Gaming for a Grade: How Goal Achievement and Causality Orientations Impact the Efficacy of Games for Classroom Engagement, Academic Achievement, and Learner Satisfaction

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Kara Theresa McGillicuddy, Ph.D.
University of Connecticut, 2020

Abstract

Games and learning have many overlapping characteristics, which has led to the popular trend of using games as educational tools. However, game-based learning (GBL) has not been sufficiently evaluated through the lens of individual learner differences. The theoretical frameworks of goal achievement orientation and self-determination theory (SDT) were used in this study to examine the relationships between individual learner orientations and engagement in GBL. A pretest/posttest experimental design utilized two conditions of extrinsic reward (performance-based and participation-based) to explore how they interact with goal achievement and causality orientations. Exam performance and learner satisfaction were used as outcomes to assess the impact of GBL engagement. Unexpectedly, only the mastery-avoidance goal achievement orientation showed a difference in engagement between conditions, as these learners were significantly more engaged when provided points for performance. Engagement in GBL did not predict higher exam scores after controlling for covariates and orientations, but it did significantly predict greater learner satisfaction. These findings suggest that GBL may be a valuable educational tool for increasing learner satisfaction but should not be depended on for improving objective exam scores.
Gaming for a Grade: How Goal Achievement and Causality Orientations Impact the Efficacy of Games for Classroom Engagement, Academic Achievement, and Learner Satisfaction

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Gaming for a Grade: How Goal Achievement and Causality Orientations Impact the Efficacy of Games for Classroom Engagement, Academic Achievement, and Learner Satisfaction

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CHAPTER I:
INTRODUCTION

Recent forecasts have projected that revenue for game-based learning (GBL) products will reach over $17 billion by 2023 (Adkins, 2018). Along with this anticipated industry boom, there has been an expanding body of literature investigating various aspects of GBL. In contrast to gamification, which is the application of game mechanics to course design, GBL involves using games in the physical classroom (Al-azawi, Al-faliti, & Al-blushi, 2016; Caponetto, Earp, Ott, & Brühlmann, 2014; Qian & Clark, 2016). Using games in classrooms may seem like a natural approach to improving student engagement, given that games are designed to elicit engagement in players via immersion and increasing challenge, elements which result in an increased state of flow (Hamari et al., 2016; McGonigal, 2011). Thus, as teachers strive to elicit engagement from students, the use of games makes sense, given that engagement has been shown to lead to improved academic achievement (Dotterer & Lowe, 2011; Pietarinen, Soini, & Pyhältö, 2014). Previous research indicates that GBL may be a useful mechanism to leverage the engagement found in gaming to improve the engagement of students in the classroom (Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012; Hamari et al., 2016; Perrotta, Featherstone, Aston, & Houghton, 2013; Plass, Homer, & Kinzer, 2015; Qian & Clark, 2016).

Games and learning overlap in a key way - both present challenges which become increasingly difficult, which keeps students/players engaged as they master each level of skill (Boyan, 2009; Garris, Ahlers, & Driskell, 2002; Lyons, 2015; Przybylski, Rigby, & Ryan, 2010; Schmierbach, Chung, Wu, & Kim, 2014). However, classroom learning differs from games in that it has a greater emphasis on grade outcomes, and because students bring their learning styles and approaches into the classroom setting and engage with course materials in different ways.
While it may be tempting to assume that bringing games into a classroom will be engaging to all students, the reality is that GBL may not effectively engage all students, due to their individual differences (Watt et al., 2016).

While engagement in gaming is usually an intrinsically motivated behavior, learning, unfortunately, often does not elicit the same level of intrinsic motivation (Loftus & Loftus, 1983; Prensky, 2001). According to the self-determination theory (SDT), classroom engagement is viewed as an outward display of educational self-determination, as internal elements (e.g., intrinsic motivation) are not as easily observed (Reeve, 2002). SDT acknowledges that the self-determination to engage in a behavior relies on basic psychological needs of autonomy, competence, and relatedness (Ryan & Deci, 2000). Need for autonomy refers to the drive to be in control of one's own choices and behaviors (Ryan & Deci, 2002). Need for competence is the desire for positive feedback about autonomous behavior (Ryan & Deci, 2002). Need for relatedness is the concept that actions acknowledged by others are more likely to result in intrinsic motivation (Ryan & Deci, 2002). GBL provides a learning environment with the potential to meet these needs and increase the self-determination of students to engage in learning.

SDT notes three different orientations based on the perceived locus of causality: autonomy (internal motivation/locus of causality), control (external motivation/locus of causality), and impersonal (amotivation/indifference) (Ryan & Deci, 2000). Locus of causality is very similar to Rotter's (1966) concept of locus of control, which is positively related to self-efficacy in an academic context (Phillips & Gully, 1997). This study utilizes SDT, however, as the theoretical basis for measuring this overlapping concept.
Previous research has shown that the introduction of extrinsic motivation(s) via rewards often decreases preexisting intrinsic motivation, although the degree of the decrease depends on whether the reward is for participation or performance (Deci, Ryan, & Koestner, 1999; Harackiewicz, 1979; McGonigal, 2011). In addition, the promotion of extrinsic motivation fosters an externally perceived locus of causality (Ryan & Deci, 2002, p. 11). An external locus of causality indicates a perception of control by outside forces and a lack of autonomy, which does not contribute to the ideal conditions for engaged learning, as noted above.

Conversely, it is possible that for students, who do not already have an intrinsic motivation to achieve academically but do have the goal of being seen as competent, the use of extrinsic rewards may lead to increased engagement (Molden & Dweck, 2000). Despite the negative impact that extrinsic reward may have on engagement, the success of educational approaches such as gamification and GBL are frequently determined by objective metrics such as retention tests, exam scores, or course grades (All, Nuñez Castellar, & Van Looy, 2015; Burguillo, 2010; Hsu, Tsai, & Wang, 2012; Huizenga, Admiraal, Akkerman, & ten Dam, 2009).

While some research has shown GBL to have the potential for a positive impact on academic achievement (Cheng & Su, 2012; Kim, Park, & Baek, 2009), it is unknown whether specific learner types buoy the positive impact. Research has shown that differences in students' goal achievement orientations (GAO) may contribute to the differing levels of classroom engagement (Caraway, Tucker, Reinke, & Hall, 2003) and intrinsic motivation to learn (Cerasoli & Ford, 2014; Elliot & Harackiewicz, 1994, 1996; Harackiewicz & Elliot, 1993; Li et al., 2011). Elliot and MacGregor (2001) proposed four main goal orientations resulting from two dimensions; mastery/performance and approach/avoidance. The mastery/performance dimension relates to the locus of causality, with mastery indicating an internal locus and performance
indicating an external locus. Since GBL is a social endeavor, students with a mastery orientation may not compare their success with others, while a performance-oriented student will be much more concerned with their success in the eyes of others. In addition, approach-oriented students "aspire to attain competence" while avoidance-oriented students "strive to avoid incompetence" (Elliot & Harackiewicz, 1996, p. 461). Given the individual differences amongst students, it is critical to determine whether all students benefit from GBL, or if some orientations interfere with the positive impact games have on engagement.

While the use of games for learning is becoming more popular, there are still many areas of GBL that remain unexplored. Specifically, whether individual learner differences impact engagement in GBL, as well as the degree to which engagement leads to improved academic outcomes for all students, regardless of learner differences. Consequently, the purpose of this study is to differentiate the efficacy of GBL by considering individual differences in learners. This study uses the frameworks of causality and goal achievement orientation to explore whether learner differences interact with the extrinsic reward types of performance and participation to influence levels of engagement in GBL. Further, the study seeks to establish whether engagement due to GBL improves academic performance, regardless of individual differences. Given how important objective outcomes are for assessing academic achievement, this study utilizes a summative measure of academic performance, via a final exam of a college course, to evaluate the impact of engagement. A laboratory study of small groups engaging in GBL was conducted to compare two conditions of extrinsic reward type (participation and performance).
CHAPTER II:
REVIEW OF LITERATURE

Games and Learning - Game-Based Learning (GBL)

A key element of game design is to specify parameters that keep players engaged and striving to improve (Anders, 2007). These parameters include the rules, allowed actions, and conditions within which the player makes decisions about how to best overcome the presented challenges and achieve goals (Boyan & Sherry, 2011; Coller, Shernoff & Strati, 2011; Plass, Homer & Kinzer, 2015). In addition, the physical interface may influence the perception of realism and contribute to the experience of immersion and enjoyment (McGloin, Farrar, & Krcmar, 2013). Well-designed game mechanics should allow a player to "seamlessly" interact with a game (Nah, et al., 2014). Through experiences with these parameters and interfaces, players build the skills necessary to overcome challenges. This process is known as scaffolding, the same concept that was developed by Vygotsky in his seminal work in educational psychology (Bull, Shuler, Overton, Kimball, Boykin & Griffin, 1999).

Repeated interaction with these game mechanics allows players to begin building mental models of how games are structured (Boyan, 2009; Boyan & Sherry, 2011; McGloin & Embacher, 2018; McGloin et al., 2016). These mental models develop from both the game mechanics within the game, such as allowable actions, and outside of the game, such as how a controller is used to input player choices (Boyan & Sherry, 2011; McGloin et al., 2016). Eventually, the development of these mental models allows the player to move past the initial learning curve of the game and begin to think strategically about how to overcome challenges (Boyan and Sherry, 2011; McGloin et al., 2016). These mental models allow the player to continue to build their skill level in a given game and also apply them to other games which are
similarly designed (e.g., first-person shooter, racing, sandbox, etc.), reducing the time it takes to move toward strategic thinking in an unfamiliar game.

Learning through the development of mental models is not unique to games, although it is an essential aspect that game designers rely upon heavily. Corollaries to these game mechanics exist in educational design. As with games, there are essential behaviors in education which allow students to overcome challenges and meet goals (Plass et al., 2015; Boyan and Sherry, 2011). Mental models for education also develop through repeated interactions and allowable actions. Like games, these mental models let students move past the larger level concerns (e.g., navigating school rules and expectations) and focus on strategic engagement with material (e.g., learning specific information and meeting academic goals).

Engaging in games or learning can be either internally (intrinsically) or externally (extrinsically) motivated. Gamers often play because they are intrinsically motivated to; they do not usually have an extrinsic reward for doing so (McGonigal, 2011). Doing so allows them to feel that their engagement is autonomous, not forced. In the context of education, however, the prevalence of a standardized grading system with metrics for success and failure may condition students to rely on grade points as an extrinsic reward for achievement, as well as enforce a sense of external causality which reduces student autonomy (Niemiec & Ryan, 2009). The reality is that college courses and grade outcomes are more important than video games. While success or failure in a game generally carries little real-world consequence, success or failure in education can potentially have a far-reaching impact on a student's life. Accordingly, the influence of external rewards and how they may interact with goal achievement and causality orientations must be considered when assessing the efficacy of GBL.
Self-Determination Theory (SDT)

Deci and Ryan first developed the theory of self-determination (SDT) in 1985 from previous research on intrinsic motivation (Deci & Ryan, 1985a). SDT considers the internal motivations that drive an individual to pursue a course of action, which include the needs for autonomy, competence, and relatedness (Ryan & Deci, 2002). These concepts are similar to McClelland's trichotomy of needs: need for power, need for affiliation, and need for achievement (Harrell & Stahl, 1981). McClelland’s theory is primarily used in the context of workplace motivation, however, and includes some differentiation between personal and institutional needs (Arnolds & Boshoff, 2003).

SDT posits that these three basic psychological needs drive a person to establish a sense of self and revolve around the need to feel in control of all actions and decisions (Ryan & Deci, 2002). In the context of education, a student must have their psychological needs for autonomy, competence, and relatedness satisfied to be optimally engaged in learning, as has been shown by Ryan and Deci (2002). To meet these basic needs, an educational environment must provide support for autonomy, structure to foster a sense of competence, and interpersonal involvement to promote a sense of relatedness (Ryan & Deci, 2002).

