DIFFERENCES IN MOTIVATION AND GAME SCORES BETWEEN MIDDLE SCHOOL STUDENTS COMPLETING DIGITAL GAME-BASED LEARNING TASKS WITH AND WITHOUT SUPPORTS OF AUTONOMY AND STRUCTURE

by

Joseph Lee Harmon

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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ABSTRACT

The purpose of this study was to determine the effect of autonomy and structure support on intrinsic motivation (IM), the facilitators of IM, and game scores during digital game-based learning (DGBL) tasks. The sample included 222 students in sixth, seventh, and eighth grade classrooms. Three instruments from the Intrinsic Motivation Inventory (IMI) were utilized during the study: (a) Perceived Choice; (b) Perceived Competence; and (c) Interest/Enjoyment. A quasi-experimental static-group comparison model research design was used to test the differences in perceived autonomy, perceived competence, interest/enjoyment, and game scores between four groups of middle school students completing online learning games in their social studies classes. One-way analyses of variance (ANOVA) were used to measure the difference in means of the three subscales on the IMI between the groups, and the difference in means in average overall game scores. The IMI was delivered via Google Forms and game scores were collected from the gaming website. The results of the study revealed that facilitators of IM are affected by teacher support prior to completing DGBL tasks, which in turn influences students overall interest and enjoyment. Teacher support or non-support, however, had no effect on game-scores. Upon analysis of the data, the researcher rejected the null hypotheses that there is no statistical difference in perceived choice, perceived competence, and interest/enjoyment between groups receiving varying supports or non-supports from their teachers prior to gameplay. However, the researcher failed to reject the null hypothesis that there is no statistical difference in game-scores amongst these same groups. Further research is needed to determine the ways in which motivation and achievement is fulfilled within the DGBL environment.

Keywords: Game-based learning, intrinsic motivation, autonomy, competence, self-determination theory

Dedication

I dedicate this dissertation first and foremost to my awesome God who nudged me to begin this long, often times difficult, yet rewarding journey. Second, I dedicate this to my wife Kelli; she has encouraged me, left me alone to grumble when I was frustrated, and shared in my joys and triumphs. She is my "always forever". Lastly, I dedicate this to my five children. I was fortunate to share my course intensive weeks with my two teen daughters. This dissertation is the end-result of those weeks which included a lot of great non-school related, father-daughters memories. To all my children, this dissertation serves as a symbol of my prayer for all of you: Never stop learning.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

Analysis of Variance (ANOVA)

Cognitive Evaluation Theory (CET)

Digital game-based learning (DGBL)

Intrinsic motivation (IM)

Intrinsic Motivation Inventory (IMI)

Pennsylvania Department of Education (PDE)

Self-Determination Theory (SDT)

Serious games (SG)

CHAPTER ONE: INTRODUCTION

Background

Motivation has been defined as a construct that describes the internal or external forces that initiates and drives behavior, and prompts it to persist (Vallerand, 2007). The most optimal form of motivation is intrinsic motivation (IM); an intrinsically motivating activity is done because it is satisfying and pleasurable (Deci & Ryan, 2000). Having a lesson that fosters IM leads to student success in the classroom (Radel et al., 2014) and improves learning outcomes (van Loon, Ros, & Martens, 2012). Yet studies indicate that IM decreases for students between the ages of 9 to 14 (Gillet, Vallerand, & Lafreniere, 2012). Two factors that have been shown to influence IM are the innate need for individuals to feel autonomous and competent with the task at hand (Deci & Ryan, 2000). Autonomy is generally defined as the feeling that one's actions are self-caused and not externally pressured or coerced (Deci & Ryan, 2000), while competence is generally defined as the ability to produce a desired outcome and not merely to succeed in an activity (Deci, Vallerand., Pelletier, & Ryan, 1991; Ryan & La Guardia, 2000). Both are theorized to be facilitators of IM (Deci & Ryan, 2000).

Digital game-based learning (DGBL) is a recent trend that is gaining attention from researchers due to its potential to motivate and to enhance learning through rich experiences, play, and interactivity (Chee, Mehrotra, & Liu, 2013). Digital game-based learning is generally defined as using a game, delivered by digital hardware or software, with educational objectives (Papastergious, 2008; Prensky, 2001). Although some have disregarded DGBL as mere entertainment, others see it as a means to conjoin fun and serious learning in the classroom (Prensky, 2001). It has the ability to change the learning process and reach those of the "Games Generation" who tend to view traditional learning as mundane (Prensky, 2001).

Since the inception of computer technology and its subsequent infusion into the classroom, classroom teachers have been provided with the tools to make lessons interactive, engaging, and fun. However, even though technology saturates and perhaps even enriches the lives of 21st century students, it cannot be assumed that a digital learning game is automatically motivating (Kiili, 2005). While sustaining student interest in the classroom can be supported through the use of digital gaming, the psychological state of interest fluctuates in the classroom setting and between individuals (Tsai, Kunter, Ludtke, Trautwein, & Ryan, 2008).

Modern digital games are rooted in nineteenth century coin operated amusement machines. By the mid-20th century, technology had evolved to "amusement machines" that coupled graphics terminals with computers (Bristow, 1977). It is believed that 1961 was the dawn of modern video games when "Space War," the first interactive computer game, was programmed onto an early data processor (Bristow, 1977). By the early 1970's, the cost of creating video games became more sustainable; first came coin-operated game systems and home game systems followed shortly after (Bristow, 1977). Initially, digital games were designed purely for fun and without intentional learning outcomes. The business sector was one of the first to take advantage of digital gaming for purposes of learning. During the 1980's, various businesses began to use interactive and engaging simulations to train their employees (Gros, 2007). The next decade saw the birth of online games delivered via the internet (Hess & Gunter, 2013). The attractiveness of online gaming was its accessibility. There was no need for a gaming console or software; users merely needed access via the Internet (Hess & Gunter, 2013).

Today's students were born after 1980 and are therefore considered "digital natives," a term first used by Marc Prensky (2001) in his seminal book, *Digital Game Based Learning*.

Prensky assumed these students were automatically familiar and enthused with digital technology. Although today's students may be familiar with the digital world and accustomed to computers, video games, and the Internet, studies indicate that students are not automatically enthusiastic about using technology over traditional forms of learning (Thirunarayanan, Lezcano, McKee, & Roque, 2011). In their review of literature on learners in the digital era, Gallardo-Echenique et al. (2015) encouraged further research on what it means to be a learner in the digital era. They specifically assert that being a learner in the digital era does not mean students are automatically competent with digital technology, nor does it mean they are motivated to use it for educational purposes (Gallardo-Echenique et al., 2015).

Since the 1950's, learning through gaming has grown as a research field, especially in the business sector (Gros, 2007). The business sector continued to broaden their research during the 1970's and 1980's, but its focus remained on simulations and not necessarily games (Gros, 2007). Although research in DGBL was slow to get started, from 2006 to 2010, the number of studies of serious games in education quadrupled over the previous five years (Hwang & Wu, 2012). Later, the research field evolved to focus on the context by which digital games are facilitated by the teacher within the classroom (Gros, 2007).

Digital game-based learning is a branch of serious games (SG) where learning outcomes are clearly defined. Serious games expanded after the Serious Games initiative and Summit of 2002 (Gros, 2007). Initial SG's were created by the business sector for training purposes such as management and leadership (Susi, Johannesson, & Backlund, 2007). An SG differs in purpose from a traditional video game. Initially, the goal of video games was to instill enjoyment, not to educate. By contrast, the expressed purpose of a serious game is to educate, although enjoyment is still a desired outcome (Susi et al., 2007).

Motivation and Technology

Motivated learners are hard to find, and according to Garris, Ahlers, and Driskell (2002), difficult to create. Research concerning motivation and technology reveals that constructs of autonomy and competence to be distinct and vital for fostering IM (Deci et al, 1991; Sheldon & Filak, 2008), that motivated learners perform better in the classroom (Cortright et al., 2013; van Loon et al., 2012) and that autonomy support and perceived competence boosts student engagement, effort, and performance (Cortright et al., 2013; Tsai et al., 2008). Each construct can be fostered by the method of instruction (Berger & Hanze, 2009) and make for a good learning experience for students (Sheldon & Filak, 2008).

