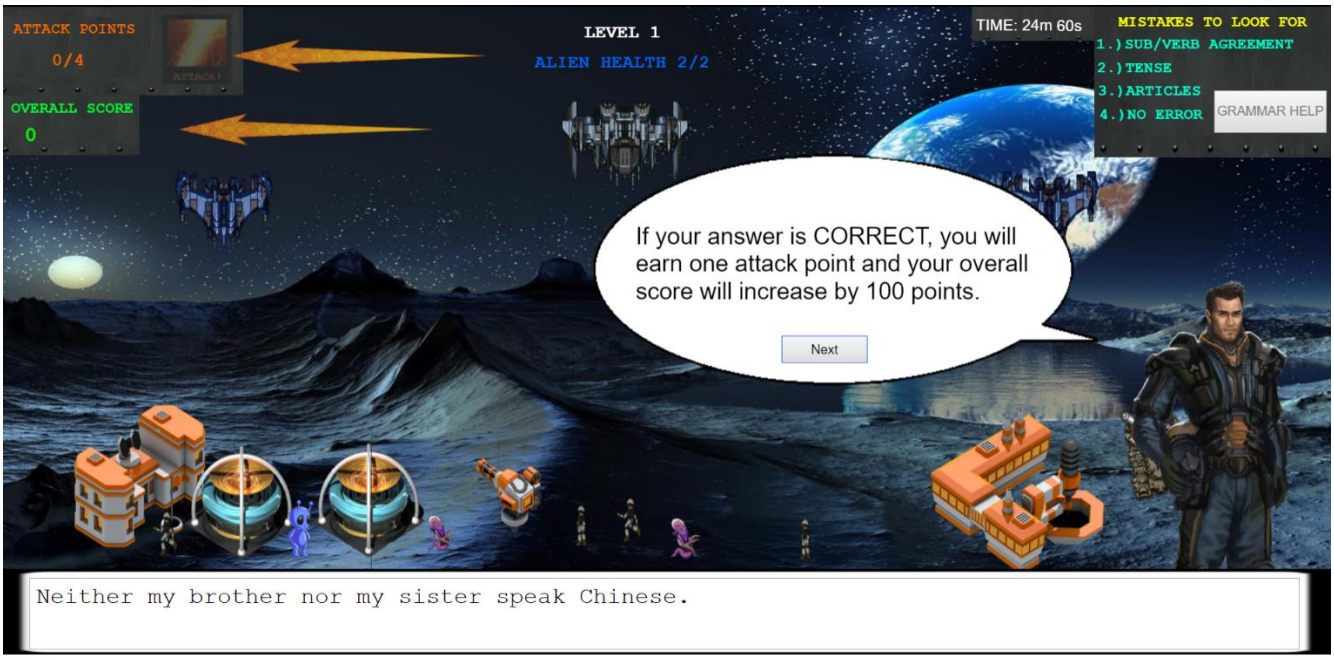

Figure 1: Game Interface and Guided Playing Instructions

Purpose of the Study

The purpose of this study was to measure group differences in composite subjective task-values, ability beliefs, and gameplay behaviors between two groups of intermediate-advanced level ESL postsecondary students while playing two versions of an educational grammar-editing computer game. This research contributes to the current need for more studies of motivation in the field of DGBL utilizing well-established theoretical frameworks. In addition, this study offers researchers, teachers, instructional designers, and video game designers further insights into the effects of regulatory orientations on perceptions and behaviors in the DGBL context. Isolating a single game element (negative consequence for incorrect responses) in version B of the digital learning game offers a narrow approach to determining its effects on motivation while taking regulatory orientations into account.

Study Design Overview

This study measured group differences in composite subjective task values, ability beliefs, and gameplay behaviors between two groups of intermediate-advanced English as a second language (ESL) postsecondary students. The two comparison groups in this study consisted of students who scored "low" in promotion focus (n = 30) and "high" in promotion focus (n = 30) according to the General Regulatory Focus Measure (GRFM) (Lockwood, Jordan, & Kunda, 2002). Each group played two versions of the same game; the first game version was a non-punishment scenario, and the second was a punishment-added scenario. Mid-way through each game, students completed a modified version of the EVQ (Eccles & Wigfield, 1995). The collected data was then analyzed for group differences using independent samples T-test in SPSS.

In the first meeting, students completed a demographic survey that included questions related to their ages, native languages, English levels (according to their academic program), and video game playing habits. Next, students completed the General Regulatory Focus Measure questionnaire (Lockwood, Jordan, & Kunda, 2002) to measure their dominant regulatory orientations within a ten-minute time limit. In the second meeting. students played both versions of the educational computer game; this was done in a computer lab setting during their regular classroom hours. The students were given game-playing instructions and monitored by the main researcher. Mid-way through each game, students completed a modified 13-item version of the EVQ (Eccles & Wigfield, 1995) within a 15-minute time limit. At the end of each game version, additional data was recorded by the main researcher regarding each student's question accuracy, time on task, and help button selection frequency. After all data was collected, a series of independent samples *t*-tests were conducted in SPSS to determine any statistically significant group differences between task-values, ability beliefs, and gameplay behaviors (question accuracy, time on task, help button selection).

Participants

The sample population used in this study consisted of 91 English as a Second Language (ESL) students in an intensive English program for academic purposes. The students were categorized into English ability levels based on their respective English writing levels in the intensive English program ranging from intermediate (levels 6-9) to advanced ability (levels 10-12). In terms of written grammar ability, intermediate level students were characterized by the following criteria by their English learning program: use of basic sentence structure with an attempt at subordinating and coordinating clauses,

general mastery of simple tenses, though problems with phrasal verbs, adverb clauses and minor repeated errors based on L1 (first language), such as article usage, may occur. Advanced ability writers were characterized by: firm control of most grammatical forms including simple, perfect and continuous tenses, and correct use of complex sentences; errors are few and result from complexity of sentence structure or may be limited but repeated errors based on L1 (e.g. articles). Overall, 76% (n = 69) were categorized as intermediate and 24% (n = 22) were advanced. No beginner level students participated in this study. 82% (n = 75) of the sample was male and 18% (n = 16) were female. First languages spoken by the sample were as follows: 68% Arabic (n = 62), 14% Chinese (n = 13), 11% Spanish (n = 10), and 7% other (n = 6). The average age of the population was 24 years old (lowest = 18, highest = 47).

Measurement Instruments

General Regulatory Focus Measure

The GRFM (Lockwood, Jordan, & Kunda, 2002) was used to sort the participants into groups based on their regulatory orientations and investigate the three research questions in this study. The GRFM measures individuals' general goal orientations and categorizes students as either having a prevention focus or promotion focus. A prevention focus emphasizes avoiding unwanted outcomes and is concerned with non-losses and losses. A promotion focus places more emphasis on desirable outcomes and is concerned with gains and non-gains. There are 18 questions on the GRFM featuring Likert scales that range from “1-Not at all true of me” to “9-Very true of me”. Nine of the items assess a promotion focus, and nine assess a prevention focus. For this study, the language of the questionnaire was modified by simplifying the vocabulary

into lower level words to ensure adequate comprehension by the ESL target population; the general meaning of the statements was not changed; for example, the word “aspirations” was changed to “goals”, “anxious” was changed to “worried”, “oriented toward” was changed to “focused on”, etc. (See Appendix B)

The Expectancy-Value Questionnaire (EVQ)

Composite subjective task-values and ability beliefs were measured using a modified version of the expectancy-value questionnaire (EVQ) developed and used by Eccles and Wigfield (1995). The questionnaire was used to investigate research questions one and three: whether the groups would differ in subjective task values and ability beliefs between groups and between games. The original questionnaire features 19 items measuring children’s self and task perceptions in the domain of mathematics including task values, expectancy beliefs, and perceived task difficulties. The EVQ utilizes a Likert scale ranging from 1 to 7. For this experiment, the original questionnaire was modified to 13 items and only the task value and ability beliefs items were utilized with a 7-point Likert scale. Composite subjective task values scores were computed by combining all items on the EVQ that measured subjective task values including: three items measuring interest/intrinsic value (items 1-3), five items measuring attainment value (items 5-10), and two item measuring utility value (items 4 and 11). Ability beliefs were measured by two items (item 12 and item 13) on the modified EVQ. In addition, the language of the original questionnaire was modified to reflect the computer-game content and to ensure adequate comprehension. A “neutral” option was also added to the middle of the Likert scale (value 4). For example, the original item on the EVQ “In general, I find working on math

assignments… (very boring, very interesting)" was modified to: "I think this computer game is… (very boring, neutral, very interesting)"

Pre-experiment Procedure

At the first meeting, all student participants received the General Regulatory Focus Measure (GRFM) (Lockwood, Jordan, and Kund, 2002) and completed their responses under the supervision of the main researcher within a ten-minute time limit. The GRFM was used to assess the students' dominant regulatory orientations; this was done by totaling the values for the items measuring either a promotion orientation (9 items) or prevention orientation (9 items). The students had the option to answer each item with a number ranging from 1 to 9. The total values for the promotion and prevention scores for each student were then divided by nine to produce an average score for each orientation. Next, to determine their dominant regulatory orientations, their prevention scores were subtracted from their promotion scores, yielding either a positive or negative difference, as was done by Lockwood, Jordan, and Kunda, (2002). In addition to the GRFM, participants also completed the demographic questionnaire; the demographic questionnaire included the subjects' ages, nationalities, English proficiency levels (their level in the English program), number of hours spent playing video games per week, and genders. The participants were then told they would play the grammar-editing game the following day. No other information regarding the game or game content was discussed.