Unfortunately, students may experience a low sense of self-determination (Lepper & Henderlong, 2000). They may feel that learning is not fun or interesting because of the perceived lack of control over what they are being tasked to do (Lepper & Henderlong, 2000). Extrinsic motivators reduce the sense of autonomy and create a sense of being controlled instead (Ryan and Deci, 2002). The academic feedback that comes from exam and course grades can have a deleterious effect on both competence and autonomy (Ryan & Weinstein, 2009). The need for
competence can be challenging to support in an educational context, which may be why instructors have turned to games and gamification for help.

GBL allows students to experience relatedness by gaming with classmates. Games can also satisfy the need for autonomy because they allow players to make "meaningful choices" that determine how the game will progress (Przybylski et al., 2010, p. 156). Additionally, games provide a great way to foster a sense of competence because they provide immediate feedback, and overcoming increasingly difficult challenges is integral to progress (Kiili, 2005).

Schmeirbach, Chung, Wu, and Kim (2014) state that the development of competency, which strengthens intrinsic motivation (Ryan & Deci, 2002), is developed by overcoming challenges. However, the effectiveness of games for these purposes may be regulated by the different orientations students have regarding causality.

Within SDT is causality orientation theory, which is a theoretical perspective regarding the degree to which an individual engages in self-regulation, often as a result of their belief in whether they do or do not have control over a situation (Ryan & Deci, 2000). Causality orientation theory refers to this as the perceived locus of causality (Ryan & Deci, 2002). If the locus of causality is perceived as internal, that indicates an autonomy orientation, while the perception of an external locus denotes a control orientation (Ryan & Deci, 2002). A third orientation, impersonal, indicates indifference and a lack of motivation (Ryan & Deci, 2002).

An autonomy-oriented person is "inclined to base their regulation on internal awareness of interests and needs" (Ryan & Deci, 2000, p. 42). Conversely, a control-oriented person is "prone to initiate and regulate behavior by looking outward, by evaluating reward and punishment contingencies that are in their social contexts or have been introjected" (Ryan & Deci, 2000, p. 42). The reason these causality orientations are important in the context of GBL is
that they may have a significant impact on student engagement in classroom games, depending on whether the GBL is presented in a way that provokes a sense of autonomy or control. Thus, this particular aspect of SDT has the potential to either enhance or hinder the success of GBL.

**Goal Achievement Orientations**

A well-established framework for measuring goal achievement behaviors in students is the 2x2 goal achievement orientation framework proposed by Elliot and MacGregor (2001). The two dimensions of mastery/performance and approach/avoidance combine to create the four orientations of mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance (Elliot & McGregor, 2001). Mastery indicates a desire to learn for the sake of learning – similar to intrinsic motivation – and should result in greater natural engagement in learning (Greene et al., 2004). Performance is more concerned with what others think – in other words, are more extrinsically motivated – and for this reason may not be as naturally engaged, preferring to participate in an activity only if it will help them avoid failure (Barron & Harackiewicz, 2000; Elliot & McGregor, 2001). Approach indicates a feeling of competence and the attitude that success is possible, which is a more positive outlook on potential goal achievement (Elliot & Harackiewicz, 1996). Avoidance, on the other hand, indicates a desire to get by or not fail (Elliot & Harackiewicz, 1996).

Elliot and MacGregor’s (2001) framework has been applied to various contexts in previous research, most commonly in the workplace (Baranik, Barron, & Finney, 2007), school sports (Li et al., 2011; Wang, Biddle, & Elliot, 2007), and academics (Elliot & McGregor, 2001; Liu, Wang, Tan, Ee, & Koh, 2009; McGillicuddy & McGloin, 2018; Pastor, Barron, Miller, & Davis, 2007; Putwain, Sander, & Larkin, 2013). In this study, these orientations are expected to shed light on how setting and pursuing academic goals may influence the degree to which GBL
can effectively engage students. For example, a student with a mastery goal orientation may not be as likely to care about their actual performance in the game, even if extra credit is performance-based. A performance-oriented student, however, may be more likely to engage in GBL for points based on performance than if the points are merely for participation. Elliot and MacGregor’s (2001) 2x2 framework enables the comparison of GBL engagement to be made between students with differing academic goal orientations and across two forms of extrinsic reward.

**Engagement**

As noted above, meeting student needs for autonomy, competence, and relatedness fosters optimal engagement in learning (Ryan & Deci, 2002). Reeve (2002) defines engagement as "the intensity and emotional quality of students involvement during learning" (p. 194-195). Engagement has both behavioral features (e.g., attention, effort, participation, persistence) and emotional features (interest, enjoyment, enthusiasm, lack of anxiety, or anger) (Reeve, 2002). Engagement as a behavior is more readily observable, so it allows researchers a way to gauge some of the internal attitudes it represents, such as intrinsic motivation (Reeve, 2002).

Engagement in games has been explored through more than one lens, including (but not limited to): flow theory, immersion, and presence (Boyle, Connolly, Hainey, & Boyle, 2012; Brockmyer et al., 2009; Kiili, Lainema, de Freitas, & Arnab, 2014; Nah, Eschenbrenner, Zeng, Telaprolu, & Sepehr, 2014). Due to the generally positive relationship found between games and engagement, it is no surprise that using games to foster engagement in learning has also become popular both in application and as a research focus. A primary goal of improving engagement in education is increasing learning outcomes such as exam scores and course grades (Dotterer & Lowe, 2011; Green et al., 2012; Greene, Miller, Crowson, Duke, & Akey, 2004; Junco,
Engagement in learning may be a struggle due to individual differences in students regarding how they are motivated, as indicated by their goal achievement and causality orientations. Therefore, it is crucial to determine these differences and their level of impact instead of expecting all students to be equally engaged.

**Extrinsic Reward (Performance vs. Participation)**

Extrinsic motivation refers to the outside influences that drive a person to take action (Ryan & Deci, 2002). Ryan and Deci (2000, 2002) have explored the role that extrinsic motivation plays in influencing self-determination. They note that there are two types of behavioral activation systems – self-regulation and regulation by reward (Ryan & Deci, 2000). Intrinsic motivation is signified by the self-regulatory nature of behavioral activation (Ryan & Deci, 2000). In education, grades are frequently used as a form of extrinsic reward because the self-determination to engage in the learning is not coming from within the student (Covington, 2000; Ryan & Weinstein, 2009). However, extrinsic reward in education has been shown to lower pre-existing intrinsic motivation to learn by moving the perceived locus of causality from internal to external (Ryan & Deci, 2000). The mere suggestion of performance evaluation can result in the loss of intrinsic motivation, regardless of how positive later feedback is (Ryan & Deci, 2000). Deci and Ryan (1985) explain that “insofar as people’s work is being critically evaluated by an external agent, it is possible that people will lose a sense of self-determination and experience a shift in the perceived locus of causality” (p. 55).

Not all rewards are created equal, however. In 1979, Harackiewicz found that rewards contingent on the performance outcomes of a task reduced the original intrinsic motivation the person might have had for that task (Harackiewicz, 1979). Rewards that were provided for
participation in or completion of a task did not lead to as sharp of a reduction in intrinsic motivation, although it was still lower than the control condition of no reward (Harackiewicz, 1979). Furthermore, a meta-analysis conducted by Deci, Ryan, and Koestner (1999) on 128 studies measuring the impact of extrinsic rewards on intrinsic motivation found that tangible rewards subvert intrinsic motivation for all age groups (Deci, Ryan & Koestner, 1999). However, they also found that positive feedback (e.g., verbal rewards) was shown to improve intrinsic motivation (Deci, Ryan & Koestner, 1999). Thus, providing a reward for participation or a reward for performance may result in different outcomes. In this study, motivation via extrinsic reward was elicited by awarding additional extra credit points for participation in the study only, or (supposedly) based on game performance. The interaction of these reward types with the goal achievement and causality orientations may differentiate the factors that influence student engagement in GBL.

**Current Study**

The current study expects to find that offering students extra course credit for either performance or participation in a game will result in varying levels of GBL engagement, depending on their goal achievement and causality orientations. Each orientation is expected to interact with the two types of extrinsic reward, performance and participation, resulting in either a significant increase or no significant change in GBL engagement. In addition, greater engagement in the game is expected to result in better performance on later testing of the material, regardless of goal achievement or causality orientations. The following is a detailed explanation of the proposed hypotheses. Theoretical models that depict these relationships are shown in Figures 1 - 4 in Appendix B.
**Causality Orientations and Reward Type.** It is expected that students with an autonomy-orientation will display no significant difference in GBL engagement between the points-for-performance condition and the points-for-participation condition (H1). This is because an autonomy-oriented student will have an internal locus of control and will make decisions based on internal needs instead of external rewards. On the other hand, students with a control-orientation are expected to be significantly more engaged in the points-for-performance condition than the students with the same orientation in the points-for-participation condition (H2) because a control-orientation indicates the student looks to external motivators, such as reward, to regulate their behavior. Knowing they will gain additional points for performance should result in greater GBL engagement in an attempt to attain the reward. Finally, it is expected that students with an impersonal-orientation will not be significantly more engaged in one condition over the other (H3a) because a student with an impersonal-orientation will show apathy toward the situation and not be inclined toward engaging, regardless of reward type offered. Thus, it is also predicted that impersonal-oriented students will have the lowest engagement score of the three causality orientations, regardless of condition (H3b).

**Goal Achievement Orientations and Reward Type.** Students with performance goal achievement orientations are expected to be significantly more engaged in the points-for-performance condition than the students with the same orientations in the points-for-participation condition. The reason for this prediction is that a performance orientation indicates a desire to perform well in the eyes of peers, so they should be more engaged if the points are for how they perform than for merely participating. This outcome is anticipated to be true for both performance-approach (H4a) and performance-avoidance (H4b) goal achievement orientations.
Conversely, it is expected that students with mastery goal achievement orientations will exhibit no significant difference in GBL engagement between conditions. This is because a mastery orientation signals a desire to perform well for personal goals and not because of peer opinion. Consequently, they should be engaged regardless of whether the points are for performance or participation. This outcome is expected for both the mastery-approach (H5a) and mastery-avoidance (H5b) goal achievement orientations.

**Engagement and Academic Performance.** Academic performance is an objective measure that is often acquired via the scores of participants on multiple levels of academic achievement, including quiz scores, exam scores, overall course grades, and grade point averages (Chamorro-Premuzic & Furnham, 2003; Connolly, et al, 2012; Erhel & Jamet, 2013; Junco, Heiberger & Loken, 2011). The current study also uses objective measures of academic performance: final exam scores. As reviewed above, games research has indicated that games can lead to higher engagement, while SDT research suggests that greater engagement may lead to improved academic performance. For this reason, it is anticipated that higher levels of engagement in GBL will lead to better performance on later testing of the material, controlling for both goal achievement and causality orientations (H6).

**Engagement and Learner Satisfaction.** Learner satisfaction is another important outcome in the learning process. Previous research in this area by Lim, Morris, and Kupritz (2007) has shown that the perception of learning and actual information retention are not always related. While it is important to retain information about content, it is also crucial that students develop positive attitudes toward learning and enjoy their course experience. Therefore, in addition to using final exam results for academic performance, participants will be asked to report their level of satisfaction with their learning experience in the overall course.
However, previous work has focused on differences in learning satisfaction stemming from different learning approaches (online vs. blended learning environments), so it is not clear if there will be a positive or negative relationship between learner satisfaction and the degree of engagement experienced during the game used in this study. As a consequence, the current study includes a research question to explore this relationship (RQ1).
CHAPTER III: METHODOLOGY

Study Design

This study was structured as a pretest/post-test experimental design with two conditions. The pretest focused on determining individual differences among students – specifically, causality and goal achievement orientations. The post-test measured participant engagement during the gaming experience, especially regarding reward - whether based on performance or participation points (i.e., the manipulation). It also measured learner satisfaction toward the course.