Further, perceived autonomy was found to be a significant predictor of enjoyment in a non-educational web-based video game (Kim et al., 2015) and satisfying both competence and autonomy was found to predict enjoyment for individuals playing a non-educational game (Rieger, Wulf, Kneer, Frischlich, & Bente, 2014). While perceived autonomy was shown to correlate to higher IM for students (Bieg, Backes, & Mittag, 2011), competence had a more significant effect in a non-DGBL environment (Sheldon & Filak, 2008). Similarly, perceived competence has demonstrated a significant effect on learning outcomes (Liu, Horton, Olmanson, & Toprac, 2011). Qualitative data revealed "choice" to be inconsequential for student interest in a game; the media-rich environment was enough to keep their interest (Liu et al., 2011). Teachers have the ability to foster IM by ensuring the basic psychological needs (BPN) of autonomy and competence are met (Cortright et al., 2013).

Motivation and DGBL. In the past, educational practices tended to be more controlling, thus inhibiting the constructs that increase motivation (Deci et al., 1991). Digital game-based

learning allows students to work individually, at their own pace, and with their own outcomes, all of which are desirable behaviors for fostering motivation (Tsai et al., 2008). However, social context plays an important role in determining a student's motivation and prior research indicates that a student's psychological state of interest fluctuates in the classroom setting (Tsai et al, 2008). In addition, there still lacks definitive empirical evidence for the effectiveness of DGBL in the classroom (Tsai et al., 2008).

Previous research in DGBL supports its motivating effect. Wang (2015) asserted that games can be used in replacement of traditional learning or integrated within traditional classroom activities to improve motivation. Elementary students playing math games were motivated to learn math after playing 30 hours of games over a course of three months (Divjak & Tomic, 2011), and their enjoyment in math increased after playing an online math quest with gaming elements (Chen, Liao, Cheng, Yeah, & Chan, 2012). There are still mixed results, however, concerning the motivational effects of digital games (Girard, Ecalle, & Magnan, 2013). Perceived autonomy does not necessarily influence students' engagement during gameplay (Eseryel et al., 2014) and variability in the characteristics of learning games makes it difficult to generalize their effects (Garris et al., 2002; Girard et al., 2013).

Theoretical Framework

The theory employed in this study is self-determination theory (SDT), developed by Richard Ryan and Edward Deci (Deci, Vallerand, Pelletier, & Ryan, 1991), which has been used to study students' interest in learning. Self-determination theory looks at motivation as a multi-dimensional construct and proposes universal basic needs of autonomy, competence, and relatedness that must be satisfied to trigger IM (Deci et al., 1991). Autonomy is the feeling of freedom without outside influence (Ryan & Deci, 2008). Competence is the feeling of

proficiency at doing a task; it can be facilitated by providing structure such as goals, strategies, and limits (Deci et al., 1991; Ryan & Deci, 2008). Intrinsic motivation is doing something for its own sake because it is enjoyable and pleasurable (Deci et al., 1991). According to Deci et al. (1991), autonomy and competence are facilitators of IM. Self-determination theory has been empirically examined across an array of domains to experimentally assess the factors that inhibit and promote self-motivation (Ryan & Deci, 2008). Cognitive Evaluation Theory (CET) is a sub-theory of SDT; it is concerned with the environmental factors that serve as catalysts to boost IM. The theory indicates that intrinsically motivating activities are strengthened by boosting the psychological needs of competence and autonomy (Deci & Ryan, 2000). As applied to this study, this theory suggests, when coupled, autonomy support and structure will positively influence students' perceived autonomy, competence, and IM. It further posits that autonomy and competence are innate needs to be satisfied, and necessary ingredients for an activity to be deemed intrinsically motivating (Deci et al., 1991).

Problem Statement

While many studies have explored the influence of perceived autonomy and competence during learning tasks, and even digital learning tasks, few have empirically measured how they are perceived in DGBL tasks and ultimately how that impacts IM. Previous research has revealed the influences of perceived autonomy and perceived competence to be context specific in an online environment (Hartnett, St. George, & Dron, 2014). Burgers, Eden, van Engelenbeurg, & Buningh (2015) affirmed IM is central for entertainment games, yet research is still lacking on the effects of IM using digital learning games. Previous research on supports of autonomy and competence during a digital learning task was conducted by van Loon et al. (2012), however, they claimed their "research consisted of a relatively short task." "In future research, the effects

of autonomy support and structure on student motivation [should be] examined in digital tasks [requiring] more time completing them" (van Loon et al., 2012, p. 1028). Guo-wei & Chung-Shan (2013) asserted that DGBL is a relatively new instructional tool within the digital learning arena. Shen, Liu, and Wang (2013) claimed online gaming as an example of an Internet application that can satisfy children's BPN of autonomy and competence, but suggest additional research to explore how autonomy and competence are perceived using specific types of Internet applications, such as online gaming. Bachman and Scherer (2015) later concurred; they assert that research is still needed in online learning contexts to explore autonomy, competence, and enjoyment.

Using CET as a framework, Burgers et al. (2015) also revealed that additional research on motivation was needed outside the lab setting. Sorebo and Haehre (2012) did a correlational study of perceived autonomy, perceived competence, and self-reports of IM using digital learning games, but no causal-relationship could be inferred. They concluded that further research in perceived autonomy, perceived competence, and IM are needed using more experimental style studies (Sorebo & Haehre, 2012). The problem is there is a lack of experimental studies of the effects of autonomy and competence support in the digital learning environment (Burgers et al., 2015; Chen & Jang, 2010), especially using digital learning tasks over longer durations (van Loon et al., 2012). Further, Shen et al. (2013) proclaim a need to investigate the effects of autonomy and competence support in online gaming environments.

Purpose Statement

The purpose of this quasi-experimental, static-group comparison study was to determine the effect of autonomy and structure support on IM, the facilitators of IM, and game scores during DGBL tasks. The sample population comprised middle school students in three different

Pennsylvania public schools. The following served as the independent variables: (a) autonomy-supportive, with structure; (b) autonomy-supportive, without structure; (c) non-autonomy supportive, with structure; and (d) non-autonomy supportive, without structure; manipulated based on the BPN for an activity to be perceived as intrinsically motivating, as proposed by CET. The independent variables included four different groups of students playing online learning games in class over a one week period. The groups were defined as such: Group A: with autonomy support and with structure; Group B: with autonomy support and without structure; Group C: without autonomy support and with structure; and Group D: without autonomy support and without structure. Group D served as a control group; they had no supports or inhibiting treatments. Group D students were simply instructed to log on and play the assigned games. The dependent variables were generally defined as: (a) perceived autonomy; (b) perceived competence; (c) interest/enjoyment; and (d) average game scores.

Significance of the Study

Recently, many researchers have been concerned with the BPN of perceived autonomy and competence, as well as self-reported measures of IM in a variety of school environments. Studies conducted in a library setting have revealed the importance of perceived autonomy (Arnone, Reynolds, & Marshall, 2009; Berger & Hanze, 2009; Bieg et al., 2011; Sheldon & Filak, 2008; Sorebo & Haehre, 2012). However, van Loon et al. (2012) were the first to investigate supports of autonomy and competence in classrooms using digital learning tasks.

This study contributes to the body of knowledge surrounding SDT, specifically to classrooms using digital learning. First, it determines the effectiveness of providing supports of autonomy and competence. There have been mixed results of how perceived autonomy and competence, and interest and enjoyment are supported in digital learning tasks (Kanar and Bell,

2013; Shen et al., 2013). This study measured how autonomy and competence, needs which predict IM, are perceived - and how students self-report IM in a classroom using digital learning over a period of time. Gauging these needs and IM after experiencing digital tasks over time was lacking in previous research (Kanar & Bell, 2013; van Loon et al., 2012). Lastly, this study extends SDT research into online educational gaming (Shen et al., 2013), which will likely be mainstream within the next couple of years (Li & Tsai, 2013).

Research Question

The following research question is proposed:

RQ1: Is there a significant difference in middle school students' motivation and game scores among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments?