Comparison Groups

As stated above, students completed the GRFM in the pre-experiment procedure; their average promotion and prevention scores were calculated, and then their dominant regulatory orientations were determined. However, because most students reported

promotion orientations (n = 81), there was not a large enough sample of prevention-oriented students. Therefore, the entire sample (n=91) was divided into two comparison groups: "high promotion" and "low promotion" individuals. To achieve this, the dominant regulatory orientation scores were arranged in ascending order and the middle tercile (n = 31) was removed, leaving the lower third (n = 30) and the upper third (n = 30) of the participants. The lower third consisted of those with low or negative differences between their promotion and prevention scores (*M* = -.02, SD = 1.09), and the upper third were those with the highest positive differences between their promotion and prevention scores (*M* = 3.8, SD = 1.02). These two terciles were used as the two comparison groups in the experiment.

Comparison group demographics

Group 1 (n =30), the low-promotion group, was made up of the following demographic criteria: Average age = 22.83, Average English ability level = 8.57 (out of 12). Gender: 83% male (n = 25), 17 % female (n = 5). Native language: 66% Arabic (n = 20), 20% Chinese (n =6), 7% Spanish (n =2), 7% other (n = 2). Average dominant regulatory orientation score (promotion score – prevention score) (*M* = - .02, SD = 1.09).

Group 2 (n = 30), the high-promotion group, was made up of the following demographic criteria: Average age = 25.23. Average English ability level = 8.23 (out of 12). Gender: 63% male (n = 19), 37% female (n = 11). Native language: 70 % Arabic (n = 21), 13% Spanish (n = 4), 6% Chinese (n = 2), 10% other (n = 3). Average dominant regulatory orientation score (promotion score – prevention score) (*M* = 3.80, SD = 1.02).

Independent Samples t-tests for Comparison Groups

An independent samples *t*-test was conducted comparing the two group mean ages, English ability levels, and differences in regulatory orientation scores (high promotion minus low promotion). The independent-samples *t*-test utilized an alpha level of $p < .05$ and 95% confidence interval. No statistically significant differences were observed between the ages and levels of each group: Age ($p = .18$); level ($p = .45$). For the low promotion group: Age ($M = 22.83$, $SD = 6.10$); Level ($M = 8.57$, $SD = 1.79$). For the high promotion group: Age ($M = 25.23$, $SD = 7.61$); Level ($M = 8.57$, $SD = 1.57$) (See Table 1). It should be noted that the standard deviations for the group ages were large due to a wide range of ages and several outliers; for the low promotion group, there were three extreme outliers (greater than 3 time the IQR) in age values ($x = 44, 36, 32$). For the high promotion group, there was one extreme outlier ($x = 47$). As expected, analysis indicated a significant difference between the means of each group regarding regulatory orientation differences (high promotion minus low promotion) as measured by the GRF instrument. For low promotion students: GRFM Difference ($M = -.02$, SD = 1.09); for high promotion students ($M = 3.80$, SD = 1.02). GRFM difference between low promotion and high promotion groups: ($t = 14.02$, $df = 57.70$, $p < .05$) (See Tables 1 and 2).

Table 1: Descriptive Statistics for High and Low Promotion Groups

	Group	N	Mean	Std. Deviation	Std. Error Mean
Age	low promotion	30	22.83	6.10	1.11
	high promotion	30	25.23	7.61	1.39
Level	low promotion	30	8.57	1.79	.33
	high promotion	30	8.23	1.57	.29
GRFM_Dif	low promotion	30	-.018	1.09	.20
	high promotion	30	3.80	1.02	.19

Note: GRFM_Dif = General Regulatory Focus Measure Difference (promotion minus prevention score)

Table 2: Independent Samples t-test for High and Low Promotion Groups

	t-test for Equality of Means						
						95% Confidence Interval of the Difference	
	t	*df*	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Age	-1.35	55.40	.18	-2.40	1.78	-5.97	1.17
Level	.77	56.98	.45	.33	.435	-.54	1.21
GRF_Dif	-14.02	57.70	.00	-3.82	.27	-4.36	-3.27

Note: Equal variance not assumed

In-Game Procedure

On the second meeting, students played both versions of the educational computer game (Version A and Version B) in a computer lab setting under the supervision of the main researcher; this was done during their regular classroom hours. Students were not given any assistance by the main researcher in answering the questions; they were only assisted regarding how to play the game. There was no break in between Version A and Version B. When each student reached the halfway point of the game (question 10 of 20), they were prompted to complete a paper copy of the modified expectancy-value questionnaire (EVQ) (Eccles & Wigfield, 1995) in order to measure their ability beliefs and composite subject task-values. Students answered 13 items on the EVQ utilizing a seven-point Likert scale. For example, one of the items measuring intrinsic/interest value: "How much do you like playing this computer game?" gave the student the option of choosing a response ranging from 1 to 7 including: "1 - Not very much" to "4 - Neutral", to "7 – Very much". Students were given a maximum of ten minutes to complete this questionnaire and were instructed to inform the main researcher if they did not fully understand any of the items. Responses were collected for each version of the game and placed in separate folders for each student.

At the end of each game version, additional data was recorded by the main researcher regarding each student's question accuracy, time on task, and the number of times the "grammar help" button was accessed. The question accuracy was computed automatically by the computer game software, producing a score out of 20, and was made available to the researcher in a separate document; this file was accessed when a student finished each version of the game. Secondly, time on task was measured by a running timer (in seconds) on the game interface that was visible to the player and main researcher. The

timer was programmed to pause whenever students clicked the help button, paused the game, or clicked the attack button, causing an attack sequence to take place. The total time output for each game version was recorded by the main researcher on a separate form once a student completed each game version. Lastly, the number of times the "grammar help" button was accessed was automatically computed by the computer game software; this file was also made available to the researcher in a separate document and recorded at the end of each game version.

Group Differences

After collecting the data for each dependent variable, a series of independent samples *t*-tests was conducted in SPSS to determine if there were any group differences between the dependent variables for the low promotion and high promotion groups. A paired samples *t*-test was also conducted to determine differences for each group between game versions. Both the independent-samples *t*-tests and paired samples *t*-test utilized an alpha level of $p < .05$ and 95% confidence interval. The results of the *t*-tests were then analyzed and compared to the research questions. The findings of the analysis are provided in the next section.

CHAPTER FOUR: RESULTS

Research Questions

The three research questions in this study were:

I. Will the comparison groups differ in composite subjective task values and ability beliefs for each game version?

II. Will the comparison groups differ in task-values or ability beliefs *between* game versions?

III. Will the comparison groups differ in gameplay behaviors (score, time spent on task, and help button access) for each game version?

Research Question One

I. Will the comparison groups differ in composite subjective task values and ability beliefs for each game version?

Composite Subjective Task Values Between Groups

Composite subjective task values scores were computed by combining all items on the EVQ that measured subjective task values including: three items measuring interest/intrinsic value (items 1-3), six items measuring attainment value (items 4-10), and one item measuring utility value (item 11). (See Appendix A). A test for construct reliability was conducted in SPSS for the subjective task value items with a result of Cronbach's alpha equal to .86 for version A, and .92 for version B. Next, the following null hypothesis was tested using an independent samples *t*-test (alpha = .05, 95% confidence interval): H_1 - There will be no differences in composite subjective task values or composite ability beliefs between groups for either game version A or B.

Results indicate that there were no significant mean differences for composite subjective task values between low promotion and high promotion groups for either game

version A (p = .92) or game version B (p = .64). For game version A, the low promotion group measured (M = 58.03, SD = 9.24) and the high promotion group measured (M = 58.30, SD = 10.37); (t = -.11 and df = 57.25). For game version B, the low promotion group measured (M = 57.93, SD = 12.87) and the high promotion group measured (M = 60.40, SD = 9.99); (t = -.83 and df = 54.64) (See Table 3).

Table 3: Group Differences for Composite Subjective Task Values

	Group	N	Mean	Std. Deviation	Std. Error Mean
CompositeSubA	low promotion	30	58.03	9.24	1.69
	high promotion	30	58.30	10.37	1.89
CompositeSubB	low promotion	29	57.93	12.87	2.35
	high promotion	30	60.40	9.99	1.82

Note: CompositeSubA = Composite subjective task values on game version A.
CompositeSubB = Composite subjective task values on game version B

Composite Ability Beliefs

Composite ability beliefs were the sum of two items (item 12 and item 13) on the modified EVQ (See Appendix C). An Independent samples test was run in SPSS to determine any significant difference of means between the low promotion and high promotion groups in terms of ability beliefs for game version A and game version B. A test for construct reliability was conducted in SPSS for the ability belief items with a result of Cronbach's alpha equal to .93 for version A, and .89 for version B. Next, the following null hypothesis was tested using an independent samples t-test (alpha = .05, 95% confidence interval): H_1 - There will be no differences in composite subjective task values or composite ability beliefs between groups for either game version A or B.