The pretest data was collected via the online survey website Qualtrics. After the online pretest, students were redirected to a page to sign up for a time to attend the review session, which was held in-person. The post-test was completed in the laboratory, immediately following the exam review session. Exam question performance was collected from the course supervisor and provided to the researchers with school identification codes but not names.

The experimental manipulation consisted of two conditions in which extrinsic reward was provided either for participating in a game or based on performance in the game. The learning environment itself did not change between the conditions - what was manipulated was the impact of reward type (performance vs. participation) on GBL engagement, learner satisfaction, and final exam scores. Participants came to the study in groups ranging in size from four to nineteen participants (\(M = 13.75, SD = 5.12\)), where they were provided an opportunity to review content for the final exam, in the form of a game. The game played in both conditions was the same.
Condition was randomly assigned to each exam review session using a random coin flip generator, which was run directly before the start of each session. Of the twelve review sessions, six sessions were assigned to the points-for-participation condition. In this condition, participants were told they would be given extra course points, in addition to the points already being received for their participation in the study, for showing up and participating in the review session that day. The other six review sessions were assigned to the points-for-performance condition, which meant that participants were told they would receive additional course points based on their performance in the review session game. This was a deception approach, however, because all participants received the same amount of extra course points. To avoid the possibility of participants letting future participants know about the deception, the fact that everyone would get the same points was not announced until the study had concluded -- at which point all participants were debriefed about the deception.

**Procedure**

**Recruitment and Consent Procedure.** Students over the age of 18 enrolled in a public speaking course at a large northeastern university were invited to participate. The course supervisor announced an opportunity to obtain extra credit while also reviewing for the final exam. A student researcher visited the course and provided a detailed explanation of the study as well as information sheets and consent forms. Students were asked to read the forms, and those who decided to participate were asked to return the signed consent form to their TA or the course instructor at the end of the lecture period.

While using a pool of college students is usually considered a convenience sample, this population is relevant to the current study because it specifically focuses on the traits and attitudes of students in higher education classrooms. The public speaking course used for this
study is an introductory communication course, which is a degree requirement for many majors. This course attracts students from various majors, mostly in their first or second year, so it was expected that there would be diversity in terms of majors and departments represented (as opposed to being primarily communication majors, as is the case with upper-level courses).

**Pretest Procedure.** Students that returned a signed consent form (which requested submission of an email address) were emailed a link to a pretest survey. The participants first re-read the information sheet and began the survey on the next page if they selected the “I AGREE” option. The pre-test survey was calculated to take approximately 30 minutes to complete.

Participants were first asked general demographic information, including their age, school identification code, gender, GPA, class level, academic program, primary major, and race/ethnicity. They then answered questions regarding individual traits, including the main traits of interest: goal achievement orientations (Elliot & McGregor, 2001) and causality orientations (Deci & Ryan, 1985). In addition, they completed measures of covariates such as trait motive to avoid failure (Hagtvet & Benson, 1997), test anxiety (Hagtvet & Benson, 1997), trait anxiety (Spielberger, 1983), trait competitiveness (Houston, Harris, McIntire, & Francis, 2002), the Big 5 personality traits (Gosling, Rentfrow, & Swann, 2003), and perceived level of College Self-Efficacy (Solberg, O’Brien, Villareal, Richard, & Davis, 1993). The frequency of previous gaming experience and self-perceived level of gaming experience was assessed by created scales, and the Video Game Skills scale (Bracken & Skalski, 2005). After the pre-test, a link was provided for students to sign up for a particular time to attend the laboratory portion of the study.

**Experimental Procedure.** The laboratory was held in a classroom reserved for the exam review, and the students attended the review with other participants who were also students in the course which the exam was for. The review was conducted using a program called Kahoot!
Kahoot! is an online gaming platform that originated in Norway in early 2013. Its founding principles are "social, play and learning," and they are striving to accomplish a sense of connectedness in learning that they characterize as a "campfire moment." They are mainly focused on classroom learning but have seen their platform expand into use for businesses and social events. The basic Kahoot! game consists of a series of questions created by the leader of the Kahoot! The leader shows the game on a large screen for the participants to see. After every question, Kahoot! displays a leaderboard with the top 5 ranking participants and their point total. Kahoot! points are based on the accuracy and speed of answering.

The participants signed into the Kahoot! game using a unique room code on their devices (laptop, tablet, smartphone), which they then used to answer questions. There was no need for the participants to sign up for an account or provide any private information - they only had to submit a "handle," which could be any combination of letters and numbers. The study participants were asked to submit their real names, which meant they were able to see their ranking in the real-time Kahoot! leaderboard. Before they began the Kahoot!, participants were informed either a) that they were receiving additional extra credit points based on their performance in the game or b) that they were receiving additional extra credit points just for participating in the game. Manipulating reward by couching it as performance-based versus participation-based allows exploration of how different credit incentives for gaming in an academic context lead to differing levels of GBL engagement.

**Post-test Procedure.** At the end of the review sessions, participants were asked to complete a post-test while still in the room. They first read the information sheet. If they selected the “I AGREE” option, they began the survey on the next page. The post-test survey was calculated to take approximately 30 minutes to complete, based on completion time evaluations.
by research staff. Post-test measures addressed the level of engagement experienced while participating in the game, as well as satisfaction with learning progress in the overall course.

**Measures**

**Demographics.** Demographics measured include age, gender, race/ethnicity, class level, academic program, and primary major (if enrolled in the College of Liberal Arts and Sciences).

**Causality Orientation.** Causality orientations were measured via the General Causality Orientations Scale (GCOS) created by Deci and Ryan (1985b). The scale is based on 12 vignettes with three items each, for a total of 36 items (Deci & Ryan, 1985b). These vignettes provide a score for each of three subscales, which measure: autonomy orientation, control orientation, and impersonal orientation (Deci & Ryan, 1985b). An example vignette is “You are embarking on a new career. The most important consideration is likely to be:” (Deci & Ryan, 1985b). An example item for that vignette is “Whether you can do the work without getting in over your head” (Deci & Ryan, 1985b). Answers for each item are given on a 7-point Likert scale, ranging from “Very unlikely” to “Very likely.” Reliability analysis indicated improved reliability would be found after dropping two of twelve items on the autonomy subscale, after which it was found to be reliable ($M = 5.69$, $SD = 1.19$, $\alpha = .81$). The impersonal subscale was almost equally reliable, with no items needing to be dropped ($M = 3.86$, $SD = 0.91$, $\alpha = .78$). The control subscale was fairly reliable, after achieving maximum reliability by dropping three of the twelve items, also based on the reliability analysis results ($M = 4.63$, $SD = 0.77$, $\alpha = .68$).

**Goal achievement orientation.** Goal achievement orientation was measured using the well-established 2x2 framework and scale developed by Elliot and McGregor (2001). This scale consists of 12 questions and is comprised of 4 subscales, each measuring one of the four goal orientations using three questions: mastery-approach ($M = 5.62$, $SD = 1.21$, $\alpha = .81$), mastery-
avoidance ($M = 4.06, SD = 1.40, \alpha = .80$), performance-approach ($M = 4.86, SD = 1.63, \alpha = .90$), and performance-avoidance ($M = 5.59, SD = 1.19, \alpha = .67$). Answers are given on a 7-point Likert scale ranging from "Disagree strongly" to "Agree strongly" (Elliot & McGregor, 2001). Examples of questions include, "It is important to me to do better than other students" and "I just want to avoid doing poorly in this class."

**Engagement.** Engagement was measured using the User Engagement Scale (O'Brien, Cairnes, & Hall, 2018). This scale includes 30 items, examples of which include: “I was really drawn into this experience” and “My experience was rewarding.” Some items of this scale were edited to specifically refer to the Kahoot! game that was being played during the review sessions (e.g., “Using Kahoot! was worthwhile”). Respondents were provided a range of 5 answer options, from “Strongly Disagree” to “Strongly Agree” (O'Brien, Cairnes, & Hall, 2018). The scale consists of four subscales: focused attention ($M = 3.16, SD = 0.76, \alpha = .81$), perceived usability ($M = 4.00, SD = 0.63, \alpha = .80$), aesthetic appeal ($M = 4.10, SD = 0.59, \alpha = .86$), and reward ($M = 4.05, SD = 0.55, \alpha = .87$). As recommended by O'Brien, Cairnes, and Hall (2018), the total score for the scale was obtained by summing the average scores from the four subscales, resulting in a maximum possible score of 20. In this study, the scores ranged from 10.12 to 19.29 ($M = 15.31, SD = 1.86$).

**Learner Satisfaction.** The Course Outcomes and Student Effort/Involvement scale created by Lim, Morris, & Kupritz (2007) was used to measure learner satisfaction with the overall course experience (i.e., when comparing the public speaking course in this study with other courses taken) using five answer options ranging from “Much less” to “Much more.” The scale consists of eight items, which include examples such as "My learning increased in this course" and “My interest in the subject area has increased.” The alpha reliability for this specific
scale was not reported by Lim, Morris, & Kupritz (2007), but the current sample resulted in \( \alpha = .88 \ (M = 3.64, \ SD = 0.72) \) after removing two items from the scale.

**Final Exam Scores.** Scores on the final exam were collected and identifiable data was then converted to the unique 6-digit identifier system. Exam performance was not kept for the students that were not participating in the study. The mean exam score for all study participants was 82.62 (SD=9.59) and scores ranged from 50 to 98.

**Controls and Covariates.** In addition to the demographic and main variables of interest that were measured, several other scales were included in this study to control for their potential influence as confounding variables in the primary analyses: trait fear of failure, test anxiety, trait anxiety, trait competitiveness, the Big 5 personality traits, past gaming experience (both frequency and perceived skill level), and perceived college self-efficacy. Correlations between the main variables of interest and potential confounds were examined, resulting in the scales for motive to avoid failure, trait anxiety, and trait competitiveness being retained as covariates to be controlled for, along with age, in the subsequent analyses. Significant bivariate correlations are displayed in Table 4, Appendix A.
CHAPTER IV:

RESULTS

Data cleaning

The data was collected in April 2019. Cases where participants completed the entire pre-test or post-test data in under 200 seconds were removed as it was determined that full consideration of the questions was not possible in that amount of time. Additionally, cases where participants provided the same answer to all questions in scales, including reverse-coded items, were removed as it was determined they were unlikely to have completed the measure thoughtfully and honestly. No participants were under the age of 18, as an alternative assignment had been provided for them to complete instead. No participants were removed due to any other demographic criteria such as gender or race. Lastly, participants that did not complete all phases of the study (pre-test, post-test, review session, and final exam) were excluded from the analyses. These adjustments resulted in the removal of 3 cases from the dataset.

A manipulation check question asked in both conditions was: “Were you offered additional extra credit points based on your performance, or just for participating (regardless of performance)?” This question helped determine whether students in each condition were aware of the reward type they had been offered. Thirteen participants answered incorrectly, all of whom were in a points-for-performance condition and believed they were offered points for participation only. Further investigation revealed that these cases were distributed across multiple review sessions and did not rise out of one particular session, which might have indicated error due to researcher communication. Answering the manipulation check question incorrectly indicated that their answers to the post-test survey were provided under a false belief and their responses could not be considered representative of the condition they were in.
Subsequently, the thirteen cases were dropped from the dataset, resulting in a final sample size of $N = 139$.