Null Hypotheses

The following null hypotheses are proposed:

$H_0$1: There is no significant difference in middle school students' perceived autonomy, as measured by the perceived choice subscale of the IMI, among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments.

$H_0$2: There is no significant difference in middle school students' perceived competence, as measured by the perceived competence subscale of the IMI, among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without

structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments.

$H_0$3: There is no significant difference in middle school students' interest/enjoyment, as measured by the perceived interest and enjoyment subscale of the IMI, among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments.

$H_0$4: There is no significant difference in students' average game scores, as measured by students' end scores on the five digital game-based learning tasks, among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments.

Definitions

The following definitions were used for this study:

1. *Autonomy* – is the feeling of freedom from outside control and the ability to direct one's own interests, even if one's actions are influenced by others (Ryan & Deci, 2000; Ryan & Deci, 2008). It is not merely acting independently (van Petegem, Marten, van Steenkiste, & Soenens, 2012).
2. *Autonomy support* - the practice of supporting autonomy which is fostered by providing relevance of task through explanatory rationale, relevance of the task at hand, opportunities for choice, and non-controlling language (Reeve & Halusic, 2009).
3. *Basic psychological needs (BPN)* – constructs including autonomy, competence, and relatedness (Ryan & Deci, 2000a).

4. *Competence* – efficacy after task completion; a student's understanding of how to achieve an outcome and feeling of efficiency at doing the task (Deci et al., 1991). Self-determination theory asserts a structure supportive environment increases student competence (Ryan & Deci, 2008).
5. *Digital game-based learning (DGBL)* – games that are made for the purpose of education or training, and not for the purpose of entertainment (Girard et al., 2013; Susi et al., 2007). They are delivered in a digital format, through computer software, or via Internet (Hess & Gunter, 2013).
6. *Extrinsic motivation* –behavior that is performed, not out of interest or pleasure, but to achieve a separate outcome (Deci et al., 1991). Extrinsic motivation exists on a continuum from the least self-determined behavior to a high level of self-determined behavior (Ryan & Deci, 2000b).
7. *Intrinsic motivation (IM)* – doing an activity because it is satisfying and pleasurable (Deci & Ryan, 2000).
8. *Locus of causality* – the perception that an individual caused their own actions, without external force, persuasion, or coercion (Deci & Ryan, 2000).
9. *Self-determined action* – an action that is fully endorsed from within; it is done by one's own choosing, and not in compliance to external or internal pressures or devices (Deci et al., 1991).
10. *Structure support* – in the context of this study, involves providing clear expectations and guidance for the classroom activity (Reeve & Halusic, 2009).

CHAPTER TWO: LITERATURE REVIEW

Introduction

This chapter focuses on the theoretical framework for this study, the current literature concerning the theory, and the extant literature supporting the focus of the study. The theoretical framework used for this study is self-determination theory (SDT). Self-determination theory is a meta-theory of motivation that views the construct in a multi-faceted manner (Ryan & Deci, 2000a). The review will expand on the different dimensions of motivation, including intrinsic motivation (IM) and the factors that predict IM, and how IM differs from extrinsic motivation. It will conclude with the recent research relating to IM and its predicting factors as outlined under SDT. An explanation of digital game-based learning (DGBL) will be provided, including the current literature on DGBL and its effectiveness in the classroom in terms of learning and motivation. This chapter will conclude with a summary which includes weaknesses in previous studies concerning SDT and DGBL, the gaps in the literature, and calls for future research.

Theoretical Overview

Self-determination theory is specifically concerned with the underlying factors that cause, sustain, and enhance IM (Ryan & Deci, 2000a). Unlike previous motivation research that was goal-oriented, SDT focuses on what regulates the processes for pursuing specific goals and outcomes (Benita, Roth, & Deci, 2013; Deci & Ryan, 2000). A self-determined action is one that is fully endorsed from within, done by one's own choosing, and not in compliance with external or internal pressures or devices (Deci et al., 1991). Thus, SDT uses a term called locus of causality, which refers to where an individual perceives a behavior is initiated (Reeve, Nix, & Hamm, 2003). If an individual's action stems from personal causes, or an internal locus of

causality, then it is deemed high in self-determination (Reeve et al., 2003). Conversely, actions that arise due to external loci of causality can be deemed as forced, and thus low, or not self-determined (Reeve et al., 2003).

Similar to other need theories, SDT assumes that all humans have a universal set of needs (Hull, 1943; Deci & Ryan, 2000; Sheldon, Abad, & Omoile, 2009). Previous need theorists such as Hull (1943) focused on physiological needs. He claimed that humans pursue needs such as food and water to ensure their health is satisfied (Hull, 1943). There is little argument over physiological needs being important for human functioning; withhold food and water and one will not survive (Ryan & La Guardia, 2000). Psychological needs are a bit more controversial, with argument concerning what constitutes a "need" (Ryan & La Guardia, 2000). Other prior need theorists also posited the vitality of fulfilling psychological needs, claiming they were not innate but learned traits (Murray, 1938). Need theorists such as Henry Murray viewed needs in a broad manner characterizing any force that drives action as a need. Therefore, constructs such as lust can be viewed as a need because they drive an individual to action. In fact, Murray (1938) identified more than 20 psychological needs. According to SDT, the most effective human functioning occurs if the basic psychological needs (BPN) of competence, relatedness, and autonomy are all met (Ryan & Deci, 2000a). In contrast to Murray, SDT posits that needs are innate, and not learned traits; meeting these needs affects how goals are pursued (Deci & Ryan, 2000). For these reasons, humans tend to be drawn to activities that fulfill their basic needs and avoid those that do not (Ryan & La Guardia, 2000).

Cognitive Evaluation Theory

Cognitive Evaluation Theory (CET) is a humanistic sub theory of SDT and is particularly concerned with how supporting the needs of autonomy and competence can strengthen IM (Deci

& Ryan, 2000; Mandigo & Holt, 2000; Ryan & Deci, 2000a; Ryan & Deci, 2000b). Because IM is inherent, it can be catalyzed if individuals are in the right conditions (Ryan & Deci, 2000b). Intrinsic motivation is boosted if external events are not perceived as controlling and if competence is perceived during a given activity (Mandigo & Holt, 2000; Ryan & Deci, 2000a). To ensure competence, activities should hold a challenge, without being too difficult to accomplish (Mandigo & Holt, 2000). Optimal challenge equates to more enjoyment and the likelihood that the individual will spend more time doing an activity (Mandigo & Holt, 2000). Other factors that boost competence are external factors such as feedback that corrects errors and helps individuals improve at a task, as well as non-controlling rewards (Mandigo & Holt, 2000). Autonomy supportive actions such as providing choice, acknowledging feelings, and allowing self-direction have all been shown to enhance IM (Ryan & Deci, 2000b). External factors that can thwart IM include the use of threats and deadlines (Ryan & Deci, 2000b). It must be stated that CET holds true only for activities that are a novelty or of intrinsic interest to the individual initially (Ryan & Deci, 2000a). Novelty is difficult because motivation wanes after the novelty wanes. For instance, in a study of 8th and 9th grade students; those that viewed course material in a more novel manner experienced more interest and motivation), but those feelings were short lived as the novelty wore off (Loukomies, Pnevmatikos, Lavone, et al., 2013).

Historic Overview

During the 1940's and 1960's, operant and learning theories were dominant in behavior theory (Ryan & Deci, 2000a). Learning theory claimed that behaviors were driven by psychological drives – that if a need can be satisfied, it is seen as motivating (Ryan & Deci, 2000a). These theories laid the foundation for the concept of IM, and ultimately SDT (Ryan & Deci, 2000a).

During the 1950's and 1960's, research shifted to a more organismic approach to motivation (Vallerand, 2007). There was an increased interest concerning how the innate needs of competence, autonomy, and relatedness are fulfilled (Vallerand, 2007). It was within this setting that SDT was developed (Vallerand, 2007).