Results indicate that there were no significant differences of mean scores for ability beliefs between the low promotion and high promotion groups for either game version A (p = .67) or game version B (p = .56). For game version A, the low promotion group (M =8.43, SD = 3.18) and the high promotion group (M = 8.10, SD = 2.78); (t = .43 and df = 56.99). For game version B, the low promotion group (M = 8.00, SD = 3.02) and the high promotion group (M = 8.47, SD = 8.47); (t = -.59 and df = 57.88.) (See Table 4).

Table 4: Group Differences of Means for Composite Ability Beliefs

	Group	N	Mean	Std. Deviation	Std. Error Mean
CompositeAblA	low promotion	30	8.4333	3.18058	.58069
	high promotion	30	8.1000	2.78357	.50821
CompositeAblB	low promotion	30	8.0000	3.017192	.55086
	high promotion	30	8.4667	3.15937	.57682

Item Specific Group Differences

Of all the 13 items from the EVQ measuring subjective task values and ability beliefs on both game versions, only two task value items had p values below .05 at the 95% confidence. The "high promotion" group scored higher than the "low promotion" group on two items measuring utility value and attainment value on game version B (punishment scenario) - util1B (p = .02) and attn5B (p = .05). The util1B item stated: "Is this game a good use of your time?" and the attn5B item stated: "How important is it to you to get a HIGH score on this game?" For util1B: the low promotion group (M = 4.77, SD = 1.17) and the high promotion group (M = 5.47, SD = 1.14); (t = - 2.34, df = 57.96). For attn5B, the low promotion group (M = 5.07, SD = 1.66) and the high promotion group (M =5.80, SD =

1.10); (t = -2.02, df = 50.24). (See Tables 5 and 6). However, it is important to note that most questionnaire items measured in this study (n = 24) did *not* demonstrate any significant differences. A much lower alpha level than the one utilized in this study is needed to draw statistically supported inferences from these two findings. Therefore, although these two significant finding at the 95% confidence interval have been included in this study, neither statistical theory nor the author implies that these differences indicate and overall trend of differences between groups.

Table 5: Descriptive Statistics for util1B and attn5B

	Group	N	Mean	Std. Deviation	Std. Error Mean
util1B	low promotion	30	4.77	1.17	.21
	high promotion	30	5.47	1.14	.21
attn5B	low promotion	30	5.07	1.66	.30
	high promotion	30	5.80	1.10	.20

Note: util1B = Is this game a good use of your time? (1 – 7 Likert scale)
attn5B = How important is it to you to get a HIGH score on this game? (1 – 7 Likert scale)

Table 6: Independent Samples T-test for util1B and attn5B

	t-test for Equality of Means						
						95% Confidence Interval of the Difference	
	t	*df*	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
util 1B	-2.36	57.97	.022	-.700	.30	-1.29	-.11
attn 5B	-2.02	50.24	.049	-.73	.36	-1.46	-.004

Note: Equal variance not assumed.

Research Question Two

II. Will the comparison groups differ in task-values or ability beliefs *between* game versions?

Composite Task-Values Between Game Versions

The following null hypothesis was tested using a paired samples *t*-test (alpha = .05, 95% confidence interval): H_2 - There will be no differences in composite subjective task values or composite ability beliefs *between* game versions A or B for either group. Results indicate there were no significant differences for either group in terms of composite subjective task-values *between* game versions A and B. The difference between game versions for the low promotion group was not significant ($p = .96$). The descriptive statistics were ($M = 58.03$, $SD = 9.24$) for Game Version A and ($M = 57.93$, $SD = 12.87$) for Game Version B (t = .053, df = 29). The difference between game versions for the high promotion group was also not significant ($p = .16$). The descriptive statistics were ($M = 58.30$, $SD = 10.37$) for Game version A and ($M = 60.40$, $SD = 9.99$) for Game version B (t = -1.45, df = 29) (See Table 7).

Table 7: Composite Task Values for Game Versions A and B

	Version	N	Mean	Std. Deviation	Std. Error Mean
CompositeLow	VersionA	30	58.03	9.24	1.69
	VersionB	30	57.93	12.87	2.35
CompositeHigh	VersionA	30	58.30	10.37	1.89
	VersionB	30	60.40	9.99	1.82

Composite Ability Beliefs Between Game Versions

The following null hypothesis was tested using a paired samples t-test (alpha = .05, 95% confidence interval): H_2 - There will be no differences in composite subjective task

values or composite ability beliefs *between* game versions A or B for either group. Results indicate there were no significant differences for either group in terms of composite ability beliefs *between* game versions A and B. The difference between game versions for the low promotion group was not significant (p = .37). The descriptive statistics for the low promotion group were (M = 8.43, SD = 3.18) for Game Version A, and (M = 8.00 SD = 3.01) for Game Version B (t = .91, df = 29). The difference between game versions for the high promotion group was not significant (p = .30). The descriptive statistics for the high promotion group were (M = 8.10, SD = 2.78) for Game Version A, and (M = 8.47, SD = 3.16) for Game Version B (t = - 1.06, df = 29) (See Table 8).

Table 8: Descriptive Statistics Composite Ability for Game Versions A and B

	Version	N	Mean	Std. Deviation	Std. Error Mean
AbLow	VersionA	30	8.43	3.18058	.58069
	VersionB	30	8.00	3.01719	.55086
AbHigh	VersionA	30	8.10	2.78357	.50821
	VersionB	30	8.46	3.15	.57682

Research Question Three

III. Will the comparison groups differ in gameplay behaviors (score, time spent on task, and help button access) for each game version?

Question Accuracy

The dependent variable of question accuracy represented how many questions each student answered correctly out of 20 total questions for each game version. Total question accuracy was computed by the computer program and made available to the researcher in a

separate document. An independent samples *t*-test was conducted in SPSS to determine if there was a difference of group means between the "low promotion" and "high promotion" groups regarding question accuracy. The following null hypothesis was tested using an independent samples t-test (alpha = .05, 95% confidence interval): H_3 - There will be no differences in gameplay behaviors (question accuracy, time on task, help-button selection). Results indicate there were no significant differences in mean scores for the "low promotion" and "high promotion groups" in either game version A (p = .97) or game version B (p = .72). On game version A, low promotion group: question accuracy (M = 10.2, SD = 3.71); high promotion group: question accuracy (M = 10.23, SD = 3.51); (t = -.04, df = 57.83). On version B, low promotion group: question accuracy (M = 11.17, SD = 4.23); high promotion group: question accuracy (M = 11.53, SD = 3.77); (t = -.36, df = 57.25). (See Table 9)

Table 9: Descriptive Statistics for Question Accuracy

	Group	N	Mean	Std. Deviation	Std. Error Mean
scoreA	low promotion	30	10.20	3.71	.68
	high promotion	30	10.23	3.51	.64
scoreB	low promotion	30	11.17	4.23	.77
	high promotion	30	11.53	3.77	.69

Note: scoreA = How many questions answered correctly on game Version A (out of 20)
scoreB = How many questions answered correctly on game Version B (out of 20)

Time Spent on Task

Time on task was measured by a running timer (in seconds) on the game interface that was visible to both the student and researcher. An independent samples T-test was conducted in SPSS to determine if there was a difference of group means between the "low promotion" and "high promotion" groups in terms of overall time spent on task (in seconds). The following null hypothesis was tested using an independent samples t-test (alpha = .05, 95% confidence interval): H_3 - There will be no differences in gameplay behaviors (question accuracy, time on task, help-button selection). Results indicate there were no significant differences in mean scores for the "low promotion" and "high promotion groups" in either game version A (p = .93) or game version B (p = .78) regarding overall time spent on task. On game version A, the low promotion group spent the following time in seconds: (M = 558.43, SD = 226.35); the high promotion group spent the following time in seconds (M = 563.50, SD = 247.68); (t = -.08, df = 57.54). On version B, low promotion group spent the following time in seconds: (M = 353.83, SD = 132.56); the high promotion group spent the following time in seconds: (M = 364.86, SD = 157.96) (t = -.29, df = 52.89) (See Table 10). It should be noted that two extreme outliers (x > 3.0 IQR) were removed from the dependent variable "timeB": (x = 2246, x = 1181).