Of the final sample, 53.2% of participants were assigned to the points-for-participation condition ($n = 74$) and 46.8% were in the points-for-performance condition ($n = 65$). 59% identified as female ($n = 82$), and 41% identified as male ($n = 57$). An option for “other” (with a place to self-identify as desired) existed in the gender measure, but no participant identified as other than male or female. Age ranged from 18 to 25, with the mean age being 19.63 ($SD = 1.38$). The majority of participants identified their ethnicity as white (62.6%, $n = 87$), followed by Asian (15.1%, $n = 21$), Black or African American (6.5%, $n = 9$) and Hispanic or Latino (5.8%, $n = 8$). 10.1% ($n = 14$) of the sample indicated multiple ethnicities. 47.5% of the sample ($n = 66$) were members of the College of Liberal Arts and Sciences, with 26.6% of the overall sample ($n = 37$) stating that they were Communication majors. Sophomores (33.1%, $n = 46$) and Freshmen (31.7%, $n = 44$) made up the majority of the sample, followed by Juniors (18.7%, $n = 26$) and Seniors (16.5%, $n = 23$). These and other demographic statistics are displayed in Table 1, Appendix A.

Assessment of frequencies of the variables of interest determined that less than 5% of data was missing. Any missing data was consequently imputed using the mean of all participants responding to a given item. For greater clarity during analysis, several of the categorical variables were recoded. Condition was dummy coded, with participation as 0 and performance as 1. This allowed for results to more clearly indicate the impact of receiving points for performance. Gender was also dummy coded, with 0 for male and 1 for female. Following cluster analysis, the resulting causality and goal orientations were also dummy coded for inclusion during the regression analyses.
Cluster analysis

To conduct the primary analyses in this study, participants first needed to be classified into one mutually exclusive causality orientation, and one mutually exclusive goal achievement orientation. In both orientation measures, separate mean scores are provided for each of the orientation subscales. For example, assessment on the autonomy orientation subscale is assessed through one set of items, control orientation by a second set, and impersonal orientation by a third. It is possible, then, for a participant to report high (or low) average responses to all three orientations at the same time. It is not possible, in the current state of this measure, to identify a particular participant as being autonomy-, control-, or impersonal-oriented to the exclusion of the other two orientations. The same is true of the goal achievement orientation measure. Therefore, a K-Means cluster analysis approach was used to group participants into a single orientation each, for both the goal achievement and causality orientation data.

Causality Orientation Clusters. For the causality orientations, confirmatory factor analysis was attempted to obtain standardized factor scores, as standardized scores are necessary to conduct a cluster analysis. Unfortunately, good model fit was not achievable unless the scales were severely reduced down to only a few items each (from twelve each), and the strength of each of the scales was markedly diminished when considering the face validity of the remaining items. Hence, this data was converted to z-scores to obtain the standardization needed to proceed.

K-Means cluster analysis was used to cluster participants based on their mean scores for the three causality orientation scales — autonomy, control, and impersonal. Initial cluster centers were not specified, and a 3 cluster solution was found (Table 2, Appendix A). The clusters fell reasonably neatly into the three scales. Participants in the first cluster \( (n = 43) \) had above average
means for autonomy (0.53) and lower than average means for control (-0.56) and impersonal (-0.90). Hence, participants in this first cluster were labeled as autonomy-oriented students.

Participants in the second cluster $(n = 54)$ were above average on all three scales, but highest on control (0.85), followed by impersonal (0.70) and then autonomy (0.44). Therefore, participants in the second cluster were labeled as control-oriented. Participants in the third cluster $(n = 42)$ were slightly above average for impersonal (0.03), but below average for control (-0.52) and very below average for autonomy (-1.11). Thus, the participants in the third cluster were labeled as impersonal-oriented.

**Goal Achievement Orientation Clusters.** Confirmatory factor analysis was conducted using the IBM AMOS program (v.26) to obtain factor scores needed to perform a cluster analysis to classify participants into mutually exclusive orientations. The scales were entered as designed, with three observed variables per latent variable (subscale), resulting in good model fit, $\chi^2(48, N=139) = 63.99, p = .06, \text{CFI} = .98, \text{RMSEA} = .05, \text{PCLOSE} = .49$. Using the data imputation option in AMOS, the standardized factor scores from the confirmatory factor analysis were saved to SPSS and used for the subsequent K-Means clustering process.

Despite the generally high alpha reliability of the subscales, as well as the good model fit obtained during the confirmatory factor analysis, the resulting clusters did not fall as neatly into each of the goal achievement orientations as anticipated. As a consequence, the specific questions asked for each subscale of the goal achievement orientation measure were revisited, which provided some insight into why the participants clustered together as they did. The following is a summary of the re-evaluation of one of these subscales: performance-approach. The entire list of items asked in all of the goal achievement orientations subscales is listed in Appendix C: Measures, for reference.
The three questions in the performance-approach subscale are: “It is important for me to do better than other students,” “It is important for me to do well compared to other students in this class,” and “My goal in this class is to get a better grade than most of the other students” (Elliot & McGregor, 2001). At face value, these questions appear to actually be assessing a competitive attitude toward goal achievement. A significant positive correlation between the factor score obtained for the performance-approach scale and the measure of trait competitiveness provides further support for this relationship, \( r = .41, p < .000 \).

The intended concept of performance-approach is a combination of concern about the opinions of others and a goal of attaining a good grade as an outward indicator of competence (Barron & Harackiewicz, 2000; Elliot & Harackiewicz, 1996; Elliot & McGregor, 2001). While these questions do appear to capture the approach aspect of this orientation (aspiring to achieve a good grade), the questions do not explicitly denote concern about the opinions or judgments of others, which greatly weakens the performance aspect that this subscale supposedly measures. Therefore, while the subscale has been proved to be reliable in previous research, as well as in the current study (\( \alpha = .90 \)), the content validity of this scale is seriously called into question. This subscale appears indicative of a competitive approach to goal achievement, and as such is no longer used in this study as indicative of a “performance-approach” goal orientation.

In light of this discovery, the data was explored further using k-means cluster analysis. Removing the performance-approach subscale from the cluster analysis did not result in three clusters, one for each remaining subscale. However, leaving it in revealed that each of the other three remaining orientations were evident when allowing for clustering of competitive (i.e., having high means on performance-approach) and non-competitive (i.e., having lower than average means on performance-approach) participants in a 6 cluster solution (Table 3, Appendix...
A). For the sake of simplification, and since the component of competitiveness was not a main variable of interest, the competitive and non-competitive members of each orientation were joined together using hierarchical clustering, resulting in three clusters: mastery-approach \((n = 54)\), mastery-avoidance \((n = 47)\), and performance-avoidance \((n = 38)\).

**Correlation matrix**

Bivariate correlations between the main variables of interest, demographics, and potential confounds were run. Significant bivariate correlations found in this process flagged particular possible confounds to control for in the analyses. Specifically, the variables age, motive to avoid failure, trait anxiety, and trait competitiveness were retained to use as covariates in the subsequent analyses. The significant correlations are presented in Table 4, Appendix A.

**Primary Analyses**

**Causality Orientations and Reward Type.** A 2 x 3 factorial ANCOVA was used to determine the impact of condition (i.e., the type of points awarded) and causality orientations on GBL engagement, after controlling for age, motive to avoid failure, trait anxiety, and trait competitiveness. Visual inspection of scatterplots found linear relationships between each covariate and engagement. Additionally, homogeneity of regression slopes, which were obtained by comparing a two-way ANCOVA model both with and without interaction terms, were non-significant \((p > .05)\) for all covariates.

One outlier was detected as being below the cutoff of three standard deviations from the group mean when reviewing the studentized residuals, with a residual of -3.31 (Laerd Statistics, 2018). After inspecting the engagement score of this case, it was found that while it had the lowest score of all participants (10.12), the next highest score is 10.97 (with a maximum possible score of 20). Since the case was not deemed an extreme outlier, it was retained for the analyses.
HOMOSCEDASTICITY OF ERROR VARIANCES WITHIN THE COMBINATIONS OF CAUSALITY ORIENTATION AND CONDITION WAS CONFIRMED THROUGH VISUAL INSPECTION OF STUDENTIZED RESIDUALS PLOTTED AGAINST PREDICTED VALUES FOR EACH GROUP. HOMOGENEITY OF VARIANCES WAS CONFIRMED USING LEVENE’S TEST ($p = .138$). ALL STUDENTIZED RESIDUALS WERE NORMALLY DISTRIBUTED, AS ASSESSED BY SHAPIRO-WILK’S TEST ($p > .05$).

THERE WAS NO STATISTICALLY SIGNIFICANT INTERACTION BETWEEN CAUSALITY ORIENTATION AND CONDITION ON ENGAGEMENT, AFTER CONTROLLING FOR AGE, MOTIVE TO AVOID FAILURE, TRAIT ANXIETY, AND TRAIT COMPETITIVENESS, $F(2, 129) = 0.10, p = .91$, PARTIAL $\eta^2 = .001$ (FIGURE 5, APPENDIX B). THE MAIN EFFECTS OUTCOMES OF THE TWO-WAY ANCOVA WERE EXPLORATED TO ANSWER HYPOTHESES 1, 2, AND 3A. THE MEANS, ADJUSTED MEANS, STANDARD DEVIATIONS, AND STANDARD ERRORS REPORTED IN THESE RESULTS ARE DISPLAYED IN TABLE 5, APPENDIX A.

HYPOTHESIS 1 PREDICTED THAT AUTONOMY-ORIENTED PARTICIPANTS WOULD HAVE “NO SIGNIFICANT DIFFERENCE” IN GBL ENGAGEMENT BETWEEN THE TWO CONDITIONS OF REWARD TYPE. THE ADJUSTED MARGINAL MEAN OF AUTONOMY-ORIENTED PARTICIPANTS IN THE POINTS-FOR-PARTICIPATION CONDITION ($M_{adj} = 15.24, SE = .39$) IS SLIGHTLY, BUT NOT SIGNIFICANTLY, LOWER THAN THE MEAN OF THE POINTS-FOR-PERFORMANCE CONDITION ($M_{adj} = 15.62, SE = .41$), WITH A MEAN DIFFERENCE OF $-0.39, 95\%$ CI $[-1.48, 0.71], p = .49$. THEREFORE, HYPOTHESIS ONE IS SUPPORTED, AS THIS DIFFERENCE IS NON-SIGNIFICANT.

HYPOTHESES 2 ANTICIPATED THAT PARTICIPANTS WITH A CONTROL-ORIENTATION WOULD BE SIGNIFICANTLY MORE ENGAGED IN THE POINTS-FOR-PERFORMANCE CONDITION THAN IN THE POINTS-FOR-POINTS-FOR-PARTICIPATION CONDITION. THE ADJUSTED MARGINAL MEAN FOR THE CONTROL-ORIENTED PARTICIPANTS IN THE POINTS-FOR-PERFORMANCE CONDITION ($M_{adj} = 16.09, SE = .36$) WERE HIGHER THAN IN THE POINTS-FOR-PARTICIPATION CONDITION ($M_{adj} = 15.45, SE = .34$), BUT THIS DIFFERENCE WAS NON-
significant, 0.64, 95% [-0.34, 1.61], \( p = .20 \). Thus, the expectation of a significant difference predicted in hypothesis two was not supported.

Hypothesis 3a expected that impersonal-oriented students would exhibit no significant difference in GBL engagement between the two conditions. The adjusted marginal means for the impersonal-oriented participants was slightly lower in the points-for-participation condition (\( M_{adj} = 14.46, \text{SE} = .38 \)) than in the points-for-performance condition (\( M_{adj} = 14.81, \text{SE} = .41 \)), but this difference was also non-significant at -0.35, 95% CI [-1.45, 0.75], \( p = .53 \). This means that hypothesis 3a is supported.