Dr. Edward Deci adopted the term self-determination theory in 1980 to differentiate motivation that is determined from outside sources, such as from reward or avoidance of guilt, from motivation that stems from one's internal intentions (Reeve et al., 2003). In contrast to other theories on motivation, SDT does not view motivation as a single construct but as multi-faceted (Ryan & Deci, 2000a). Previous motivation research focused on the desires and outcomes that occurred as a result of initiating certain behaviors and expectations with more of a focus on the motivators that encouraged people toward selecting goals and outcomes (Deci & Ryan, 2000).

Basic Psychological Needs

In SDT, optimal psychological effects occur if all three basic needs (autonomy, competence, and relatedness) are fulfilled; undermining any of those needs thwarts the effects (Ryan & Deci, 2000a). Research indicates that each of the three needs is distinct and important to achieve optimal motivation (Sheldon & Filak, 2008). Therefore, humans tend to pursue and engage in activities, on their own volition, that support these needs (Ryan & Deci, 2000a; Vallerand, 2007). If these psychological needs are being met, SDT asserts humans do not seek to keep doing an activity merely because needs are being satisfied, but because the activity is interesting or important (Deci & Ryan, 2000). This has implications for the classroom: if a student can be mobilized to act out of his or her interests and enjoyment, positive outcomes will follow (Ryan & Deci, 2000b). The context of the classroom can either thwart or facilitate these

needs, thus effecting students' perceptions of how their needs are fulfilled, and effecting their engagement in learning (Stefanou, Perencevich, DiCintio, & Turner, 2004). Overall, SDT provides the theoretical framework upon which to examine the contextual factors that enhance motivation (Chen & Jong, 2010).

Autonomy. According to SDT autonomy is more than just acting independently (van Petegem et al., 2012). The need for autonomy can be defined as the feeling of freedom without influence (Ryan & Deci, 2008) or pressure from external sources (Reeve et al., 2003). It means being able to pursue one's own interests without feeling coerced or externally led to do so, either by force or obligation (Deci & Ryan, 2000; van Petegem, et al., 2012). While acting independently has been equated with problem behavior, autonomy has been shown to have a positive influence on effect (van Petegem et al., 2012). Tasks are deemed to fulfill the need for autonomy if individuals feel the locus of causality was their own: in other words, they caused their own actions (Deci & Ryan, 2000). Put another way, the higher the internal loci of causality, the higher the perceived autonomy - and the higher the IM (Deci & Ryan, 2000). According to SDT, the need for autonomy is the most important element for motivation to be intrinsic in nature (Deci & Ryan, 2000) and the most prominent indicator for the perception of autonomy (Taboada, Kidd, & Tonks, 2010). Students are intuitively aware if an environment supports their needs for autonomy yet data indicates that high school students view their classrooms as non-autonomy supportive (Hafen, Allen, Mikami, et al., 2012). In one study, increased age was negatively correlated with perceived autonomy support from both parents and teachers of high school students in India and Nigeria (Sheldon et al., 2009).

Autonomy transcends culture. While independence is largely a Western phenomenon due to the highly individualistic nature of these cultures (Patall, Cooper, & Robinson, 2008;

Sheldon et al., 2009), SDT posits that autonomy is not merely acting in one's own accord. According to SDT, autonomy is the phenomenological experience that accompanies the feeling of independence (van Petegem et al., 2012). It therefor transcends culture, though may be expressed differently or may have different catalysts that satisfy it across cultures (Ryan & La Guardia, 2000; Sheldon et al., 2009).

Several studies have empirically verified the benefits of autonomy support across cultures globally. The effect of autonomy support on emotional engagement in class appears to transcend gender, race, and achievement level (Park et al., 2012). This was true for Spanish students (Sanchez-Olivia, Sasnchez-Miguel, Leo, Kinnafick, & Garcia, 2014). German students school engagement and stress mediated by all three needs (Raufelder, et al., 2014). Nigerian and Indian high school students' life satisfaction was mediated by autonomy need satisfaction (Sheldon et al., 2009). Chinese high school students' perceptions of autonomy contributed to their feelings of well-being in school (Tian, Chen, & Huebner, 2012). Belgian secondary students perceived autonomy supportive behaviors by their teachers (Haerenans et al., 2013; Sierens, Vansteenkiste, Goosens, et al., 2009).

Provisions of choice. Autonomy is largely perceived as providing choice (Assor, Kaplan, & Roth, 2002; Haerenans et al., 2013; Sheldon et al., 2009). Choice is viewed as the most prominent and noticeable indicators of perceived autonomy (Taboada et al., 2010) and is deemed as the agent that shifts the locus of causality from being forced by external forces, to feelings of freedom and self-determination (Reeve et al., 2003).

In the classroom, autonomy is supported by providing choices and by acknowledging the interests of the students (Deci & Ryan, 2000). It is believed that by allowing others to choose

their course of actions, they will cherish the behavior and work toward more positive results (Patall, et al., 2008).

The provision of choice is context specific and has varied throughout the research. In some studies, choice meant allowing students to work in their own manner, while giving students the opportunity to move about the class or work with others, allowing students to use their own methods to complete classroom activities (Wallace, Sung, & Williams, 2014), or to choose the most interesting course materials to reach a curricular goal, were used as other examples (Taboada et al., 2010). Choice has meant allowing students to decide the amount of time they spend on work, which work to do, and effort assigned (Reeve et al., 2003). Overall, provisions of choice are believed to offer students a sense of control over their environment (Hafen et al., 2012).

However, there are variables that can influence the ways in which choice provisions affect motivation. Such factors can include the cognitive demands of the choices, the background of the student, and the number and types of options (Reeve et al., 2003; Katz & Assor, 2007). Patall et al. (2008) concur: only meaningful choices will have the best effect on motivation. Merely providing options does not necessarily equate to higher IM (Reeve et al., 2003). Patall (2013) suggests that a student's initial level of interest in a specific activity can help determine the number of choices and what type of choice should be provided. Fewer choices is often better because they are not cognitively demanding; however, too few choices may not provide the perception of autonomy (Patall et al., 2008). In a meta-analysis of choice research, Patall et al. (2008) concluded that IM was greatest when there were three to five choices and multiple opportunities for choice were presented. Initial choices lacking subsequent choices do not necessarily affect feelings of volition nor internal locus of causality (Reeve et al., 2003). In

addition, being cognizant that choices are available heightens the motivational effect while denying choice in the same situation feels controlling (Patall et al., 2008).

The provision of choice relies on flexibility. Providing choice in an environment that allows flexibility is theorized to enhance self-determination and IM (Reeve et al., 2003). In the classroom, this means following students' leads on their comments, interest, and ideas (Wallace et al., 2014). It additionally means taking the students' perspective and listening to their needs (Reeve & Halusic, 2009; Sheldon et al., 2009). Having a say in their education, voicing their opinions, and doing things that allow high school students to express their personality were all deemed as means for teachers to provide choices (Garn & Jolly, 2014; Reeve & Halusic, 2009).

While it is agreed that providing choice is a vital aspect of the classroom that theoretically boosts IM (Reeve et al., 2003), the benefits of providing choice has been empirically confusing (Katz & Assor, 2007). First, assessing the benefits of choice provisions is difficult because of the subjective values attached to the types of choices (Taboada et al., 2010). While choice may be a universal and innate desire, type of choice and perception of choice is dependent on a multitude of variables. For instance, age has been a factor: younger students enjoy making choices, and qualitative interviews revealed feelings of happiness when they were provided with choices (Taboada et al., 2010). However, younger students may not realize which choices support their personal goals or interests (Assor et al., 2002). Second, students can become overwhelmed with the task at hand or the number of choices presented (Katz & Assor, 2007). Seventh grade students in Germany were provided choice and non-controlling behavior that were intended to make students feel more autonomous but had the opposite affect (Furtak & Kunter, 2002).

Role of the teacher. Teaching style is a continuum from highly controlling on one end to high in autonomy support on the other (Reeve & Halusic, 2009). However, autonomy support does not mean leaving students to their own accord. Research shows elementary students are able to detect a multitude of autonomy supportive behaviors by their teachers (Assor et al., 2002). The goal of autonomy supportive teaching is to support students' inner-motivational resources (Reeve & Halusic, 2009). Supporting students' interests and preferences, taking their perspective, and providing rationale for the lessons can serve to accomplish this (Reeve & Halusic, 2009).