Table 10: Descriptive Statistics for Time on Task

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
timeA	low promotion	30	558.43	226.35	41.33
	high promotion	30	563.50	247.68	45.22
timeB	low promotion	30	353.83	132.56	24.20
	high promotion	28	364.86	157.96	29.85

Note: timeA = Time (in seconds) spent on game version A

timeB = Time (in seconds) spent on game version B

Help Button Selection

Help button selection was measured by the computer game, which recorded how many times the student selected the "grammar help" button on the game interface. An independent samples *t*-test was conducted in SPSS to determine if there was a difference of group means between the "low promotion" and "high promotion" groups in terms of help button selection. The following null hypothesis was tested using an independent samples t-test (alpha = .05, 95% confidence interval): H_3 - There will be no differences in gameplay behaviors (question accuracy, time on task, help-button selection). Results indicate there were no significant differences in mean scores for the "low promotion" and "high promotion groups" in either game version A (p = .49) or game version B (p = .42) regarding help button selection. On game version A, the low promotion group had descriptive statistics of (M = .48, SD = .83) and the high promotion group measured (M = .67, SD = 1.9); (t = -.69, df = 52.01). On version B, the low promotion group measured (M = .37, SD = .85) and the high promotion group measured (M =.22, SD = .42) (t = .82, df = 43.51) (See Table 11). It should be noted that several extreme outliers (x > 3.0IQR) were removed from the data: one extreme outliers in game version A (x = 10); three extreme outliers in game version B (x = 8, x = 6, x = 5)

Table 11: Group Difference of Means for Help Button Selection

	Group	N	Mean	Std. Deviation	Std. Error Mean
helpA	low promotion	29	.48	.83	.15
	high promotion	30	.67	1.90	.22
helpB	low promotion	30	.37	.85	.16
	high promotion	27	.22	.42	.08

Note: helpA = Number of times grammar help button selected in game version A
helpB = Number of times grammar help button selected in game version B

CHAPTER FIVE: DISCUSSION

This study measured group differences in subjective task-values, ability beliefs, and gameplay behaviors among intermediate and advanced level ESL postsecondary students who played two versions of an educational computer game. The three research questions in this study were: I. Will the comparison groups differ in composite subjective task values and ability beliefs for each game version? II. Will the comparison groups differ in task-values or ability beliefs *between* game version? III. Will the comparison groups differ in gameplay behaviors (score, time spent on task, and help button access) for each game version? The two comparison groups in this study consisted of students scoring "low" in promotion focus and students scoring "high" in promotion focus according to the General Regulatory Focus Measure (GRFM) (Lockwood, Jordan, & Kunda, 2002). For the experiment, students completed a modified version of the EVQ (Eccles & Wigfield, 1995) in the middle of each game version. An independent samples *t*-test was conducted in SPSS to determine any statistically significant group differences.

Composite Task Values Between Groups: Game Version A

The first research question investigated in this study was: *Will the comparison groups differ in composite subjective task values and ability beliefs for each game version*? There are several possible reasons, supported by previous research, for the statistically similar reported task values for the low promotion and high promotion groups in game version A (rewards-only scenario). For example, lack of challenge can lead to lower reported task values, as was the case in a similar DGBL study done by Öztürkcan and Şengün (2016) in which players rated a reward-only scenario as unchallenging and less motivating. Therefore, the high promotion players, who would be expected to rate a rewards-only scenario as more motivating, may not have done so due

to a lack of challenge. Additionally, the rewards in game version A may not have been valuable enough for the high promotion players to deem important due to their lack of utility or interest value. Further testing about the perceived value of the game rewards for the low promotion and high promotion groups would help clarify the reasons for their similar reported task-values in game version A.

Composite Task-Values Between Groups: Game Version B

In game version B (punishment-added scenario), the lack of statistically different composite task values between groups contrasts ROT. According to ROT, those with a *prevention focus* would be more engaged in a situation concerned with the absence and presence of negative outcomes (Higgins, 1998). Therefore, it would be expected the low promotion individuals would report higher subjective task-values due to a regulatory fit between their vigilant strategy and game version B (punishment scenario); however, this was not the case. One explanation supported by previous research is that Version B in this study included both rewards and punishments and thus was a balanced scenario. When Öztürkcan and Şengün (2016) observed players in a balanced scenario (both rewards and punishments) they found that this scenario generated significantly lower levels of motivation as compared to the rewards-only and punishment-only scenarios. Therefore, if the rewards had been removed in game version B, it would have been a pure punishment scenario. In that case, the low promotion individuals would have been expected to be more sensitive to the punishment and thus report more dissimilar task values.

Item-specific Differences Between Groups

While investigating if composite task values differed between the comparison groups, the majority of questionnaire items measured did *not* demonstrate any significant differences. However, two individual items, attn5B and util1B, demonstrated statistically significant group differences at a 95% confidence interval. Although these two significant group differences have been included in this study, a much lower alpha level than the one utilized in this study is needed to draw statistically supported inferences. Nevertheless, these group differences were analyzed in comparison to ROT and previous research.

First, item attn5B item which stated: "How important is it to you to get a HIGH score on this game?" had higher reported values from the high promotion group. This finding aligned with promotion-oriented individuals' desire to achieve a reward (Higgins, 1998). Higher attainment value was not reported in game version A (reward-only scenario) by the high promotion group possibly due to a lack of challenge or reward value, as mentioned above. Second, there was a significant difference between groups for item util1B: "Is this game a good use of your time?" A lower reported utility value among the low promotion group contrasts ROT, which states that prevention-oriented individuals are more engaged in a loss-avoidance scenario. The lower utility value may have been because game version B was a balanced, rather than punishment-only scenario conducive to prevention-oriented strategy. The lower utility reported may have also been a result of prevention-oriented individuals desire to quit the game in the face of losing points. According to Crowe and Higgins (1997), prevention-oriented individuals were more likely to quit in the face of increased difficulty or failure. Because the increased difficulty in version B was not reflected in student's ability beliefs, the failure punishment in game

version B may have had a negative hedonistic effect, rather than an effect on the student's ability beliefs. Measuring hedonistic experiences of pleasure and pain in this study would have given more information to determine the reasons for the reported composite values and is a valid consideration for future studies.

Ability Beliefs Between Players and Game Versions

The ability beliefs of the students did not appear to vary based on regulatory orientation or from game to game. This finding was contrary to the researcher's expectation that game version B (rewards and punishment scenario) would generate lower ability beliefs for the low promotion students because of their higher sensitivity to losses. The lack of decreased ability beliefs for either group in game version B may have been because the students had seen the same questions in game version A, and thus had more positive expectancy beliefs about their ability to succeed on the questions the second time. In addition, the similar levels of ability beliefs reported in both game versions parallels the similar composite task values reported from version to version. According to EVT and Bandura's (1997) self-efficacy theory, ability self-concepts influence the development of task values. If the ability beliefs of the players had increased or decreased significantly from version to version, more pronounced differences in composite task values would have been expected.

Composite Task Values Between Game Versions

The next second research question was: *Will the comparison groups differ in task-values or ability beliefs between game version?* The lack of differences in reported task-

value and ability beliefs between game versions both support and contradict previous research. For example, Öztürkcan and Şengün (2016) found the punishment scenario generated more motivation than the rewards scenario for both promotion and prevention individuals in their educational computer game. However, in this study, there were no increases in task values or ability beliefs in the punishment version of the game compared to the rewards-only scenario. According to Öztürkcan and Şengün (2016), higher motivation in the punishment scenario in their study may have been due to an inadequate level of challenge in the rewards scenario. In this study, level of challenge was not measured and cannot be used to draw conclusions regarding the reported data. On the other hand, the fact that the subjective task-values for the low promotion group did not decrease in the punishment scenario is in line with Lee, Heeter, Magerko & Medler (2013) who found that negative feedback did not demotivate prevention-oriented learners.

Differences in Gameplay Between Groups

The third research question was: *Will the comparison groups differ in gameplay behaviors (score, time spent on task, and help button access) for each game version?* The lack of significant differences between the comparison groups regarding question accuracy for game versions A and B contrasts findings of previous studies. For example. Gangadharbatla and Davis (2016) stated that promotion focus individuals perform better under awarding systems while prevention focus individuals perform better under punishing conditions. In addition, Heeter, Lee, Magerko, Cole, & Medler (2012) found that promotion focus players were less careful and made more mistakes in their video game study. However, the high promotion group in this study did not demonstrate less accuracy in

answering questions. The reason for similar question accuracy between groups may have been a result of similar prior grammar ability of the players. It is also possible that the rewards and punishments were not strong enough to affect the way in which students answered questions. In future studies, more detailed measures of prior grammar ability should be utilized to further isolate the effect of manipulated game elements.

Next, the lack of group differences in time spent on task contrasts previous research, such as the results of Lee, Heeter, Magerko and Medler (2013) who found that learners played 26% longer time and demonstrated more related behaviors, such as spending more time on feedback, when they experienced regulatory fit. Moreover, the findings of this study contrast Higgins and Crowe (1995) who found that prevention individuals take more time to respond than individuals with a promotion focus. One reason for the similar times spent on game version B by the groups is that game version B featured both rewards and punishments and thus was not a pure loss-avoidance scenario that aligned with the vigilant strategy of prevention-oriented individuals. If the rewards had been removed in game version B and a pure punishment scenario had been tested, it could have caused the low promotion individuals to spend more time on each question due to increased regulatory fit.

Lastly, there were no differences between comparison groups regarding the number of times they selected the help button. This finding contradicts the author's prediction that the low promotion group would use the help button more in game version B. According to Heeter, Lee, Magerko, Cole,and Medler (2012), prevention players were more careful and more influenced by external instructions; thus, it was expected that they would utilize the help button in an effort to be more careful with their answers. The reason for similar frequency of help button use between groups may have been a function of the groups'

similar grammar-editing skill levels and a similar level of need for the help-button. A more specific grammar-editing pre-test would have provided more information to determine the reasons for this finding.

Implications for Practice

The findings of this study contribute to the relatively small amount of empirical evidence about whether motivational theories hold up in game-based learning environments (Star, Chen, & Dede, 2015). In addition, this study can inform the practices of researchers, teachers, instructional designers and video game designers. First, researchers can compare these findings to other studies focusing on DGBL and regulatory orientations (e.g. Heeter, Lee, Magerko, Cole, & Medler, 2012; Lee, Heeter, Magerko & Medler, 2013; Öztürkcan & Şengün, 2016) and formulate further research questions. For example, this study may serve as a starting point for investigating how game elements, such as time limits or negative reinforcement, affect individuals of differing regulatory orientations in different game formats. Investigating the relationship between regulatory orientations, gameplay, and subjective task values directly contributes to the need for further testing of how interindividual differences affect perception, motivation and behavior in DGBL tasks. Isolating a single game element (e.g. a negative consequence for incorrect responses) offers a narrow approach to determining the motivational effects of game elements and their relationship to motivation and regulatory orientation.