Hypotheses 3b further predicted that impersonal-oriented students would be the least engaged of the three causality orientations, regardless of condition. A Bonferroni post hoc test was used to determine if the difference between these orientations supports hypothesis 3b, and the following results are displayed in Table 6, Appendix A.

Engagement in the game was lower for the impersonal orientation group (\( M_{adj} = 14.63, \text{SE} = .28 \)) compared to the autonomy orientation group (\( M_{adj} = 15.43, \text{SE} = .29 \)), but the mean difference is non-significant (-0.80, 95% CI [-1.78, 0.18], \( p = .15 \). Engagement in the game was, however, statistically significantly lower for the impersonal orientation group (\( M_{adj} = 14.63, \text{SE} = .28 \)) than the control orientation group (\( M_{adj} = 15.77, \text{SE} = .25 \)), with a mean difference of -1.14, 95% CI [-2.05, -0.23], \( p = .01 \). These results indicate that the participants with an impersonal orientation were significantly lower in GBL engagement in the control orientation but not the autonomy orientation, partially supporting hypothesis 3b.

**Goal Achievement Orientations and Reward Type.** It was anticipated that both performance-approach (H4a) and performance-avoidance (H4b) participants would be significantly more engaged in the points-for-performance condition than in the points-for-
participation condition. As the impact of the performance-approach orientation was found not to be measuring what it was supposed to measure, it is no longer being used as a goal orientation for these analyses. Consequently, it is not possible to test hypothesis 4a. Hypothesis 4b, however, is still testable as there is a performance-avoidance group in the newly clustered goal orientations. Mastery-approach (H5a) and mastery-avoidance (H5b) participants were expected to show no significant difference in game engagement between conditions, and these are both testable using the new clustered orientation groups as well.

As with the investigation of the causality orientations and reward conditions, a 2 x 3 factorial ANCOVA was used. The same covariates of age, motive to avoid failure, trait anxiety, and trait competitiveness were used. Scatterplots were used to confirm linear relationships for all of these covariates with engagement. A comparison of a two-way ANCOVA model, both with and without interaction terms, found all covariates had non-significant \( p > .05 \) homogeneity of regression slopes. A visual inspection of studentized residuals plotted against predicted values for each group confirmed homoscedasticity of error variances, and Levene’s test was used to confirm homogeneity of variances \( p = .45 \).

No outliers were detected in the data. In almost all combinations of the orientations and conditions, the studentized residuals were found to be normally distributed by the non-significant results of the Shapiro-Wilk test \( p > .05 \). The one exception was the mastery avoidance group in the points-for-participation condition, \( p = .03 \). However, as the two-way ANCOVA is generally robust enough to handle deviations from normality, and the sizes of the three orientation groups were relatively equal, the decision was made not to transform the data (Laerd Statistics, 2018).

A significant interaction was found between reward condition and the three new goal orientations, \( F(2, 129) = 3.98, p = .02, \) partial \( \eta^2 = .06 \). The difference between the adjusted
marginal means of the two reward conditions was not significant ($p = .15$) and no significant difference was found between the three orientations, $F(2, 129) = 1.48, p = .23$, partial $\eta^2 = .02$. These interactions are depicted in Figure 6 of Appendix B. Means, adjusted means, standard deviations, and standard errors of the following analyses are shown in Table 7, Appendix A.

Hypotheses 4b anticipated that there would be significantly greater GBL engagement in the points-for-performance condition than the points-for-participation condition for the performance-avoidance orientation. A Bonferroni post hoc test showed that, against expectations, engagement was slightly higher for performance-avoidance students in the points-for-participation condition ($M_{\text{adj}} = 15.04, \text{SE} = .40$) as compared to those in the points-for-performance condition ($M_{\text{adj}} = 14.70, \text{SE} = .43$), although the mean difference between the two conditions was not significant (0.34, 95% CI [-0.81, 1.49], $p = .57$). As this orientation was not significantly more engaged in the points-for-performance condition than the points-for-participation condition, hypotheses 4b was not supported.

The Bonferroni post hoc analysis was also used to assess the predictions of hypotheses 5a and 5b that mastery-oriented students would have no significant difference in engagement in the game regardless of condition. Mastery-approach students were slightly more engaged in the points-for-performance condition ($M_{\text{adj}} = 15.40, \text{SE} = .37$) than the points-for-participation condition ($M_{\text{adj}} = 15.34, \text{SE} = .33$), and the difference was not significant (0.06, 95% CI [-0.91, 1.04], $p = .90$). Therefore, hypothesis 5a is supported.

However, a significant difference was seen for the mastery-avoidance students, who were more engaged in the points-for-performance condition ($M_{\text{adj}} = 16.39, \text{SE} = .38$) as compared to the points-for-participation condition ($M_{\text{adj}} = 14.73, \text{SE} = .38$), with a mean difference of 1.67,
95% CI [0.61, 2.70], \( p = .01 \). Since mastery-avoidance students were expected to show no significant difference in GBL engagement between conditions, hypothesis 5b is not supported.

**Engagement and Academic Performance.** Hypotheses 6 expected higher engagement in GBL through the use of the Kahoot! game would predict higher final exam scores, regardless of orientation (after controlling for covariates). To test this, a hierarchical multiple linear regression approach was used. Before the analysis, however, the final exam data needed to be transformed as it was negatively skewed and positively kurtotic (Laerd Statistics, 2018). The non-normal distribution was confirmed with Shapiro-Wilk’s test (\( p < .000 \)). A square root transformation was applied after reflecting the data, which resulted in more acceptable levels of skewness and kurtosis (Laerd Statistics, 2018). The Shapiro-Wilk's test was still significant (\( p = .04 \)), but much improved. In addition, more extreme forms of transformation resulted in non-normal distributions. The “reflect and square root” approach was deemed the most acceptable, and the resulting variable was used for the exam score outcome in the following analyses.

The first block of the regression contained all of the covariates that need to be controlled for: age, motive to avoid failure, trait anxiety, and trait competitiveness. The second block contained the new causality and goal orientations that resulted from the cluster analysis. For the causality orientation, dummy-coded variables for the autonomy and control orientations were entered, with the impersonal orientation as the reference category. For the goal orientations, mastery-approach and mastery-avoidance dummy-coded variables were entered in, with the performance-avoidance orientation as the reference group. The final block contained engagement in the Kahoot! game, to determine the degree to which it influences exam scores after controlling for the other factors. This approach also provides an opportunity to view any particularly significant contribution to exam scores by any of the variables in the first two blocks.
Linearity between exam score and each of the independent variables was established using partial regression plots, and the linearity of exam score with all of the independent variables collectively was assessed by examining a scatterplot. In all cases, the data exhibited linear relationships. Similarly, homoscedasticity was confirmed by a plot of studentized residuals against unstandardized predicted values. No multicollinearity was identified, according to the VIF values reported in the regression. Lastly, normality was assessed through visual inspection of a Q-Q plot, and it was determined that the data were distributed normally enough to proceed.

The first model, which contained only the five covariates, was not significant, $F(4, 134) = 1.84, p = .13$, and explained only a very small amount of the variance (adjusted $R^2 = .02$). The second model, however, was significant, $F(8, 130) = 2.24, p = .03$, and explained a small and marginally significant portion of the variance (adjusted $R^2 = .07$, adjusted $\Delta R^2 = .05$). In this second model, trait competitiveness is a significant positive predictor of exam score ($\beta = 0.20, p = .03$). On the other hand, the control orientation is significantly negative predictor ($\beta = -0.24, p = .03$).

The third and final model (Table 8, Appendix B) included the addition of Kahoot engagement to gauge its impact on exam scores after controlling for the variables entered in models 1 and 2. This final model was also significant, $F(9, 129) = 1.99, p = .045$, but the added variance was insignificant (adjusted $R^2 = .06$, adjusted $\Delta R^2 = -.01$). Once again, trait competitiveness significantly predicted exam score ($\beta = 0.20, p = .03$), as did the control orientation ($\beta = -0.23, p = .04$). Kahoot engagement, however, was not a significant predictor of exam score ($\beta = -0.03, p = .74$). The results of this regression analysis, therefore, show that hypothesis 6 is not supported.
Engagement and Learner Satisfaction. In addition to exam scores, learner satisfaction was an important potential outcome of the student experience. However, past research did not indicate whether GBL engagement would predict higher or lower levels of learner satisfaction. As a result, a research question was developed to look at this connection more closely. Another hierarchical multiple regression analysis was conducted to answer this question. Linearity between course satisfaction and the independent variables (both individually and collectively) was confirmed, along with homoscedasticity, lack of multicollinearity, and normality of data being analyzed, before proceeding with the analysis.

As before, the four covariates were placed in the first model, the same dummy-coded orientations in the second model, and Kahoot engagement in the third model to determine whether it predicted the dependent variable learner satisfaction, after controlling for the other variables. The first model was found to be significant, $F(4, 134) = 5.34, p = .001$, and explained a small portion of the variance (adjusted $R^2 = .11$). In this model, age was a significant predictor of course satisfaction ($\beta = -.21, p = .01$). In addition, trait anxiety was shown to be a significant predictor ($\beta = -.23, p = .01$).

The second model was also significant, $F(8, 130) = 5.80, p < .000$, with an increase in the portion of variance it explains (adjusted $R^2 = .22$, adjusted $\Delta R^2 = .11$). In this case, age is no longer a significant predictor, although trait anxiety continues to be ($\beta = -.26, p = .004$). In addition, two of the goal orientations are also significant predictors of learner satisfaction: mastery-approach ($\beta = 0.37, p < .000$) and mastery-avoidance ($\beta = .35, p = .001$).

The third and final model for this regression (Table 8, Appendix B) is also significant, $F(9, 129) = 6.50, p < .000$, with another small increase in variance explained (adjusted $R^2 = .26$, adjusted $\Delta R^2 = .04$). Age is once again a significant negative predictor ($\beta = -.16, p = .045$). Trait
anxiety continues to be a significant negative predictor ($\beta = -.21, p = .016$), as do the mastery-approach ($\beta = .35, p = .000$) and mastery-avoidance orientations ($\beta = .32, p = .001$). Kahoot engagement is also a significant predictor of learner satisfaction ($\beta = .24, p = .003$), indicating that the relationship being explored in research question one, between GBL engagement and learner satisfaction, may be a positive one.
CHAPTER V: DISCUSSION

The current study sought to clarify the relationships between student orientations, reward type, game engagement levels, and academic outcomes. This study had two main objectives to reveal these relationships. The first objective of the study was to determine how student orientations interact with reward types to impact engagement levels in course-content-related games. The second objective of the study was to establish whether higher levels of GBL engagement predicted better final exam scores and levels of learner satisfaction, regardless of student orientation. In the process, issues of validity in the goal achievement measure were identified and incorporated.

Causality Orientations and Engagement

The theory of self-determination centers around each individual's need for autonomy, competence, and relatedness (Ryan & Deci, 2000; Ryan & Deci, 2002). Environments and experiences that effectively meet these needs allow individuals to feel a sense of control over their lives and develop a sense of self (Ryan & Deci 2002). If this is the case, a person feels an internal locus of causality, which is associated with the autonomy orientation (Ryan & Deci, 2000). If not, they may perceive the locus of causality as external, which is indicative of a control orientation (Ryan & Deci, 2000). Alternatively, they may feel entirely indifferent about the environment or experience, which manifests as an impersonal orientation (Ryan & Deci, 2000).