Relevance. Another variable that affects autonomy in the classroom is relevance. This is accomplished by first providing the purpose and objectives of the lesson and then encouraging students to evaluate their own goals, values and interests (Wallace et al., 2014). It is also means providing explanative rationale. Autonomy becomes supported when students are provided an activity's relevance and meaningfulness (Haerenans et al., 2013).

Language support. Autonomy support even has to do with teachers' language. Language that is flexible and non-controlling is deemed more autonomy supportive (Reeve & Halusic, 2009). For instance, directing a student with a "you should" versus "I suggest" statement or acknowledging students' feelings by asserting "I realize this may be boring, but…", is deemed more autonomy supportive (Reeve & Halusic, 2009). Words that support can also include "consider, suggest, encourage, and invite" or phrases such as "this will help you," or "the reason for this is" (Young-Jones, Cara, & Levesque-Bristol, 2014). When combined with rationale, middle school teachers who adopted more supportive language had students who perceived choice higher which correlated to higher interest and enjoyment (Benita et al., 2013). This was echoed in a lab setting where participants perceived higher choice, reported higher

interest and enjoyment, and felt less pressure and tension (Benita et al., 2013). Undergrad students had similar results. When verbal and non-verbal support was provided, students felt higher experiences of learning climate, greater feelings of choice, and stronger intentions to continue the course in the future (Young-Jones et al., 2014). Non-verbal cues included the teacher moving around in front and sitting at the desk occasionally to convey an open feeling (Young-Jones et al., 2014).

Research on autonomy supportive classrooms. Prior research in authentic classroom settings reveals teachers with high levels of autonomy in their instructional style have higher levels of IM and positive emotion in the classroom (Mandingo, Holt, Anderson, & Sheppard, 2008; Tsai et al., 2008). However, as students get older, they perceive their teacher as less autonomy supportive, which weakens their motivation (Gillet et al., 2012). Students who reported higher levels of perceived autonomy from their teacher had higher motivation in the classroom (Furtak & Kunter, 2012; Mandingo et al., 2008). This is consistent with research asserting teacher autonomy support having a mediating effect on motivation, even greater than the effect provided by parental autonomy support (Gillet et al., 2012). Across several school subjects, elementary students experienced more perceptions of involvement, and were more willing to participate in class (Miserandino, 1996). This was especially true when teachers were able to foster relevance and suppress criticism (Assor et al., 2002). Students were more persistent and curious (Miserandino, 1996) and evaluated courses in a positive manner (Sheldon et al., 2009). Similarly, students in grades four through eight became more invested in the classroom practices and were thus more cooperative with their teachers (Wallace et al., 2014). Autonomy was the strongest of all three needs contributing to engagement (Skinner, Chi, & The Learning-Gardens Educational Assessment Group, 2012) and achievement (Diseth & Samdal,

2014) for high school students. When choice, relevance, and flexibility are incorporated into a middle school class, there were high levels of student engagement and positive interpersonal climates (Wallace et al., 2014). Relevance and choice was positively correlated to classroom engagement (Hafen et al., 2012). In a physical education class, students wanted to keep doing a specific activity after teachers used autonomy supportive strategies (Mandingo et al., 2008). Autonomy has been linked to classroom success (Skinner et al., 2012) and associated with higher perceived competence in doing an activity (Mandingo et al., 2008; Patall, 2012). Merely providing support in the form of choice led students to outperform their non-choice counterparts over a four month period (Patall, 2012).

Just as the benefits of autonomy support have been empirically verified through numerous studies, the lack of supporting autonomy, or having a controlling classroom environment has been problematic. Lack of autonomy support led to students' feelings of anxiety, anger, boredom, and admission to faking their way through lessons (Miserandino, 1996). However, even with autonomy supportive strategies, class can still be deemed boring if the activities are too easy (Mandingo et al., 2008).

Competence

According to the SDT framework, competence is more than just the feeling of self-efficacy - it is having the ability to produce a desired internal or external outcome (Deci et al., 1991; Ryan & La Guardia, 2000). This differs from the work of social-cognitive theorists such as Albert Bandura who posit competence as the ability to succeed in an activity (Ryan & La Guardia, 2000).

According to SDT, competence can be fostered through feedback, by providing goals and limits, and by providing strategies for success (Ryan & Deci, 2008). Providing choice in an activity that students are highly interested in doing has similar effects (Patall, 2012).

Research on supporting the basic psychological needs

Studies indicate that the effects of how needs are perceived and satisfied depended on the age group and type of activities being experienced.

Well-being. Well-being has been associated with the support of the BPN as posited by SDT. Well-being focuses on the subjective feeling of happiness and perceptions of life elements as good or bad (Tian et al., 2012). Life satisfaction was mediated by satisfaction by all three BPN for 15 and 16 year olds doing leisure activities (Leverson, Danielson, Birkeland, & Samdal, 2012) and for high school students in India and Nigeria (Sheldon et al., 2009). This was also true for overall feelings of school well-being (Tian et al., 2012). Relatedness and competence were the most important indicators while feelings of autonomy were not as important, yet still statistically significant (Leverson et al., 2012). Controlling environments were shown to coincide with feelings of anxiety and anger (Miserandino, 1996), perceived stress, and both behavioral and emotional school engagement (Raufelder, Kittler, Braun, et al., 2014).

Learning, performance, and engagement. One of the main benefits of supporting the psychological needs of autonomy, competence, and relatedness is the effect on learning, performance, and engagement. For junior college students supporting all three needs was accompanied by higher self-regulated learning and better grades (Liu, Wang, Kee, et al., 2013). For elementary students, supporting competence and autonomy proved to increase students' efforts in class (Miserandino, 1996). Engagement in the learning process proved beneficial when all three needs were supported in low performing schools (Park, Holloway, Arendstz, Bempechat

& Li, 2012), while negative perceptions of autonomy and competence were associated with negative affect, and a decline or avoidance in school work (Miserandino, 1996). Park et al. (2012) discovered engagement fluctuates as a result of the context of the learning environment, which in turn was shaped by the supports of autonomy, competence, and relatedness. Fulfilling all three needs directly related to persistence and performance in the classroom (van Nuland et al., 2012) and persistence and concentration in gym class (Zhang, Solmon, & Xiangli, 2012). However, in physical education classes, only perceptions of autonomy and competence were important predictors of exertion in physical education activities (Zhang et al., 2012).

Interest in class. School becomes boring and miserable for students who are amotivated or externally motivated (Froiland, Oros, Smith, & Hirchert, 2012). Correlations were found between the supports of all three BPN and students' interest and enjoyment in a specific course (Liu et al, 2013) that also transferred excitement out to other courses and school in general (Skinner et al., 2012). However, interest tends to wane if a need-supportive activity is presented in a short duration (Loukomies et al., 2013) and may not be affected if students are not initially interested in the activity, even if autonomy support is provided (Patall, 2013). Supporting competence and autonomy mitigates boredom (Miserandino, 1996).

Intrinsic Motivation

According to SDT, IM is inherent: from birth, all humans tend to curiously and inquisitively explore, seek out novelty, and try to learn (Ryan & Deci, 2000b). Human development is dependent on the construct of IM which serves as a catalyst for enjoyment (Ryan & Deci, 2000b). Thus, an activity is intrinsically motivating if it is inherently interesting and therefore fulfills wanted goals of pleasure and satisfaction (Deci et al., 1991; Ryan & Deci, 2000a). It is not dependent on external factors such as rewards or constraints; the activity in

itself is intrinsically rewarding (Deci et al., 1991; Deci & Ryan, 2000). Ryan and La Guardia (2000) provide prototypes of intrinsically motivating behavior: play, self-challenging activities, and curious exploration. Therefore, IM is a subjective experience depending on individual interests and the task on hand.

Self-determination theory is not concerned with what specifically causes IM, but under what conditions IM is sustained versus thwarted (Ryan & Deci, 2000b). Thus, much of the empirical research of SDT is concerned with contextual variables by which IM flourishes or diminishes (Ryan & Deci, 2000b).