Second, teachers can benefit from this study by gaining awareness of the possible effects of regulatory orientations on students' perceptions and behaviors when using DGBL in the classroom. The way a game's goals and rewards are designed may cause prevention

and promotion focus learners to react differently. Therefore, teachers can select DGBL games that appeal to both regulatory orientations in an effort to maximize interest and engagement, especially in the DGBL context. Additionally, teachers can frame a DGBL task based on the desired approach of the students (promotion or prevention).

Lastly, both instructional designers and video game designers can benefit from this research when designing training modules or entertainment games. The design of specialized games and instructional materials benefit from considering the target population's demographic information, such as skill level, previous experience, and psychographic profiles. In addition to these factors, an individual's regulatory orientation plays an important role in determining his or her perception and subsequent motivation, especially within a context that features potential gains and losses. Therefore, learning games or instructional content that feature the game element of scoring (gains vs. losses) can be designed with the learner's regulatory orientation in mind, or modified to fit the nature of the task; doing so has the potential to increase engagement and motivation toward identified outcomes.

Limitations

There were several limitations of this study. First, the overall sample sizes of each comparison group were small (n = 30). In addition, several demographic differences must be taken into account as influencing factors. For example, the population who participated in this study was comprised of mostly males: 83% for the low promotion group, and 63% for the high promotion group. Because gender can affect game play engagement and behavior (Hoffman and Nadelson, 2009), this could be a possible influence on the game

play outcomes reported in this study. For example, Hoffman and Nadelson (2009) found that males were almost twice as likely to be engaged in gaming as females, making gender a significant indicator of video gaming engagement. In addition, from the perspective of EVT, the task value of attainment is closely tied to an individuals' self-schema which can in part be derived from gender role stereotypes (Burgoon, White, & Greene, 1997; Eccles & Harold, 1991); therefore, an individual's gender can influence their self-schema as it relates to playing video games. Lastly, most participants spoke Arabic because the English learning institution consisted of mostly students whose first language was Arabic. The percentage of participants whose first language was Arabic was 66% in the low promotion group, and 70% in the high promotion group. As a result, future studies would benefit from incorporating target populations of different native languages (e.g. Chinese) and different demographic makeups in terms of gender.

Second, this study relied on self-report measures to measure both general regulatory orientation via the GRFM (Lockwood, 2002), and subjective task values via the EVQ (Eccles, 1995). Some weaknesses of self -report measures include the fact that individuals may not recognize the source of their own behaviors (Feldon, 2007) or may feel pressure to present positive or expected self-images to researchers (Greene, 2015). In fact, Feldon (2010) concluded that "participants' self-explanations are largely inaccurate" (p. 395). Therefore, future studies should utilize additional indices when measuring regulatory orientation and subjective task-values because self -report cannot be solely relied upon.

Third, there are some considerations regarding the measurement instruments in this study. The modified EVQ used in this study excluded the measurement of expectancy

beliefs, which are an essential part of EVT and are used in conjunction with value attribution to determine an individual's motivation. Expectancies play a key role in the shaping of experience (Kirsch, 1999) and when experience is accompanied by positive or optimistic expectancies, evaluations are more likely to be positive in nature (Hopp & Fisher, 2017). Therefore, the expectancies of the students regarding grammar-editing and educational computer games could have influenced their subsequent reported task-values. Future studies would benefit from measuring expectancy beliefs regarding grammar editing and educational computer games in conjunction with subjective task-values and ability beliefs to achieve a more consummate picture of motivation. In addition, Summerville and Roese (2008) advised a cautious reading of data derived from the GRFM. In their study, they found that GRFM measures showed an unexpected correlation with affect. Thus, the measurements of students' general regulatory orientations may also include measures of emotional tendencies (Summerville & Roese, 2008).

Lastly, the design of the experiment contained several possible limitations. For example, the GRFM was administered by the main researcher, who was also a teacher of the students in the experiment. Therefore, students' responses may have been influenced by the fact that their teacher was administering the questions and they wanted to make a positive impression; the desire to present a positive image is in line with the results of the GRFM indicating that a large majority of students fell into the promotion category. Future studies should utilize administration of questionnaires by a third party or computer-based system to avoid possible biases or altered questionnaire responses.

In addition, the students played both versions of a similar computer game and therefore could have been influenced by the novelty effect, or the halo effect. In the case of

the novelty effect, students may have reported higher subjective task values on the first game version because it was a new and unique experience. Likewise, they may have reported lower subjective task values on the second game version because there was a lack of novelty and uniqueness, or because the students had already seen the game questions. In terms of the halo effect, students may have transferred any positive experiences of the first game version to the second, which may have influenced their reported subjective task values. On the other hand, students may have generalized any negative experiences on the first game version to the second, thereby influencing their perception and reported task values on the second game version. Future studies could improve upon this one by featuring a one-game experiment design in which students are not influenced by a second game version.

Recommendations for Future Research

There are several recommendations for further research. First, ample opportunity remains for further research in the fields of DGBL and DGBLL. The fields of DGBL and DGBLL are broad and encompass a wide spectrum of game formats, genres, and content. In particular, future studies could focus on game formats other than MMPORGs because they are already the most commonly studied game formats in DGBL and DGBLL. The author reiterates the suggestion made by Lee et al. (2013) that future regulatory orientation studies should focus on different games and take factors such as genre into account. Studies similar to this one can be conducted with different educational content such as science or math-based content to determine if similar results are replicated. In addition, future studies could manipulate different game elements to

continue investigating the impact of each game element on motivational outcomes while taking regulatory orientations into account.

This study also raises further questions about how regulatory orientations affect individuals regarding gains and losses in DGBL. For example, in this study there were no significant differences in subjective task-values and ability beliefs in the punishment scenario for the low promotion individuals, which parallels previous research (Lee, Heeter, Magerko & Medler, 2013; Öztürkcan and Şengün,2016). Understanding that punishment conditions may not actually demotivate prevention-oriented individuals may provide justification for instructional designers and video game designers to include negative consequences in their DGBL designs. Further research is still needed before conclusions can be drawn about the effects of punishment on prevention-oriented individuals.

Overall, the effects of regulatory orientations in DGBL require additional research. This study was one of only several focusing on regulatory orientation in a DGBL context. Therefore, the author of this study echoes the recommendations of Ozturkcan and Sengun (2016) for further testing of ROT in the DGBL context. Doing so can help increase the breadth and depth of knowledge in this area and give practitioners, such as game designers and instructional designers, more empirical justification for incorporating game elements into their designs. Identifying the interplay of game elements and the motivational profiles of game players can give game designers and instructional designers more opportunity to design games that are engaging and motivational.

APPENDIX A: IRB APPROVAL LETTER

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Stephen Strnad**

Date: **August 23, 2017**

Dear Researcher:

On 08/23/2017 the IRB approved the following human participant research until 08/22/2018 inclusive:

Type of Review:	UCF Initial Review Submission Form Expedited Review
Project Title:	The Effects of Regulatory Fit on Motivation and Gameplay in a Grammar Editing Computer Game.
Investigator:	Stephen Strnad
IRB Number:	SBE-17-13336
Funding Agency:	
Grant Title:	
Research ID:	N/A

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

If continuing review approval is not granted before the expiration date of 08/22/2018, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

All data, including signed consent forms if applicable, must be retained and secured per protocol for a minimum of five years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained and secured per protocol. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Signature applied by Gillian Amy Mary Morien on 08/23/2017 01:31:20 PM EDT

IRB Coordinator

APPENDIX B: MODIFIED GENERAL REGULATORY FOCUS QUESTIONNAIRE

Name_____ Number____

PRE-QUESTIONNAIRE III

Directions: Using the scale below, please write the appropriate number in the blank beside each item.

1	2	3	4	5	6	7	8	9
Not at all true of me								**Very true of me**

1. __ In general, I am focused on preventing negative events in my life.
2. __ I am anxious that I will not accomplish responsibilities and things I must do.
3. __ I frequently imagine how I will achieve my hopes and dreams.
4. __ I often think about the person I am afraid I might become in the future.
5. __ I often think about the person I would really like to be in the future.
6. __ I typically focus on the success I hope to achieve in the future.
7. __ I often worry that I will fail to accomplish my academic goals.
8. __ I often think about how I will achieve academic success.
9. __ I often imagine myself experiencing bad things that I fear might happen to me.
10. __ I frequently think about how I can prevent failures in my life.
11. __ I am more focused on preventing losses than I am toward achieving gains.
12. __ My major goal in school right now is to achieve my academic ambitions.
13. __ My major goal in school right now is to avoid becoming an academic failure.

14. __ I see myself as someone who is mostly trying to reach my "best self"—to achieve my hopes, wishes, and goals..
15. __ I see myself as someone who is mostly trying to become the self I "should" be—to accomplish my duties, responsibilities, and things I must do.
16. __ In general, I am focused on achieving positive outcomes in my life.
17. __ I often imagine myself experiencing good things that I hope will happen to me.
18. __ Overall, I am more focused on achieving success than preventing failure.