Educational environments strive to meet the needs for autonomy, competence, and relatedness, but often fall short of achieving their goal (Lepper & Henderlong, 2000). One reason for this may be the ubiquitous reliance on external motivators such as grades and other forms of
assessment (Covington, 2000; Ryan & Weinstein, 2009). Previous research has shown that many forms of extrinsic reward encourage the perception of an external locus of causality, and thereby reducing a sense of autonomy and fostering a control orientation for that context (Ryan & Deci, 2002; Ryan & Weinstein, 2009). Therefore, the use of extrinsic reward should interact with an individual's causality orientation to impact their level of engagement in an activity for which they are receiving the reward. Furthermore, previous research indicates that the level of this impact should vary depending on whether the reward is given for performance in an activity, or for merely participating in it (Deci & Ryan, 1985; Deci, Ryan, & Koestner, 1999; Harackiewicz, 1979).

**Autonomy Orientation.** Of the three causality orientations, autonomy-oriented students are the most likely to act based on their desires and not due to external forces, since they perceive the locus of causality as internal (Ryan & Deci, 2000). Assuming a learning environment they are in is meeting their needs for autonomy, competence, and relatedness, it is expected that autonomy-oriented students would be engaged regardless of enticements such as extra points toward their course grade. Thus, this study anticipated that students with an autonomy orientation would exhibit no significant difference between conditions in their engagement in the Kahoot! game. Results provided support for this hypothesis, as no significant difference was found in levels of engagement between autonomy-orientated students in each condition.

**Control Orientation.** Control-oriented students, on the other hand, were expected to be significantly more engaged in the points-for-performance condition than the points-for-participation condition. This is because students with this orientation perceive the locus of causality as external and are more likely to look for an external motivator for taking action (Ryan
In this case, since receiving a reward was predicated on game performance in the points-for-performance condition, control-orientated students were expected to show higher levels of GBL engagement in that condition. However, while the control-oriented students in the points-for-performance condition were slightly more engaged than in the points-for-participation condition, the difference was not significant. Additionally, control-oriented students showed the greatest engagement levels of all three orientations, in both conditions (see Figure 5, Appendix B).

Engagement in the points-for-performance condition was expected, but why would control-oriented students feel so engaged (more than even autonomy-oriented students) in the points-for-participation condition? The answer is unclear, and should be the subject of further research. However, one possible explanation is that the control-oriented students may have experienced a sense of obligation to engage after being told they were being provided additional points for their participation. As a control-orientation denotes a lack of autonomy, they may have felt they were expected by an outside force to engage, as so they did. As noted, though, this is a question that should be explored in subsequent research.

Impersonal Orientation. Impersonal-oriented students were not expected to be significantly more engaged in either condition, as they are expected to display indifference to the situation as a whole (Ryan & Deci, 2002). Results indicated that impersonal-oriented students were slightly more engaged in the points-for-performance condition, but this difference was not significant, as expected. They were also expected to be significantly less engaged than either the autonomy-oriented or control-oriented students, regardless of which condition they were in. Impersonal-oriented students were significantly lower in game engagement than control-oriented students, partially supporting this prediction. While the difference with autonomy-oriented
students was not significant, and therefore did not fully support the hypothesis, it is important to note that they were still lower in engagement than both other orientations (see Figure 5, Appendix B). Therefore, the overall expectation that impersonal-oriented students will be the least engaged across both conditions is still upheld.

**Goal Achievement Orientations and Engagement**

The goal achievement orientation framework also attempts to capture the factors that lead students to be more or less engaged in activities, based on their goals in a given context. As noted above, the use of extrinsic reward has the potential to negatively impact student motivation and shift it from a place of internal drive to one of external performance (Ryan & Deci, 2000). In the goal achievement framework, this dichotomy is captured in the mastery and performance dimension, with mastery indicating a desire to learn coming from an internal place, and performance indicating that the goal is instead an external desire to perform well, particularly in the eyes of others (Barron & Harackiewicz, 2000; Elliot & McGregor, 2001; Greene et al., 2004). The other dimension, approach and avoidance, relates to the way in which a student feels capable of attaining their goal, with approach being more confident about success and avoidance being more concerned with avoiding failure (Elliot & Harackiewicz, 1996).

**Performance orientations.** Performance-oriented students (both performance-approach and performance-avoidance) were expected to be significantly more engaged in the points-for-performance condition because students with this outlook on goal achievement are typically looking for an external motivation to do something (Barron & Harackiewicz, 2000; Elliot & McGregor, 2001). In the context of education, in particular, points toward their grade should be a greater motivation for performance than simply learning for their own sake (Barron & Harackiewicz, 2000; Elliot & McGregor, 2001). Also, they are generally more concerned with
the opinions of others and may be more motivated to engage if it means proving their competence in the company of others during the game (Barron & Harackiewicz, 2000; Elliot & McGregor, 2001).

The performance-approach orientation was not testable, but results showed that performance-avoidance students did not have significantly higher levels of GBL engagement in the points-for-performance condition than in the points-for-participation condition. While the difference was slight and not significant, it was actually in the direction of higher levels of engagement in the points-for-participation condition. This is an interesting reversal from the expected outcome. Not only was the difference between the conditions not significant, there was even a slightly lower level of engagement in the points-for-performance condition, contrary to the anticipation that points-for-performance would provide more motivation to engage.

A possible explanation for this could be a combination of two factors. First, the performance-avoidance students in the points-for-performance condition may have felt apprehension at performing poorly in the game in front of their peers. Second, if these students felt they did not fully grasp the course material (which is possible since their orientation does not indicate a focus on mastery), they may have felt it was likely that they would not do well. The situation may have caused them to disengage as a way to avoid experiencing embarrassment. While additional points toward their grade might be desirable, they may have felt it was not worth exposing their lack of knowledge publicly.

**Mastery orientations.** Mastery-oriented students (both mastery-approach and mastery-avoidance) were expected to behave more like the autonomy-oriented group in the causality orientations. A mastery orientation indicates an intrinsic desire to learn and should lead to being more naturally engaged and less affected by the fact that points are being provided, regardless of
the points type (Elliot & McGregor, 2001; Greene et al., 2004). They are also less concerned with the opinions of others and may therefore be less likely to feel pressure to perform well in front of the other students during the game (Elliot & McGregor, 2001; Greene et al., 2004).

For this reason, both mastery orientations were expected to show no significant difference in engagement between the two conditions. The results for the mastery-approach oriented participants supported this expectation. While they were slightly more engaged in the points-for-performance condition, they were not significantly so. Contrary to expectations, however, the mastery-avoidance oriented students were significantly more engaged in the points-for-performance condition than in the points-for-participation condition. In fact, it is the only orientation that exhibited a significant difference in engagement between the two conditions.

The difference in outcomes is most likely due to the approach and avoidance dimension of goal orientation. Both orientations are focused on mastering the class material, but the attitude toward achieving that goal is distinctly different. An approach orientation indicates a positive outlook, with a goal of doing well (Elliot & Harackiewicz, 1996). On the other hand, an avoidance orientation suggests less confidence in a positive outcome and more of a focus on avoiding doing poorly (Elliot & Harackiewicz, 1996).

Notably, the questions for the mastery-avoidance subscale include statements such as “I worry,” “Sometimes I’m afraid,” and “I am often concerned” (Elliot & McGregor, 2001). These questions indicate a degree of anxiety, which is supported by a significant positive correlation between the mastery-avoidance scale and trait anxiety ($r = 0.21, p < .05$). Conversely, the mastery-approach scale is negatively correlated with anxiety ($r = -0.27, p < .01$), accentuating this factor as a key difference between the two orientations.
This outcome sheds new light on the behavior of mastery-avoidance oriented students. If mastery-avoidance students have an underlying sense of anxiety toward learning due to fears about course success (e.g., grades), the opportunity to obtain more points through performance may have pushed them to engage so that they might get as many extra points toward their grade as possible. This relationship between trait anxiety and the approach vs. avoidance dimension of goal achievement orientation is an important finding that should be incorporated into future use of the theory.

**Engagement and Course Outcomes**

The second goal of this study was to explore the relationships between engagement in GBL and academic outcomes. Two outcomes were used to capture different aspects of student success. The first was exam scores, which provide an objective measure of the student's retention of the material of the course. The second is learner satisfaction, which focuses on the student's evaluation of their experience in the course overall. Both outcomes - final exam scores and learner satisfaction - were expected to be positively predicted by greater engagement in the Kahoot! game during the review sessions.

**Final Exam Scores.** Against expectations, engagement in the Kahoot! game did not predict higher final exam scores. This result is a key finding for this study, as it implies that engagement in game-based learning may not be as useful a tool for improving objective academic outcomes as is popularly believed. Furthermore, this result was found while controlling for both the causality and goal achievement orientations, which suggests that this may be true for many types of students.

It should be noted that the exam review gaming experience may have directly changed the studying habits of the participants after their participation in the study, but before the final
exam. For example, if a student did well in the game, they may have erroneously believed they
did not have to study as much for the exam as they originally planned to. Although the review
session was not intended to replace traditional forms of exam preparation, and it did not cover all
of the material on the exam, it is still possible that students who did well in the game session felt
a false sense of confidence in their ability to do well on the exam and led to less preparation.

On the other hand, students that did not do well in the game may have spent more time
studying than they otherwise would have – thus also changing the exam score outcome from
what it might have been without intervention via the gaming experience. Actual Kahoot! game
performance was not incorporated into the present analyses, so it is not clear whether this is the
case. However, it should be considered as a possible explanation for the lack of a significant
finding and may indicate an important form of data to be collected in future studies of this
nature.

Trait competitiveness was a significant positive predictor of final exam score. It is logical
that students which embody this trait are logically more likely to be competitive when it comes
to achieving scores on objective measures, as it may provide them with a sense of “winning”
their goal. Having a control orientation, however, was a significant negative predictor of exam
score. A control orientation indicates that a student may feel that they are not in control of their
own actions and outcomes (i.e. perceive their locus of causality as external). If a student does not
feel a sense of autonomy in their academic situation, they might be less likely to spend time in
preparation, since they don’t perceive their own actions as having an impact on outcomes. If so,
this lack of preparation might contribute to the reason a control-orientation would negatively
impact final exam score.
Learner Satisfaction. While a student may not score high on an exam, it is possible they may feel that they learned a lot during the course and have a high sense of satisfaction. This form of success is just as important as an exam score and captures the students' attitude toward their learning experience. The direction of the relationship between GBL engagement and learner satisfaction was not hypothesized before conducting the study, however, as there was not enough conclusive previous literature to determine whether the relationship would be positive or negative.

Analysis revealed that the relationship appears to be a positive one, with higher levels of Kahoot! engagement positively predicting learner satisfaction. This relationship was discovered after controlling for all covariates and both the causality and goal orientations, which indicates that the effect of game engagement on learner satisfaction is evident above and beyond these individual differences in learner traits and motivations. This is a thought-provoking finding. There can be much pressure on students to do well on graded assessments, but an attitude of satisfaction toward their learning experience is arguably just as important as objective success. These findings suggest that while game-based learning does not necessarily improve exam scores, it may contribute to a greater sense of satisfaction in the learning experience as a whole, which still makes it a potentially valuable pedagogical tool.

In addition to engagement, several other variables also significantly predicted learner satisfaction. Age and trait anxiety were also shown to be a significant negative predictors of learner satisfaction. One reason that age may negatively predict course satisfaction is the fact that older students have taken more classes, so they have more courses to compare to the one in this study. Students with trait anxiety might be naturally disposed to feel more negatively or critical about their learning experience, regardless of how well they may actually be doing.
Both mastery-approach and mastery-avoidance orientations were significant positive predictors of learner satisfaction. This is logical for the mastery-approach orientation, since these students have both the drive to learn for the sake of learning (mastery) and a positive outlook toward their chances of success (approach). It is interesting that the mastery-avoidance orientation almost equally predicted course satisfaction, since these participants have a more anxious and less optimistic expectation about their ability to succeed (avoidance). However, this orientation is still a mastery orientation, which may explain why it also positively predicts learner satisfaction, despite the avoidance aspect. Furthermore, this lack of difference suggests that the approach vs. avoidance dimension of goal achievement orientation does not have a strong impact on learner satisfaction.