Interest and enjoyment of an activity is a common approach to measure IM (Ryan & Deci, 2000a). The enjoyment of experiences affects individuals' motivational state and is brought about through their interacting with the environment (Tsai et al., 2008). This is dependent on individual interest. Individual interest is dependent on differences between individuals such as gender and prior knowledge (Tsai et al., 2008). As such, teacher practices can either promote or undermine IM (Ryan & Deci, 2000a).

Research on IM in the classroom. The importance of IM in the classroom is well documented in the literature. Twenty-five percent of school referrals are attributed to motivational problems (Froiland et al., 2012). Lack of IM can lead to less work completion, lower school attendance, and less attention paid in class (Wormington, Corpus, & Anderson, 2012). Promotion of IM is linked to prosocial citizens who care about others (Froiland et al., 2012).

Prior research reveals IM to be one of the most important variables for classroom success (Radel et al., 2004; Skinner et al., 2012; Vecchione, Allesandri, & Marsicano, 2014) and engagement (Skinner et al., 2012; Vecchione et al., 2014). When IM is high, student-learning

outcomes improved (van Loon et al., 2012) and demonstrated positive correlations with perceived academic competence (Gherasim, Butnaru, & Iacob, 2011). This was true even after controlling for socio-economic status (Vecchione et al., 2014). However, is not necessarily key for improving short term success (van Nuland, Taris, Boekaerts, & Martens, 2012).

Students believe that by catering to their interests, learning can be fun (Garn & Jolly, 2014). Unfortunately, IM is not prevalent in all grades and can be context specific. It has shown to decrease as students proceed through school (Wormington et al., 2012), yet remains a vital construct for their performance (Ryan & La Guardia, 2000). Intrinsic motivation and self-determined extrinsic motivation decreases until age 15, after which it increases (Gillet et al., 2012). It has also been found to be shaped by the social interactions and teaching environment created by the teacher (Garn & Jolly, 2014)

Extrinsic Motivation

According to Ryan and Deci (2000b.), as humans develop, social pressures curtail their ability to take part in activities that are interesting. These activities would not be intrinsically motivating, yet humans still persist in them (Ryan & Deci, 2000b). Self-determination theory posits a continuum of motivations that are extrinsically caused and sustained. An extrinsically controlled motivating behavior is performed, not out of interest or pleasure, but to achieve a separate outcome (Deci et al., 1991). Unlike previous motivational theories, SDT does not view extrinsic motivation as an anti-thesis to self-determined motivation. Extrinsically motivated behaviors lie upon an autonomy continuum, from ones that are perceived as controlling to ones that are more internalized into a person's sense of self (Deci et al., 1991). How motivation is regulated in a classroom is partly dependent on the social interactions within the class (Garn &

Jolly, 2014) and the subjective feelings that affect how students' BPN are met (Loukomies et al., 2013).

Organismic Integration Theory. To address the different forms of extrinsic motivation, Ryan and Deci (2000b) created another sub theory of SDT called organismic integration theory (OIT). It posits a self-determination continuum based on the type of motivation and the locus of causality (Ryan & Deci, 2000b). The following is a summary of those types of extrinsic motivations from the most non self-determined to self-determined:

External regulation. This is the least autonomous form of extrinsic motivation (Ryan & Deci, 2000b). It deals with human behaviors that are driven to attain external items, such as rewards, or are constrained via measures such as punishment (Deci & Ryan, 2000a; Vallerand, 2007). The locus of causality is external to one's self (Deci et al., 1991). This is a non-autonomous and the least self-determined type of motivation where the individual feels controlled by external pressures (Deci et al., 1991; Deci & Ryan, 2000). Historically, this was the type of motivation that was in direct opposition with IM (Ryan & Deci, 2000b).

Introjected regulation. Introjection is also not self-determined as external pressures still drive individual actions (Vallerand, 2007). However, individuals begin to internalize the reasons to act through self-imposed feelings (Vallerand, 2007). For instance, a person may feel guilt or anxiety, which in turn, steers their actions (Vallerand, 2007). Likewise, ego may drive behavior to sustain feelings of worth or avoid feelings of failure (Ryan & Deci, 2000b). Unlike external regulation, introjection can maintain over time; like external, it also is non-autonomous and perceived as controlling (Deci & Ryan, 2000).

Identified regulation. Identification is associated with an attached value to doing an activity. Actions are done not necessarily because they are interesting or enjoyable, but because

of a recognized value a person perceives by doing them (Deci & Ryan, 2000) or because they are perceived as important (Ryan & Deci, 2000b). Therefore, there is more of a willingness to do an activity because there is an increased perception of choice (Deci et al., 1991).

Integrated regulation. The most autonomous form of external regulation is integrated. These actions are done out of a person's choice. This occurs due to an internalization of the value attached to doing the action and an incorporation of that value into the sense of self (Deci & Ryan, 2000; Vallerand, 2007). This is the most closely tied to IM; however intrinsically motivating activities are done out of sheer interest while an integrated behavior is done because of the attached value or importance of doing the activity (Deci et al., 1991). Integrated is the most prevalent type of motivation for older students likely due to them internalizing the value of education (Darner, 2012; Vecchione et al., 2014). Overall, integrated regulation is deemed the most self-determined extrinsic motivation (Deci & Ryan, 2000).

Class Structure

According to Reeve and Halusic (2009), the inclusion of structure does not equate to a controlling environment. This was corroborated by a study done by Sierens et al. (2009). While secondary students were able to empirically differentiate structure from perceived autonomy (Sierens, et al., 2009), studies indicate that teacher autonomy support and structure naturally covary (Vansteenkiste, Sierens, Goossens et al., 2012). So, while providing clear expectations can enhance supports of competence for the student, doing so without providing a rationale for the activity leads to non-autonomous motivation (Vansteenkiste et al., 2012).

Class structure is a multi-dimensional construct that occurs before and after instruction (Haerenans, et al., 2013). Secondary students were able to empirically differentiate it from perceived autonomy (Sierens, et al., 2009). In a qualitative study in Belgian secondary schools,

structure was observed prior and during instruction. Before instruction, it was providing clear instructions, demonstrating the activities, and providing an overview of the lesson (Haerenans et al., 2013). During instruction, structure was seen as helping students, providing them with feedback, guidance, advice; and monitoring their progress (Haerenans, et al., 2013).

There is a misconception that withholding or minimizing guidance supports autonomy (Assor et al., 2002). Students who view teachers as autonomy-supportive also report them as providing clear expectations and vice versa (Vansteenkiste et al., 2012).

There are positive correlations between how structure is delivered and autonomy support. This is consistent with Reeve and Halusic's (2009) assertion that structure deliverance such as clear expectations, constructive feeback, and activity guidance are all non-controlling and thus will not undermine autonomy, typically when teachers provide structure in an autonomy-supportive manner (Sierens et al., 2009).

There are empirical benefits for providing structure in the class. Structure and autonomy are both important to achieve self-regulated learning (Sierens et al., 2009). When combined, they have optimal effects on autonomous motivation, produce less behavioral problems, and reduce anxiety in the classroom (Vansteenkiste et al., 2012). Structure had the most positive relationship with self-regulated learning (Sierens et al., 2009); conversely, low perceptions of structure and autonomy led to less self-regulated learning (Vansteenkiste et al., 2012). It was also a possible mediator between students' ages and their IM in the classroom (Gillet et al., 2012).

Digital Game-Based Learning

A growing trend in education is to infuse a medium for learning that interests and engages students. That trend is DGBL. The effectiveness of DGBL is attributed to its versatility

and ability to motivate a young generation used to playing video games (Prensky, 2003). Ninety-seven percent of young people play computer and video games in their lives, and 77% of American homes have video game systems (Erenli, 2013). As such, the conception of a "gamer" has changed. Gaming is practically universal, crossing both gender (Cheng, Lou, Kuo, & Shih, 2013) and social lines (Prensky, 2003), and acceptance of gaming in the classroom does not depend on previous gaming experience (Cheng, et al., 2013). Nor do they depend on students being familiar with technology (Kim, Buckner, Kim, et al., 2012). Games can potentially make a dull subject more dynamic by immersing students into the learning process, thereby motivating students to learn (Chee & Tan, 2012; Jackson & McNamara, 2013).