This questionnaire was adapted from the Promotion/Prevention Scale developed by Lockwood, Jordan, and Kunda (2002).

Reference - Lockwood, P., Jordan, C. H., & Kunda, Z. (2002). Promotion/Prevention Scale. *Journal Of Personality And Social Psychology*, *83*854-864

APPENDIX C: MODIFIED EXPECTANCY-VALUE QUESTIONNAIRE

Name_____ Number____

MID-GAME QUESTIONNAIRE I

Directions: Read each question, then circle the number that best describes your answer. You may ask your teacher if you do not understand the question.

1. I think this computer game is…

1	2	3	4	5	6	7
Very boring			**Neutral**			**Very interesting**

2. How much do you like playing this computer game?

1	2	3	4	5	6	7
Not very Much			**Neutral**			**Very much**

3. I think the questions in this game are...

1	2	3	4	5	6	7
Very boring			**Neutral**			**Very interesting**

4. Is this game a good use of your time?

1	2	3	4	5	6	7
Not at all			**Neutral**			**Very much**

5. Is it important for you to get the questions CORRECT?

1	2	3	4	5	6	7
Not at all important			**Neutral**			**Very important**

6. Do you care if you get a question WRONG?

1	2	3	4	5	6	7
I don't care At all			**Neutral**			**I care a lot**

7. How important is it to get the questions CORRECT in this game?

1	2	3	4	5	6	7
Not at all important			**Neutral**			**Very important**

8. Is it important to AVOID (stay away from) MAKING A MISTAKE on this game?

1	2	3	4	5	6	7
Not at all important			**Neutral**			**Very important**

9. How important is it to you to get a HIGH score on this game?

1	2	3	4	5	6	7
Not at all important			**Neutral**			**Very important**

10. How important is it to you to AVOID (stay away from) a LOW score on this game?

1	2	3	4	5	6	7
Not at all important			**Neutral**			**Very important**

11. How USEFUL is playing this game for improving your grammar?

1	2	3	4	5	6	7

Not very useful	**Neutral**	**Very useful**

12. How well do you think you are doing on this game?

1	2	3	4	5	6	7
Very bad			**Neutral**			**Very good**

13. How good at this game are you?

1	2	3	4	5	6	7
Very bad			**Neutral**			**Very good**

This questionnaire was adapted from the Self- and Task-Perceptions Questionnaire developed by Eccles and Wigfield (1995).
Reference - Eccles, J. S., & Wigfield, A. (1995). In the mind of the actor: the structure of adolescents' achievement task values and expectancy-related beliefs. *Personality & Social Psychology Bulletin*, (3), 215.

REFERENCES

Alyaz, Y., Spaniel-Weise, D., & Gursoy, E. (2017). A study on using serious games in teaching German as a foreign language. *Journal of Education and Learning, 6*(3), 250.Alyaz, Y., & Genc, Z. S. (2016). Digital game-based language learning in foreign language teacher education. *Turkish Online Journal of Distance Education*, *17*(4), 130-146.

Amadieu, F., & Tricot, A. (2014). Apprendre avec le numérique: Mythes et réalités [Learning with digital technologies: Myths and Realities]. *Retz*. Retrieved from http://www.editions-retz. com/pedagogie/domaines-transversaux/apprendre-avec-le-numerique-9782725633206. Html

Anderson, L., & Ward, T. (2013). Expectancy-value models for the STEM persistence plans of ninth-grade, high-ability students: a comparison between Black, Hispanic, and White Students. *Science Education*, *98*(2), 216–242.

Anyaegbu, R., Ting, W. and Li, Y. (2012) Serious game motivation in an EFL classroom in Chinese primary school. *TOJET: The Turkish Online Journal of Educational Technology, 11*(1), 154–164.

Asgari, M., & Kaufman, D. (2004). *Relationships among computer games, fantasy, and learning.* Paper presented at the IERG International Conference.

Avnet, T., & Higgins, E. T. (2006). How regulatory fit affects value in consumer choices and opinions. *Journal of Marketing Research, 43*(1), 1–10.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: W.H. Freeman.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Barzanji, A., & Mihai, F. (2016). *Identifying the most common errors in Saudi university students' writing: does the prompt matter?* Orlando, Florida: University of Central Florida, 2016.

Bedwell, W. L., Pavlas, D., Heyne, K., Lazzara, E. H., & Salas, E. (2012). Toward a taxonomy linking game attributes to learning: an empirical study. *Simulation & Gaming, 43*(6), 729–760. doi: 10.1177/1046878112439444.

Bitchener, J., & Ferris, D. R. (2012). *Written corrective feedback in Second Language Acquisition and Writing*. New York, NY: Routledge.

Bitner, N., & Bitner, J. (2002). Integrating technology into the classroom: Eight keys to success. *Journal of Technology and Teacher Education*, *10*, 95-100.

Bittick, S. J., & Chung, G. K. W. K. (2011). *The use of narrative: Gender differences and implications for motivation and learning in a math game.* Los Angeles: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).

Bopp, M. (2007). Storytelling as a motivational tool in digital learning games. In T. Hug (Ed.), *Didactics of microlearning. Concepts, discourses and examples* (pp. 250–266). Munster, Germany: Waxmann, V.

Boyle, E. A., Connolly, T. M., Hainey, T., & Boyle, J. M. (2012). Review: Engagement in digital entertainment games: A systematic review. *Computers in Human Behavior*, *28*, 771-780. doi:10.1016/j.chb.2011.11.020

Brown, M. R., Hall, L. R., Holtzer, R., Brown, S. L., & Brown, N. L. (1997). Gender and video game performance. *Sex Roles*, *36*, 793-812. doi:10.1023/A:1025631307585

Burgoon, J. K., White, C. H., & Greene, J. O. (1997). Researching nonverbal message production: A view from interaction adaptation theory. *Message production: Advances in communication theory*, 279-312.

Bushong, R.W, & Mihai, F.M. (2014, March). *Five strategies for the top five errors in advanced composition*. Paper presented at the TESOL 2014 International Convention and English Language Expo. Portland

Camacho, C. J., Higgins, E. T., & Luger, L. (2003). Moral value transfer from regulatory fit: What feels right is right and what feels wrong is wrong. *Journal of Personality and Social Psychology*, *84*(3), 498.

Carenys, J., & Moya, S. (2016). Digital game-based learning in accounting and business education. *Accounting Education*, *25*(6), 598-651.

Chen, C., & Law, V. (2016). Scaffolding individual and collaborative game-based learning in learning performance and intrinsic motivation. *Computers in Human Behavior*, *55*(Part B), 1201-1212. doi:10.1016/j.chb.2015.03.010

Chia-Wen Tsai1, j., & Ya-Ting, F. (2013). Research trends in game-based learning research in online learning environments: A review of studies published in SSCI-indexed journals from 2003 to 2012. *British Journal of Educational Technology*, *44*(5), E115-E119.

Chorianopoulos, K., & Giannakos, M. (2014). Design principles for serious video games in mathematics education: from theory to practice. *International Journal of Serious Games, 1*(3), 51–59.

Cornillie, F., Clarebout, G., & Desmet, P. (2012). The role of feedback in foreign language learning through digital role-playing games. *Social and Behavioral Sciences, 34*, 49–53. doi: 10.1016/j.sbspro. 2012.02.011.

Chung, L., & Chang, R. (2017). The effect of gender on motivation and student achievement in digital game-based learning: A case study of a contented-based classroom. *EURASIA Journal of Mathematics, Science & Technology Education*, *13*(6), 2309-2327.

Clark, D. B., Tanner-Smith, E. E., & Killingsworth, S. S. (2015). Digital games, design, and learning: A systematic review and meta-analysis. *Review of Educational Research. Advance* online publication. http://doi.org/10.3102/0034654315582065

Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T., & Boyle, J. M. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education*, *59*, 661-686. doi:10.1016/j.compedu.2012.03.004

Crowe, E., & Higgins, E. T. (1997). Regulatory focus and strategic inclinations: Promotion and prevention in decision-making. *Organizational Behavior and Human Decision Processes*, *69*(2), 117–132. doi:10.1006/obhd.1996.2675

De Bruyckere, P., Kirschner, P. A., & Hulshof, C. D. (2015). *Urban myths about learning and education.* New York, NY: Academic Press.

Deterding, S., Dixon, D., Nacke, L.E., O'Hara, K., Sicart, M. (2011). Gamification: Using game design elements in non-gaming contexts. In *Proceedings of the 2011 Annual Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA'11)*, Vancouver, BC, Canada. 2425-2428. doi:.

Dietrich, J., Viljaranta, J., Moeller, J., & Kracke, B. (2017). Situational expectancies and task values: Associations with students' effort. *Learning and Instruction*, *47*, 53-64.

Doe, R. J. (2014). *Lost in The Middle Kingdom: Teaching new languages using serious games and language learning methodologies* (Master's thesis). University of South Carolina, Columbia, USA. Retrieved from http://scholarcommons.sc.edu/etd/2813

Cresswell, A. (2000). Self-monitoring in student writing. *ELT Journal*, *54*, 235–244.

deHaan, J. (2005) Acquisition of Japanese as a foreign language through a baseball video game. *Foreign Language Annuals*, *38*(2), 278–282.

deHaan, J., Reed, W. M. and Kuwada, K. (2010). The effect of interactivity with a music video game on second language vocabulary recall. *Language Learning & Technology*, *14*(2), 74–94.