**Implications**

The results of this study have theoretical implications for two established measures of learner orientation: causality orientation and goal achievement orientation. In both cases, the fact that these measures do not result in mutually exclusive orientations complicated the utility of the measures for exploring how they interact with other factors. K-Means cluster analysis was used to rectify this, and in the process provided further indication of how effective these measures are at identifying the qualities they are meant to identify.

In the case of the causality orientations, the cluster analysis provided overall support for the three orientations as conceptualized. However, the goal achievement orientation scale appears to need significant improvement. The results of the cluster analysis in this study discovered that one of the subscales, performance-approach, did not sufficiently measure what it was supposed to be measuring. It appears to be measuring competitiveness instead. If the subscale was truly measuring a performance-approach orientation, it should not be strongly
correlated with measures of other traits. However, this subscale was significantly correlated with the trait competitiveness scale, which indicates that it does not have the discriminant validity desired. Similarly, the mastery-avoidance scale appears to capture a degree of underlying academic anxiety, which was supported by its significantly positive correlation with trait anxiety, while mastery-approach was significantly negatively correlated with trait anxiety. This implies that the approach/avoidance dimension of the measure may be separating students based on academic anxiety. Although not the intention of this study, these are very important findings, as changes to the scale may result in more accurate analysis in future research and potentially strengthen goal achievement orientation theory.

There are also several practical implications from these results that are useful to instructors in higher education. First, it was found that all three causality orientations and two of the three goal achievement orientations did not significantly differ in engagement between the two reward conditions. This means that, for most of the orientation types measured in this study, reward type does not significantly change the impact of reward on student GBL engagement.

The one exception is mastery-avoidance oriented students, who were significantly more engaged when offered reward for their performance, than if offered reward for participation. It is important for instructors to seriously consider this implication when making decisions about what type of rewards to provide for engagement in game-based learning. The findings suggest that it might be better to offer rewards for performance, if the goal is to increase engagement in GBL. However, the reason for this engagement may be due to underlying academic anxiety, which is not necessarily something that educators want to evoke for the sake of engagement.

This leads to the second practical implication provided by this study, which concerns whether instructors should have the goal of increasing GBL engagement at all. This study sought
to find the value of using game-based learning to improve both exam performance and learner satisfaction. The result was split, as GBL engagement did not positively predict exam scores but it did positively predict learner satisfaction. This implies that whether or not to use GBL in higher education depends on which outcomes an instructor is looking to elicit.

While exam scores and other objective grades may be the primary focus of students and educators alike, learner satisfaction is also an important outcome. A student may perform “worse” than another student on an objective measure, but their learning experience may be more meaningful and valuable. When a student is struggling to understand something, they may enjoy deeper gratification when they finally master the material.

Moreover, in the context of the course within which this study was conducted, this may mean mastering an important and often difficult skill – public speaking. This skill has value beyond the college transcript, and many people feel stress when they initially engage in a public speaking course. Students may feel great satisfaction in their improvement over the course of the semester, regardless of the grade they receive. Thus, this study shows that engagement in game-based learning may not improve exam scores, but it may still have great value to higher education because it has the potential to improve learner satisfaction.

Limitations and Future Directions

One limitation of this study is the external validity of the results. This study focuses on one course within one university. While the number of participants that were communication majors (26.6%) was relatively low for a communication course, replication of this study in courses which cover different material is recommended. Additionally, the sample of the current study was 62.6% white, which is not surprising as the student population at the university where this study was conducted is 56% white (National Center for Education Statistics, 2018).
Therefore, it is also recommended that the study be replicated in other colleges and universities to obtain results from a broader range of ethnicities and other demographics.

Another concern regarding the generalizability of the current study’s results is the format of the stimulus. The Kahoot! game is one of many possible games that can be played as part of an exam review session. There may be aspects of this particular game, whether general game type or specific elements of its design, which had an impact on the outcomes of this study. It is entirely possible that using a different game as a stimulus in a replication of this study may result in different results. It would be advisable to vary the style of game in future studies to determine whether this is the case.

Similarly, it is possible that other forms of reward may have a greater interaction with learner orientations than the ones used in this study. In future research, the experimental manipulation of reward type should be extended past the points-for-performance vs. points-for-participation comparison to incorporate various formats of feedback, such as verbal rewards vs. tangible rewards, which previous research has indicated can further impact intrinsic motivation (Deci, Ryan & Koestner, 1999).

As with any study that relies on volunteer participation, it is necessary to consider the possibility of selection bias. For a study in an educational context, in particular, there is the possibility of particular types of students self-selecting to participate – especially when there are extra credit points offered. In the design phase of this study, however, careful consideration was made for how this might occur. It was determined that there would likely be two main reasons for a student to participate in this study. One was to obtain the extra credit for their course grade and not because of a desire to review the material for the final exam, which should entice students with control and performance orientations. On the other hand, students motivated to
participate for the opportunity to review for the final exam, regardless of extra credit points, would likely be autonomy and mastery-oriented students. Thus, the study expected to elicit interest from students across the orientations that were being explored.

Social desirability bias is also a possible concern, since this study was closely tied to a particular course, and focused on the final exam. While the researcher made every effort to assure participants that no answers would be provided to the instructor with personally identifiable data, there may have still been concerns by students that their answers would somehow impact their course or exam grade, resulting in inaccurate self-reporting of answers.

In terms of measurement, only the trait anxiety subscale of the State-Trait Anxiety Inventory - Form Y (Spielberger, 1983) was used, but not the state anxiety subscale. It may have been beneficial to include this during the post-test directly following the review session, since state anxiety could have influenced the game experience for some students and not others.

Conclusion

Game-based learning is increasingly popular due to the seemingly complimentary characteristics of games and educational approaches, and should therefore be analyzed for its true value as a pedagogical tool in higher education classrooms. The results of this study indicate that game-based learning may be a great way to improve learner satisfaction in higher education courses, for multiple learner types. GBL should not, however, be expected to improve objective outcomes such as exam scores, although the lack of a significant finding in this area may need further exploration using game performance data or a follow-up survey with participants to determine whether study participation changes subsequent final exam study habits.

This study also indicates that if instructors want to increase engagement in game-based learning, they may want to provide course points based on performance. While this does not
appear to significantly change the engagement of students with most of the orientations measured, it did significantly improve the engagement of one group: mastery-avoidance oriented students. The major drawback to this finding is that it appears to be due to underlying trait anxiety.

An additional, albeit unexpected, finding of this study is that one of the subscales of the goal achievement orientation measure, performance-approach, is lacking sufficient validity. This is an important theoretical contribution, as it allows other researchers to more closely consider their usage of the scale and may result in refinement of the measure, which would strengthen subsequent findings in this field.
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## Appendix A: Tables

### Descriptive Statistics.

<table>
<thead>
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<th>Total Sample</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>(N = 139)</td>
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<tr>
<td><strong>Age, M (SD); min/max</strong></td>
<td>19.63 (1.38); 18/25</td>
</tr>
<tr>
<td><strong>Condition, % (n)</strong></td>
<td></td>
</tr>
<tr>
<td>Participation</td>
<td>53.2% (74)</td>
</tr>
<tr>
<td>Performance</td>
<td>46.8% (65)</td>
</tr>
<tr>
<td><strong>Gender, % (n)</strong></td>
<td></td>
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<tr>
<td>Female</td>
<td>59% (82)</td>
</tr>
<tr>
<td>Male</td>
<td>41% (57)</td>
</tr>
<tr>
<td>Other</td>
<td>0% (0)</td>
</tr>
<tr>
<td><strong>Ethnicity, % (n)</strong></td>
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<tr>
<td>White</td>
<td>62.6% (87)</td>
</tr>
<tr>
<td>Asian</td>
<td>15.1% (21)</td>
</tr>
<tr>
<td>Black or African American</td>
<td>6.5% (9)</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>5.8% (8)</td>
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<tr>
<td>Multiple Ethnicities</td>
<td>10.1% (14)</td>
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<tr>
<td><strong>Class Level, % (n)</strong></td>
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</tr>
<tr>
<td>Freshman</td>
<td>31.7% (44)</td>
</tr>
<tr>
<td>Sophomore</td>
<td>33.1% (46)</td>
</tr>
<tr>
<td>Junior</td>
<td>18.7% (26)</td>
</tr>
<tr>
<td>Senior</td>
<td>16.5% (23)</td>
</tr>
<tr>
<td><strong>Goal Achievement Orientation, M (SD); min/max</strong></td>
<td></td>
</tr>
<tr>
<td>Mastery Approach (α = .81)</td>
<td>5.62 (1.21); 2.00/7.00</td>
</tr>
<tr>
<td>Mastery Avoidance (α = .80)</td>
<td>4.06 (1.40); 1.00/7.00</td>
</tr>
<tr>
<td>Performance Approach (α = .90)</td>
<td>4.86 (1.63); 1.00/7.00</td>
</tr>
<tr>
<td>Performance Avoidance (α = .67)</td>
<td>5.59 (1.19); 2.67/7.00</td>
</tr>
<tr>
<td><strong>Causality Orientation, M (SD); min/max</strong></td>
<td></td>
</tr>
<tr>
<td>Autonomy (α = .81)</td>
<td>5.69 (1.19); 3.44/7.00</td>
</tr>
<tr>
<td>Control (α = .68)</td>
<td>4.63 (0.77); 2.00/6.89</td>
</tr>
<tr>
<td>Impersonal (α = .78)</td>
<td>3.86 (0.91); 1.60/6.58</td>
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<tr>
<td><strong>Kahoot! Engagement, M (SD); min/max</strong></td>
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<tr>
<td>Focused Attention (α = .81)</td>
<td>3.16 (0.76); 1.43/5.00</td>
</tr>
<tr>
<td>Perceived Usability (α = .80)</td>
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<tr>
<td>Aesthetic Appeal (α = .86)</td>
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<tr>
<td>Reward (α = .87)</td>
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<tr>
<td><strong>Learner Satisfaction (α = .88), M (SD); min/max</strong></td>
<td>3.64 (0.72); 1.17/5.00</td>
</tr>
<tr>
<td><strong>Final Exam Score, M (SD); min/max</strong></td>
<td>82.62 (9.59); 50/98</td>
</tr>
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</table>
Table 2.

*Final Cluster Centers – Causality Orientations.*

<table>
<thead>
<tr>
<th>Cluster</th>
<th>1</th>
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<th>3</th>
</tr>
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<tbody>
<tr>
<td>Autonomy</td>
<td>0.53</td>
<td>0.44</td>
<td>-1.11</td>
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<tr>
<td>Control</td>
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<td>0.85</td>
<td>-0.52</td>
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<td>Impersonal</td>
<td>-0.90</td>
<td>0.70</td>
<td>0.03</td>
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Table 3.

*Final Cluster Centers – Goal Achievement Orientations.*

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<tr>
<th>Cluster</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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</thead>
<tbody>
<tr>
<td>Mastery-approach</td>
<td>0.09</td>
<td>0.38</td>
<td>0.29</td>
<td>0.72</td>
<td>-0.76</td>
<td>-1.40</td>
</tr>
<tr>
<td>Mastery-avoidance</td>
<td>-0.77</td>
<td>-0.40</td>
<td>1.14</td>
<td>1.22</td>
<td>-0.88</td>
<td>-0.56</td>
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<tr>
<td>Performance-avoidance</td>
<td>-1.17</td>
<td>-0.14</td>
<td>0.28</td>
<td>0.42</td>
<td>0.13</td>
<td>0.39</td>
</tr>
<tr>
<td>Performance-approach</td>
<td>-1.94</td>
<td>0.89</td>
<td>-0.83</td>
<td>1.49</td>
<td>-1.63</td>
<td>0.44</td>
</tr>
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</table>
Table 4.