Definition

Digital based learning games are different from mere video games. Video games that are not made for the purposes of education or training are a source of entertainment; therefore players seek them due to the pleasure they yield (Neys, Jansz, & Tan, 2014). Digital game-based learning, whether delivered via computer software or online, is designed for educational use where learning outcomes are defined; fun is a byproduct, but not the main point (Girard et al., 2013; Susi et al., 2007). Although there are a multitude of variations in educational games, a well-designed one has clear goals, allows students to take risks, provides feedback, provides incremental levels of challenges, and incorporates multi-media (Gee, 2005). Digital-game based learning differs from gamification, which is characterized as merely applying game-based elements to a non-game system (Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011).

DGBL Research

It is believed that DGBL offers the means to make academic subjects more enjoyable, interesting, and therefore a more effective method to reach educational objectives (Papastergiou,

2009). This occurs by situating students into complex learning environments and allowing students to explore, interact, and hopefully learn (Huang, 2011). It is believed that DGBL has the potential to manifest as a classroom experience that is in line with best practices based on educational research (Plass, J.L., O'Keefe, P.A., Homer, B.D., Case, J. et al., 2013). It is warned, however, that using DGBL in the classroom is not a substitute for teaching and planning; the teacher is a necessary component as they consider which pedagogical practices are necessary to facilitate learning (Struppert, 2010).

Usefulness. Both students and teachers perceive the usefulness of DGBL in the classroom. Qualitative interviews reveal teachers lauding its use as a means for students to reflect, analyze, and test their abilities (Ke, 2008). Although one study revealed males typically have a more positive view of the usefulness of DGBL (Karakus, Inal, & Cagiltay, 2008), several studies uncovered students' overall approval of digital games as a useful tool for learning in the classroom. (Dourda, Bratitsis, Griva, & Papadopoulou, 2014; Karakus et al., 2008; Lin, Wei, & Hung, 2012; Struppert, 2010). Usefulness of games has been associated with the ease of use (Cheng et al., 2013).

DGBL and attitude. Another research concern for the utilization of DGBL in the classroom is its effect on students' attitude toward the subject matter. Elementary students' attitude toward math positively increased after playing a digital math game, ten times, in two hour sessions over the course of several weeks (Ke, 2008). Two hours of playing science based games resulted in student enthusiasm and desire to play the games at home (Papastergiou, 2009). Even after one hour of gameplay, attitudes can be improved. High school students' attitude toward civic affairs improved as a likely result of playing an online civics-based digital game (Lim & Ong, 2012), while fourth grade students' attitude toward the environment improved

(Cheng et al., 2013): both after one hour of gameplay time. Finally, a literature review by Li and Tsai (2013) revealed recurring results of positive attitudes toward learning within classrooms using DGBL.

Positive attitudes towards game-based learning is not necessarily a given. High school students' attitude toward gaming in the classroom were not affected after playing a tutorial type science game (Miller, Chang, Wang, Beier, & Klisch, 2011). Additionally, attitude toward in-game variables does not necessarily equate to better performance. For instance, students preferred incremental difficulty levels, yet fared better when the games adjusted during play based on individual student abilities (Sampayo-Vargas, Cope, He, & Byrne, 2013).

DGBL and confidence. One of the benefits of using DGBL in the classroom has been its association with improved student confidence, which can be boosted by providing non-complex terminology, providing feedback, and a means to learn from mistakes (Huang, 2011). There are mixed results concerning DGBL and the effects of confidence. Confidence in math was boosted significantly for elementary students playing math mini-games over nine learning sessions, compared to students using paper and pencil math training (Ku, Chen, Wu, et al., 2014). Confidence does not necessarily equate to other positive results. Although college students were confident playing a digital economics game, they reported low levels of satisfaction (Huang, 2011).

DGBL and learning and achievement. According to Bennett, Wood, and Rogers (1997), play is a powerful element of the educational process. If given the opportunity to play, students will spontaneously learn, even without a teacher present (Bennett et al., 1997). Although the motivational appeal of DGBL is supported by research, its appeal depends on learning to take place.

Social Studies. Digital game-based learning has been beneficial for supporting civic education in the classroom; however, research using social studies based games is scant. Citizenship education is believed to be difficult to teach as it is not only encompasses cognitive knowledge, but also feelings of empathy toward others within the local and global community (Bachen, Hernandez-Ramos, & Raphael, 2012). Lim & Ong (2012) assert the viability of DGBL in promoting civics for young learners who have yet to reach the maturity necessary to internalize important civic values. Elementary-aged students demonstrated significant gains in civics and government knowledge after they were exposed to the topic merely through civics games (LeCompte, Moore, & Blevins, 2011). Similarly, incorporation of a civics based game over the course of three weeks led to fifteen year-old students producing rich essays, full of detail concerning global and local issues, compared to the shallow responses by students taught in a textbook only manner (Chee et al., 2013). In a different study, qualitative interviews revealed fifth grade students to be more cognizant of their role in society, while quantitative measures illustrated increased efficacy to make societal change as a result of playing a civics-based game (Lim & Ong, 2012).

For high school students, one hour of a civics-based gaming session fostered critical questioning and thinking skills as observed during post-game discussion (Lim & Ong, 2012). When assessed on geography knowledge acquired within a game, primary students were able to make significant gains after playing for only one hour a week, over three weeks (Karakus et al., 2008). Dourda et al. (2014) echoed this finding after primary students played a geography themed game over the course of eight weeks. Junior high students in Taiwan had greater gains in achievement on a Taiwan history test if they were involved with a history game, once a week, for a month period (Lin et al., 2012). Even one gaming session can have significant effects.

Students playing a medieval history game did significantly better on a post-game knowledge test than students in a non-game learning environment (Admiraal, Huizenga, Heemskerk et al., 2014). It is important to note that Admiraal et al. (2014) found prior history knowledge was not correlated with post-test results for the game-based subjects, but was for the control group.

Mathematics. The most prevalent research for the educational effectiveness of DGBL in the classroom has been for mathematics games. Compared to students learning via paper and pencil, elementary students playing online math games over nine sessions did significantly better on their post-lesson math assessment (Huang, 2011). This was true for both high and low ability students (Huang, 2011). Similar findings were found for third grade students. There was a significant difference in arithmetic scores from pre-test to post-test for students practicing on a game-based system versus a paper and pencil learning (Beserra, Nussbaum, Zeni, Rodriguez, & Wurman, 204). However it is important to note that there was no difference between game-based and computer-based learning and their effect on improving arithmetic scores (Beserra et al., 2014).

Several studies reveal mixed results concerning the educational effectiveness of math digital learning games. Compared to traditional instruction, 13 year-old students' math performance was not statistically different after playing a digital math game (Giannakos, 2013). Although elementary students played a digital math game for 20 hours over a five week time span, there were no changes in cognitive learning or metacognitive awareness (Ke, 2008). However, this was attributed to students avoiding difficult tasks by merely guessing and moving on in the game; students were even able to reach the upper levels by this trial and error method (Ke, 2008). Trial and error was also a factor for third grade students completing in-game assessments. Students advanced through an arithmetic-based game by making guesses on the in-

game multiple choice questions until they got a correct answer which allowed them to proceed (Buserra et al., 2014). Many eighth grade students in a different study got questions right within gameplay, but missed them when the same questions were assessed afterward (Tsai, Yu, & Hsiao, 2012). They too were able to reach victory in the game, focusing on their scores versus learning outcomes and achieving within the game via trial and error (Tsai et al., 2012). Therefore, while students can learn to become better "gamers," their learning can be deemed irrelevant, thus undermining the point of incorporating DGBL into the classroom (Ke, 2008). This finding was not so for high school students; their math achievement increased after playing a math game for an hour a week over the course of a semester, compared to students who received traditional instruction (Kebritchi, Hirumi, & Bai, 2010).