Diab, N. M. (2010). Effects of peer- versus self-editing on students' revision of language errors in revised drafts. *System*, *38*, 85–95.

Diab, N. M. (2011). Assessing the relationship between different types of student feedback and the quality of revised writing. *Assessing Writing*, *16*, 274–292.

Eccles, J. S. (1983). Expectations, values and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motivations* (pp. 75–146). San Francisco, CA: W. H. Freeman

Eccles, J. S., & Harold, R. D. (1991). Gender differences in sport involvement: Applying the Eccles expectancy-value model. *Journal of Applied Sport Psychology*, *3*, 7-35. doi:10.1080/10413209108406432

Eccles, J., Wigfield, A., Harold, R. D., & Blumenfeld, P. (1993). Age and gender differences in children's self and task perceptions during elementary school. *Child development*, *64*(3), 830-847.

Eccles, J. S., & Wigfield, A. (1995). In the mind of the actor: The structure of adolescents' achievement task values and expectancy-related beliefs. *Personality & Social Psychology Bulletin*, (3), 215.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, *53*(1), 109-132.

Elliot, A. J., & Covington, M. V. (2001). Approach and avoidance motivation. *Educational Psychology Review, 13*, 73–92.

Ellis, R., Basturkmen, H., & Loewen, S. (2001). Preemptive focus on form in the ESL classroom. *TESOL Quarterly*, *35*(3), 407–432.

Feldon, D. F. (2007)/ The implications of research on expertise for curriculum and pedagogy. *Educational Psychology Review, 19*(2), 91-110. http://dx.doi.org/10.1007/s10648-006-9009-0

Feldon, D. F. (2010). Do psychology researchers tell it like it is? A microgenetic analysis of research strategies and self-report accuracy along a continuum of expertise. *Instructional Science, 38*(4), 395-415.

Ferris, D. (2002). *Treatment of error in second language student writing*. Ann Arbor: University of Michigan Press.

Filsecker, M., & Hickey, D. T. (2014). A multilevel analysis of the effects of external rewards on elementary students' motivation, engagement and learning in an educational game. *Computers& Education, 75*, 136-148. doi:10.1016/j.compedu.2014.02.008

Flake, J. K., Barron, K. E., Hulleman, C., McCoach, B. D., & Welsh, M. E. (2015). Measuring cost: The forgotten component of expectancy-value theory. *Contemporary Educational Psychology, 41*, 232-244.

Freitas, A. L., Liberman, N., & Higgins, E. T. (2002). Regulatory fit and resisting temptation during goal pursuit. *Journal of Experimental Social Psychology*, *38*(3), 291–298. doi:10.1006/jesp.2001.1504

Gaspard, H., Dicke, A. L., Flunger, B., Schreier, B., Häfner, I., Trautwein, U., & Nagengast, B. (2015). More value through greater differentiation: Gender differences in value beliefs about math. *Journal of educational psychology*, *107*(3), 663.

Gee, J. P. (2007). *What video games have to teach us about learning and literacy.* Basingstoke: Palgrave Macmillan.

Göbel, S., de Carvalho Rodrigues, A., Mehm, F., & Steinmetz, R. (2009). Narrative game-based learning objects for story-based digital educational games. In *Proceedings of the 1st int. open workshop on intelligent personalization and adaptation in digital educational games* (pp. 43–53).

Greene, B. A. (2015) Measuring cognitive engagement with self-report scales: Reflections from over 20 years of research. *Educational Psychologist, 50*(1), 14-30. http://dx.doi.org/10.1080/00461520.2014.989230

Groff, J., Howells, C., & Cranmer, S. (2010). *The impact of console games in the classroom: Evidence from schools in Scotland*. Bristol, UK: Futurelab.

Grove, De., Bourgonjon, J., & Van Looy, J. (2012). Digital games in the classroom? A contextual approach to teachers' adoption intention of digital games in formal education. *Computers in Human Behaviour*, *28*, 20-23.

Halter, E. (2006). *From Sun Tzu to xbox: War and video games*. Thunder's Mouth Press.

Heeter, C., Lee, Y. H., Magerko, B., Cole, C., & Medler, B. (2012) Regulatory focus and serious games: A quasi-experimental study.

Higgins, E. T. (1998). Promotion and Prevention: Regulatory focus as a motivational principle. *Advances in Experimental Social Psychology*, *30,* 1-46. doi:10.1016/S0065-2601(08)60381-0

Higgins, E. T. (2000). Making a good decision: Value from fit. *American psychologist*, *55*(11), 1217.

Higgins, E. T. (2005). Humans as applied motivation scientists: Self-consciousness from "shared reality" and "becoming." in *The missing link in cognition: origins of self-reflective consciousness*, eds H. S. Terrace and J. Metcalfe (New York, NY: Oxford University Press).

Higgins, E. T. (2006). Value from hedonic experience and engagement. *Psychological Review*, *113*(3), 439-460.

Howland, R., Urano, S., & Hoshino, J. (2012). Computer assisted language learning system within a 3D game environment. In, *Advances in Computer Entertainment—Proceedings of 9th International Conference (ACE 2012*) (pp. 262-273). Katmandu, Nepal.

Hoffman, B., & Nadelson, L. (2010). Motivational engagement and video gaming: a mixed methods study. *Educational Technology Research & Development*, *58*(3), 245-270.

Hopp, T., & Fisher, J. (2017). Examination of the relationship between gender, performance, and enjoyment of a first-person shooter game. *Simulation & Gaming*, *48*(3), 338-362.

Hsu, H. Y., & Wang, S. K. (2010). Using gaming literacies to cultivate new literacies. *Simulation & Gaming*, *41*(3), 400–417.

Hwang, G. g., & Wu, P. (2012). Advancements and trends in digital game-based learning research: A review of publications in selected journals from 2001 to 2010. *British Journal of Educational Technology*, *43*(1), E6-E10.

Hung, H. T., Chang, J. L., & Yeh, H. C. (2016. A review of trends in digital game-based language learning research in *Advanced Learning Technologies (ICALT), 2016 IEEE 16th International Conference on* (pp. 508-512). IEEE.

Ibrahim, K. (2017). The impact of ecological factors on game-based l2 practice and learning. *Foreign Language Annals*.

Iuppa, N., & Borst, T. (2007). *Story and simulations story and simulations: Tales from the trenches.* Burlington: Focal Press.

Jantke, K. P., & Hume, T. (2015). Effective learning through meaning construction in digital role-playing games. In *The Proceedings of the 5th IEEE International Conference on Consumer Electronics.* Berlin, Germany. Retrieved from

Keller, P.A. (2006) Regulatory focus and efficacy of health messages. *Journal of Consumer Research*, *33*, 109–114. http://dx.doi.org/10.1086/504141

Kirsch, I. (1999). *How expectancies shape experience.* Washington DC: American Psychological Association.

Landers, R. N. (2014). Developing a theory of gamified learning: Linking serious games and gamification of learning. *Simulation & Gaming*, *45*(6), 752–768.

Lee, A. Y., & Aaker, J. L. (2004). Bringing the frame into focus: The influence of regulatory fit on processing fluency and persuasion. *Journal of Personality and Social Psychology*, *86*, 205–218.

Lee, Y. H., Heeter, C., Magerko, B., & Medler, B. (2013). Feeling right about how you play: The effects of regulatory fit in games for learning. *Games and Culture*, *8*(4), 238-258.

Leiker, A. M., Bruzi, A. T., Miller, M. W., Nelson, M., Wegman, R., & Lohse, K. R. (2016). The effects of autonomous difficulty selection on engagement, motivation, and learning in a motion-controlled video game task. *Human Movement Science*, *49,* 326-335. doi:10.1016/j.humov.2016.08.005

Li, Z. (2013). Mobile-assisted grammar exercises: Effects on self-editing in l2 writing. *Language Learning & Technology: A Refereed Journal for Second and Foreign Language Educators*, *17*(3), 135-156.

Lockwood, P., Jordan, C. H., & Kunda, Z. (2002). Motivation by positive and negative role models: Regulatory focus determines who will best inspire us. *Journal of Personality and Social Psychology*, *83*, 854–864.

Long, M., & Robinson, P. (1998). Focus on form: Theory, research and practice. In C. Doughty & J. Williams (Eds.), *Tasks and language learning: Integrating theory and practice* (pp. 15-41). Cambridge, UK: Cambridge University Press.

Lu, H.-M., Lou, S.-J., Papa, C. and Chung, C.-C. (2011) Study on influence of adventure game on English reading confidence, motive and self-efficacy. In: Chang, M., Hwang, W.-Y., Chen, M.-P. and Müller,W.(eds.), *Edutainment technologies. Educational games and virtual reality/augmented reality applications* (872). Springer: Berlin, Heidelberg, 430–434.

Magerko, B., Heeter, C., & Medler, B. (2010). Different strokes for different folks: Tapping into the hidden. *Gaming and Cognition: Theories and Practice from the Learning Sciences: Theories and Practice from the Learning Sciences, 255*.

Makino, T. (1993). Learner self-correction in EFL written compositions. *English Language Teaching Journal*, *47*, 337–341.

Malmberg, L-E., Walls, T., Martin, A. J., Little, T. D., & Lim, W. H. T. (2013). Primary school students' learning experiences of, and self-beliefs about competence, effort, and difficulty: Random effects models. *Learning and Individual Differences, 28*, 54–65.