*Bivariate Zero-Order Correlation Matrix.*

<table>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<td><strong>Trait Anxiety</strong></td>
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<td><strong>Trait Competitiveness</strong></td>
<td>-0.04</td>
<td>-0.29**</td>
<td>-0.24**</td>
<td>-</td>
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<tr>
<td><strong>Engagement</strong></td>
<td>0.11</td>
<td>0.18*</td>
<td>-0.07</td>
<td>0.04</td>
<td>-</td>
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<td><strong>Course Satisfaction</strong></td>
<td>-0.25**</td>
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<td>0.20*</td>
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<td>-0.04</td>
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<td><strong>Mastery Approach</strong></td>
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<td>-0.40**</td>
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<td>-0.16</td>
<td>0.19*</td>
<td>-0.49**</td>
<td>-0.44**</td>
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**. Correlation is significant at the 0.01 level (2-tailed).
*
. Correlation is significant at the 0.05 level (2-tailed).
Table 5.

*Means, Adjusted Means, Standard Deviations and Standard Errors for Kahoot! Engagement for the 6 Causality Orientation Groups*

<table>
<thead>
<tr>
<th></th>
<th>Participation</th>
<th>Performance</th>
<th>Participation</th>
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</tr>
<tr>
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<td>21</td>
</tr>
<tr>
<td>M</td>
<td>15.31</td>
<td>15.64</td>
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<td>1.46</td>
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<tr>
<td>$M_{\text{Adj}}$</td>
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<td>15.45</td>
<td>14.46</td>
<td>15.62</td>
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<tr>
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<td>0.34</td>
<td>0.38</td>
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Table 6.

*Means, Adjusted Means, Standard Deviations and Standard Errors for Kahoot! Engagement for the 3 Causality Orientation Groups*

<table>
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<th>Impersonal</th>
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</thead>
<tbody>
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<tr>
<td>(SE)</td>
<td>0.29</td>
<td>0.25</td>
<td>0.28</td>
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Table 7.

*Means, Adjusted Means, Standard Deviations and Standard Errors for Kahoot! Engagement for the 6 Goal Orientation Groups*

<table>
<thead>
<tr>
<th></th>
<th>Mastery Approach</th>
<th>Mastery Avoidance</th>
<th>Performance Approach</th>
<th>Performance Avoidance</th>
</tr>
</thead>
<tbody>
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<td>N</td>
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<td>(SD)</td>
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<td>1.84</td>
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<td>14.73</td>
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<tr>
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</table>

66
Table 8.

*Multi-step Regression Models of Predictors on Outcomes of Final Exam Score and Learner Satisfaction.*

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Final Exam Score</th>
<th>Learner Satisfaction</th>
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<tr>
<td></td>
<td>B</td>
<td>S.E.</td>
</tr>
<tr>
<td>Age</td>
<td>0.14</td>
<td>0.08</td>
</tr>
<tr>
<td>Motive to Avoid Failure</td>
<td>0.15</td>
<td>0.19</td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td>-0.27</td>
<td>0.23</td>
</tr>
<tr>
<td>Trait Competitiveness</td>
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<td>Mastery Approach</td>
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<td>Mastery Avoidance</td>
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<tr>
<td>Kahoot! Engagement</td>
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*Notes.* Final model for each outcome presented.

* p < .05, ** p < .01, *** p < .001
Appendix B: Figures

Figure 1. Theoretical Model for Hypotheses 1 - 3

Figure 2. Theoretical Model for Hypotheses 4 & 5

Figure 3. Theoretical Model for Hypothesis 6

Figure 4. Theoretical Model for Research Question 1
Figure 5. Plot of interactions between clustered causality orientations and reward conditions on Kahoot! engagement

Figure 6. Plot of interactions between clustered goal orientations and reward conditions on Kahoot! engagement
Appendix C: Measures

Causality Orientations Scale (Deci & Ryan, 1985)

These items pertain to a series of hypothetical sketches. Each sketch describes an incident and lists three ways of responding to it. Please read each sketch, imagine yourself in that situation, and then consider each of the possible responses. Think of each response option in terms of how likely it is that you would respond that way. (We all respond in a variety of ways to situations, and probably most or all responses are at least slightly likely for you.) If it is very unlikely that you would respond the way described in a given response, you should circle answer 1 or 2. If it is moderately likely, you would select a number in the mid range, and if it is very likely that you would respond as described, you would circle answer 6 or 7.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very unlikely</td>
<td>Moderately likely</td>
<td>Very likely</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. You have been offered a new position in a company where you have worked for some time. The first question that is likely to come to mind is:

   a. What if I can't live up to the new responsibility?
   b. Will I make more at this position?
   c. I wonder if the new work will be interesting.

2. You have a school-age daughter. On parents' night the teacher tells you that your daughter is doing poorly and doesn't seem involved in the work. You are likely to:

   a. Talk it over with your daughter to understand further what the problem is.
   b. Scold her and hope she does better.
   c. Make sure she does the assignments, because she should be working harder.

3. You had a job interview several weeks ago. In the mail you received a form letter which states that the position has been filled. It is likely that you might think:

   a. It's not what you know, but who you know.
   b. I'm probably not good enough for the job.
   c. Somehow they didn't see my qualifications as matching their needs.

4. You are a supervisor and have been charged with the task of allotting coffee breaks to three workers who cannot all break at once. You would likely handle this by:

   a. *Telling the three workers the situation and having them work with you on the schedule.* (Item removed)
   b. *Simply assigning times that each can break to avoid any problems.* (Removed)
   c. Find out from someone in authority what to do or do what was done in the past.
5. A close friend of yours has been moody lately, and a couple of times has become very angry with you over "nothing." You might:

a. Share your observations with him/her and try to find out what is going on for him/her.
b. Ignore it because there's not much you can do about it anyway.
c. Tell him/her that you're willing to spend time together if and only if he/she makes more effort to control him/herself. (Item removed)

6. You have just received the results of a test you took, and you discovered that you did very poorly. Your initial reaction is likely to be:

a. "I can't do anything right," and feel sad.
b. "I wonder how it is I did so poorly," and feel disappointed. (Item removed)
c. "That stupid test doesn't show anything," and feel angry.

7. You have been invited to a large party where you know very few people. As you look forward to the evening, you would likely expect that:

a. You'll try to fit in with whatever is happening in order to have a good time and not look bad. (Item removed)
b. You'll find some people with whom you can relate.
c. You'll probably feel somewhat isolated and unnoticed.

8. You are asked to plan a picnic for yourself and your fellow employees. Your style for approaching this project could most likely be characterized as:

a. Take charge: that is, you would make most of the major decisions yourself.
b. Follow precedent: you're not really up to the task so you'd do it the way it's been done before.
c. Seek participation: get inputs from others who want to make them before you make the final plans.

9. Recently a position opened up at your place of work that could have meant a promotion for you. However, a person you work with was offered the job rather than you. In evaluating the situation, you're likely to think:

a. You didn't really expect the job; you frequently get passed over.
b. The other person probably "did the right things" politically to get the job.
c. You would probably take a look at factors in your own performance that led you to be passed over.

10. You are embarking on a new career. The most important consideration is likely to be:

a. Whether you can do the work without getting in over your head.
b. How interested you are in that kind of work.
c. Whether there are good possibilities for advancement.
11. A woman who works for you has generally done an adequate job. However, for the past two weeks her work has not been up to par and she appears to be less actively interested in her work. Your reaction is likely to be:

   a. Tell her that her work is below what is expected and that she should start working harder.
   b. Ask her about the problem and let her know you are available to help work it out.
   c. It's hard to know what to do to get her straightened out.

12. Your company has promoted you to a position in a city far from your present location. As you think about the move you would probably:

   a. Feel interested in the new challenge and a little nervous at the same time.
   b. Feel excited about the higher status and salary that is involved.
   c. Feel stressed and anxious about the upcoming changes.
Goal Achievement Scale (Elliot & McGregor, 2001)

Please indicate how strongly you agree or disagree with the following statements:

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<th></th>
<th>1</th>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>Disagree moderately</td>
<td>Disagree a little</td>
<td>Neither disagree nor agree</td>
<td>Agree a little</td>
<td>Agree moderately</td>
<td>Agree strongly</td>
</tr>
</tbody>
</table>

Mastery Approach
1. I want to learn as much as possible from this class.
2. It is important for me to understand the content of this class as thoroughly as possible.
3. I desire to completely master the material presented in this class.

Mastery Avoidance
4. I worry that I may not learn all that I possibly can in this class.
5. Sometimes I'm afraid that I may not understand the content of this class as thoroughly as I'd like.
6. I am often concerned that I may not learn all that there is to learn in this class.

Performance Approach
7. It is important for me to do better than other students.
8. It is important for me to do well compared to other students in this class.
9. My goal in this class is to get a better grade than most of the other students.

Performance Avoidance
10. I just want to avoid doing poorly in this class.
11. My goal in this class is to avoid performing poorly.
12. My fear of performing poorly in this class is often what motivates me.
User Engagement Scale (O'Brien, Cairnes, & Hall, 2018)

The following statements ask you to reflect on your experience of engaging with Kahoot!. For each statement, please use the following scale to indicate what is most true for you.

<p>| | | | | |</p>
<table>
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<tr>
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<th></th>
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</thead>
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<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Neither disagree nor agree</td>
<td>Agree</td>
<td>Agree strongly</td>
</tr>
</tbody>
</table>

Focused Attention
1. I lost myself in this experience.
2. I was so involved in this experience that I lost track of time.
3. I blocked out things around me when I was using Kahoot!
4. When I was using Kahoot!, I lost track of the world around me.
5. The time I spent using Kahoot! just slipped away.
6. I was absorbed in this experience.
7. During this experience I let myself go.

Perceived Usability
8. I felt frustrated while using Kahoot!*
9. I found Kahoot! confusing to use.*
10. I felt annoyed while using Kahoot!*
11. I felt discouraged while using Kahoot!*
12. Using Kahoot! was taxing.*
13. This experience was demanding.* (Item removed)
14. I felt in control while using Kahoot!
15. I could not do some of the things I needed to do while using Kahoot!*

Aesthetic Appeal
16. Kahoot! was attractive.
17. Kahoot! was aesthetically appealing.
18. I liked the graphics and images of Kahoot!
19. Kahoot! appealed to be visual senses.
20. The screen layout of Kahoot! was visually pleasing.

Reward
21. Using Kahoot! was worthwhile.
22. I consider my experience a success.
23. This experience did not work out the way I had planned.* (Item removed)
24. My experience was rewarding.
25. I would recommend Kahoot! to my family and friends.
26. I continued to use Kahoot! out of curiosity. (Item removed)
27. The content of Kahoot! incited my curiosity.
28. I was really drawn into this experience.
29. I felt involved in this experience.
30. This experience was fun. (*reverse-coded)
Course Outcomes and Student Effort/Involvement  (Lim, Morris, & Kupritz, 2007)

For the following question items, rate your perception about the quality of COMM 1100 Public Speaking compared to other courses.

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<tr>
<td></td>
<td>Much Less</td>
<td>Less</td>
<td>About the same</td>
<td>More</td>
<td>Much more</td>
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</table>

1. My learning increased in this course.
2. I made progress toward achieving course objectives.
3. My interest in the subject area has increased.
4. This course helped me to think independently about the subject matter.
5. This course actively involved me in what I was learning.
6. I studied and put effort into this course. (Item removed)
7. I was prepared for each class (such as reading assignments).
8. I was challenged by this course. (Item removed)