Martin, A. J., Papworth, B., Ginns, P., Malmberg, L., Collie, R. J., & Calvo, R. A. (2015). Real-

time motivation and engagement during a month at school: Every moment of every day for every student matters. *Learning and Individual Differences*, *38*, 26-35. doi:10.1016/j.lindif.2015.01.014

Miller, C. H. (2004). *Digital storytelling: A creator's guide to interactive entertainment:* Elsevier/Focal Press.

Milton, J., Jonsen, S., Hirst, S. and Lindenburn, S. (2012). Foreign language vocabulary development through activities in an online 3D environment. *The Language Learning Journal*, *40*(1), 99–112.

MIT. (2014). Institute-wide Task Force on the future of MIT education (Final Report). Massachusetts: Massachusetts Institute of Technology. Retrieved from: http://web.mit.edu/future-report/ TaskForceFinal_July28.pdf

Moos, D. C., & Marroquin, E. (2010). Multimedia, hypermedia, and hypertext: Motivation considered and reconsidered. *Computers in Human Behavior*, *26*, 265–276.

Moreno, R., & Mayer, R. E. (2005). Role of guidance, reflection, and interactivity in an agent-based multimedia game. *Journal of Educational Psychology*, *97*(1), 117–128.

Moreno-Ger, P., Burgos, D., Martínez-Ortiz, I., Sierra, J. L., & Fernández-Manjón, B. (2008). Educational game design for online education. *Computers in Human Behaviour*, *24*, 2530–2540.

Nieto, V., & Carbonell, M. (2012). Serious games and learning effectiveness: The case of It's a Deal! *Computers & Education*, *58*, 435-448.

Novak, E. (2015). A critical review of digital storyline-enhanced learning. *Educational Technology Research and Development*, *63*(3), 431-453.

Ozturkcan, S., & Şengün, S. (2016). Gaining reward vs. avoiding loss: When does gamification stop being fun? In *Emerging research and trends in gamification* (pp. 48-71). IGI Global.

Perez, T., Cromley, J. G., & Kaplan, A. (2014). The role of identity development, values, and costs in college STEM retention. *Journal of Educational Psychology, 106*(1), 315.

Peters, D., & Daly, S. (2013). Returning to graduate school: Expectations of success, values of the degree, and managing the costs. *Journal of Engineering Education*, *102*(2), 244–268.

Peterson, M. (2010). Massively multiplayer online role-playing games as arenas for second language learning. *Computer Assisted Language Learning, 23*(5), 429-439.

Peterson, M. (2010) Learner participation patterns and strategy use in second life: An exploratory case study. *ReCALL, 22*, 273-292. doi:10.1017/S0958344010000169

Peterson, M. (2010a) Computerized games and simulations in computer-assisted language learning: A meta-analysis of research. *Simulation & Gaming*, *41*(1), 72–93.

Peterson, M. (2012) Learner interaction in a massively multiplayer online role -playing game (MMORPG): A sociocultural discourse analysis. *ReCALL, 24*(3), 361–380.

Pintrich, P. R., & Schunk, D. H. (2002). *Motivation in education: Theory, research, and application.* Upper Saddle River, NJ: Merrill Prentice Hall.

Polio, C., Fleck, C., & Leder, N. (1998). "If I only had more time": ESL learners' changes in linguistic accuracy on essay revisions. *Journal of Second Language Writing*, *7*, 43–68.

Prensky, M. (2007). *Digital game-based learning.* St. Paul, MN: Paragon House.

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

Proulx, J., Romero, M., & Arnab, S. (2017). Learning mechanics and game mechanics under the perspective of self-determination theory to foster motivation in digital game-based learning. *Simulation & Gaming, 48*(1), 81-97. doi:10.1177/1046878116674399

Rama, P. S., Black, R. W., van Es, E. and Warschauer, M. (2012). Affordances for second language learning in World of Warcraft. *ReCALL*, *24*(3): 322–338

Ranalli, J. (2008) Learning English with The Sims: Exploring authentic computer simulation games for L2 learning. *Computer Assisted Language Learning*, *21*(3): 441–445.

Reinders, H., & Wattana, S. (2015). Affect and willingness to communicate in digital game-based learning. *ReCALL*, *27*(1), 38-57.

Ritterfeld, U., Cody, M., & Vorderer, P. (Eds.) (2009). *Serious games: Mechanisms and effects*. Routledge: New York NY

Ryan, R. M., & Deci, E. L. (2000a). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*, 54-67. doi:10.1006/ceps.1999.1020

Salen, K., & Zimmerman, E. (2004). *Rules of play: Game design fundamentals*. Cambridge, MA: The MIT Press.

Shah, J., Higgins, E.T. and Friedman, R. (1998) Performance incentives and means: How regulatory focus influences goal attainment. *Journal of Personality and Social Psychology*, *74*, 285–293. http://dx.doi.org/10.1037/0022-3514.74.2.285

Sørensen, B. H., & Meyer, B. (2007). Serious Games in language learning and teaching-a theoretical perspective. In *DiGRA Conference*.

Spiegel, S., Grant-Pillow, H., & Higgins, E. T. (2004). How regulatory fit enhances motivational strength during goal pursuit. *European Journal of Social Psychology*, *34*(1), 39–54. doi:10.1002/ejsp.18

Sylvén, L. K. and Sundqvist, P. (2012) Gaming as extramural English L2 learning and L2 proficiency among young learners. *ReCALL*, *24*(3): 302–321.

Squire, K. (2011). *Video games and learning: Teaching and participatory culture in the digital age.* New York, NY: Teacher College Press.

Star, J. R., Chen, J., & Dede, C. (2015). Applying motivation theory to the design of game-based learning environments. In *Describing and studying domain-specific serious games* (pp. 83-91). Springer International Publishing.

Stevens, C., & Bavelier, D. (2012). The role of selective attention on academic foundations: A cognitive neuroscience perspective. *Developmental Cognitive Neuroscience*, *25*, S30–S48.

Suzuki, M. (2008). Japanese learners' self-revisions and peer revisions of their written compositions in English. *TESOL Quarterly*, *42*(2), 209–233.

Tanaka, A., & Murayama, K. (2014). Within-person analyses of situational interest and boredom: Interactions between task-specific perceptions and achievement goals. *Journal of Educational Psychology*, *106*(4), 1122.

Tobias, S., & Fletcher, J. D. (2012). Reflections on "a review of trends in serious gaming". *Review of Educational Research, 82*(2), 233-237.

Tüzün, H., Yılmaz-Soylu, M., Karakuş, T., İnal, Y., and Kızılkaya, G. (2009). The effects of computer digital Games on primary school students' achievement and motivation in geography learning. *Computers & Education, 52*, 68-77. doi:10.1016/j.compedu.2008.06.008.

Tsai, Y.-M., Kunter, M., Lüdtke, O., & Trautwein, U. (2008). Day-to-day variation in competence beliefs: How autonomy support predicts young adolescents' felt competence. In C. G. Rhonda, & H. W. Marsh (Eds.), *International Advances in Self Research: Vol. 3* (pp. 119-143). Charlotte, NC: Information Age Publishing.

Verhagen, T., Feldberg, F., van den Hooff, B., Meents, S., & Merikivi, J. (2011). Satisfaction with virtual worlds: An integrated model of experiential value. *Information & Management*, *48*(6), 201-207.

Vernadakis, N., Kouli, O., Tsitskari, E., Gioftsidou, A., & Antoniou, P. (2014). University students' ability-expectancy beliefs and subjective task values for exergames. *Computers & Education*, *75*, 149-161.

Vos, N., van der Meijden, H., & Denessen, E. (2011). Effects of constructing versus playing an educational game on student motivation and deep learning strategy use. *Computers & Education*, *56*(1), 127–137. doi: 10.1016/j.compedu.2010.08.013.

Wigfield, A., & Guthrie, J. T. (1997). Relations of children's motivation for reading to the amount and breadth of their reading. *Journal of Educational Psychology*, *89*, 420–432.

Wigfield, A., Tonks, S., & Klauda, S. L. (2009). Expectancy-value theory. In K. R. Wentzel & A. Wigfield (Eds.), *Handbook of motivation at school* (pp. 55–75). New York, NY: Routledge.

Wolters, C. (2003). Regulation of motivation: Evaluating an underemphasized aspect of self-regulated learning. *Educational Psychologist*, *38*, 189–205.

Wouters, P., van Nimwegen, C., van Oostendorp, H., & van Der Spek, E. D. (2013). A meta-analysis of the cognitive and motivational effects of serious games. *Journal of Educational Psychology*, *105*, 249-265. doi:10.1037/a0031311

Xiang, P., McBride, R., Guan, J., & Solmon, M. (2003). Children's motivation in elementary physical education: An expectancy-value model of achievement choice. *Research Quarterly for Exercise and Sport*, *74*(1), 25–35.

Zhao, Y. and Lai, C. (2009) MMORPGs and foreign language education. In: Ferdig, R. E. (ed.), *Handbook of research on effective electronic gaming in education*(Vol.1). New York: Information Science Reference, 402–421.

Zhu, X., & Chen, A. (2010). Adolescent expectancy-value motivation and learning: A disconnected case in physical education. *Learning and Individual Differences*, *20*, 512–516.