Science. In a recent literature review of DGBL in science education, Li and Tsai (2013), laud the potential of gaming in the science curriculum, declaring that traditional science curricula contains a lot of memorization and that content can become decontextualized. Digital games show promise for biology instruction; gains from pre-test to post-test achievement was significantly greater for high school students after playing 12 hours (Sadler, Romine, Stuart, & Merle-Johnson, 2013). These results were for students with limited prior science knowledge (Sadler et al., 2013). Middle school students fared better on a chemistry-based post-test after playing a chemistry-based game, twice a week for two hours each, over the course of four weeks (Chee & Tan, 2012). Even shorter play times have yielded positive gains for achievement after students played science-based digital learning games. High school students' achievement on a researcher created science test improved after students played a science-based digital game for one hour after school over three days (Miller et al., 2011), while elementary students' science knowledge significantly increased after 90 minutes of gameplay spread over two sessions

(Meluso, Zheng, Hiller, Spires, & Lester, 2012). Even two hours of gameplay affected high school students' science knowledge when compared to students in non-game computer instruction groups (Papastergiou, 2009).

Conclusion on the educational effectiveness. After reviewing the literature on the educational effectiveness of DGBL, several conclusions were made. First, DGBL offers a platform for students, especially academically weaker ones, to explore without feelings of frustration, ultimately learn, and achieve (Sadler et al., 2014). Games that were too easy to use affected achievement because students were seemingly not as frustrated during gameplay (Miller et al., 2011). This was true for university students as well. Games that were deemed too difficult or too simple led to frustration and were associated with low levels of learning perception (Chen & Huang, 2013).

Second, achievement was typically based on short-term retention of knowledge and not necessarily due to long-lasting learning (e.g. Papastergiou, 2009; Sampayo-Vargas et al., 2013). Woo (2014) found similar results: while learning was enhanced, game-based learning had no effect on higher order cognition. When compared to students using a paper and pencil drill and practice activity, elementary students using a game-based drill and practice showed significantly lower retention of vocabulary skills (Young & Wang, 2014). Similar studies found that the short duration of the games had limited effects (Barzilai & Blau, 2014), causing no differences in learning between treatment and control groups on pre-assessment scores (Proske, Roscoe, & McNamara, 2014). The effects of DGBL need to be assessed over longer periods of gameplay than most research currently provides (Bruner et al., 2012).

Third, although experimentation within a game has revealed to have positive results (e.g. Dourda et al., 2014), in-game success does not necessarily equate to learning. Students become

adept at advancing through the game, accomplishing tasks at times via trial and error (Beserra et al., 2014; Ke, 2008; Tsai et al., 2012). Plass et al. (2013) echoed this finding, asserting middle school students were individually able to perform game tasks, while not reaching a "game over" result. This was attributed to students becoming good at playing the game versus accomplishing the educational skill tasks (Plass et al., 2013).

There are several positives, however, that emerged from the research. First, problem solving can be improved by adding advanced organizers either before or after the game (Barzilai & Blau, 2014). Second, the immediate feedback provided within games seemed to impact students' achievement after the game (Beserfa et al., 2014). Third, DGBL seemed especially helpful for students who lacked prior subject knowledge (Beserra et al., 2014). Dourda et al. (2014) discovered that students needed less help with terminology and spelling on a post-test after they became more experienced with the terms during eight weeks of gameplay.

DGBL and Engagement

The gaming industry has typically ensured that the product they create are engaging (Prensky, 2003). Although they are not made for entertainment purposes like traditional video games, digital learning games have the potential to wield the entertaining nature of video games to increase student engagement (Sherry, 2013). Learning through DGBL is often viewed as the antithesis of what happens in the typical classroom (Prensky, 2003). Digital game-based learning provides a platform for students to make decisions quickly (Barzilai & Blau, 2014; Struppert, 2010), experiment within a complex system, and overcome obstacles by testing strategies; all of which are engaging activities (Prensky, 2003).

There have been numerous studies indicating the engaging nature of DGBL. When compared to traditional paper and pencil learning, DGBL is perceived as significantly more

engaging (Papastergiou, 2009; Proske, Roscoe, & McNamara, 2014) which equates to less student disruptions (Beserra et al., 2014). Observations of elementary students in a game-based classroom, for instance, revealed noisy students, interacting with one another, while comparing their progress and showcasing their acquired skills (Young & Wang, 2014). However, DGBL is not necessarily the most engaging technology that can be used in the classroom; it can be context specific (Schaaf, 2012).

There are several benefits of engagement in connection with DGBL. The engaging nature of DGBL can cause students to want to learn more about the subject (Struppert, 2010) or seek additional readings concerning the topic presented through DGBL (Bachen et al., 2012). Students were observed to be more at ease, relaxed, and held less feelings of pressure to achieve (Young & Wang, 2014). Qualitative interviews revealed that teachers were happy about the engaging nature of DGBL; students who would otherwise not pay attention became engaged (Giannakos, 2013). Further, DGBL holds promise for actively involving academically weaker students in what is deemed difficult subject matter (Magnussen, Hansen, Planke, & Sherson, 2014). Cheng et al. (2013) corroborated this finding: low achieving elementary students were observed to be engaged in a digital learning game, paying more attention to the teacher and studying hard, in order to win the game.

Engagement and DGBL, however, does not necessarily equate to positive results. Eighth grade students, for instance, were so immersed with playing a math and science-based game that they completely overlooked the learning objectives (Tsai et al., 2012).

There are variables that can affect game engagement as well. There is fear that adding too many instructional elements into a game will interfere with students' engagement (Ke, 2008). The difficulty level of the game can also affect engagement. Thirty-five percent of participating

elementary students seemed disengaged while playing digital learning games, even though the majority of the students were initially enthused with the idea of playing a game in class (Otta & Tavella, 2010). As these studies demonstrate, it is difficult to generalize the degree to which DGBL impacts engagement. First, it is highly dependent on student specific variables such as the need for students to rest or sleep (Otta & Tavella, 2010). Second, engagement is likely attributed to preference of game genre which is subjective to the individual (Sherry, 2013).

DGBL and Motivation

Motivation is a research interest for DGBL because of students' innate interest of playing video games contrasted with their lack of interest in more traditional pedagogy (Papastergiou, 2009). Motivation is an important construct within DGBL because of the associations with it. It has shown to be highly correlated with engagement and performance (Otto & Tavella, 2010), and it predicts performance (Woo, 2014). Meta-analyses of DGBL reveals motivation to be a research concern; however, it typically is of secondary importance compared to learning effectiveness (Girard et al., 2013). It is assumed that playing games is intrinsically motivating (Li & Tsai, 2013). Teachers have voiced their support of games as a means to make class more interesting and enjoyable (Kebritchi et al., 2010). A recent meta-analysis reports that the motivational appeal of digital games is the most prevalent reason for educators to incorporate DGBL into their classrooms. (Wouters, van Nimwegan, van Oostendorp, & van der Spek, 2013).

One of the motivations for incorporating DGBL into the curriculum is the inherent enjoyment it can provide. This is corroborated by empirical data. A game-based tutoring environment yielded higher motivation and enjoyment for 15 year-old students compared to students using a non-game based system; enjoyment even increased across sessions of gameplay

(Jackson & MacNamara, 2013). High school students' enjoyment manifested in celebrations of accomplishments (Tsai et al., 2012) and of students excitedly walking around the room to help others succeed in the game (Giannakos, 2013). Elementary students were especially keen on playing educational games in the classroom, expressing high levels of enjoyment (Chen, 2012; Razak & Connolly, 2013; Giannakos, 2013; Tuzun et al. 2013). This was especially true when compared to students receiving more traditional modes of instruction (Schaaf, 2012). Further, elementary students' interest to take part in a learning activity was boosted (Otta & Tavella, 2010) as was motivation to accomplish learning tasks if they were situated within a game (Ke, 2008). This was particularly true if the task was within their competence level (Ke, 2008).

One means to address levels of competence is to choose games that adapt to students' abilities versus ones that gradually become more difficult. While students may enjoy incremental difficulty levels within the game, if they do not coincide with their competence levels, there is less achievement (Sampayo-Vargas et al., 2013). Using games was not a motivating factor for high school math students compared to learning math more traditionally (Kebritchi et al., 2010). However, games were played twice a week, over the course of a semester; it is possible that the novelty of the games wore off, potentially affecting the motivation levels (Kebritchi et al., 2010).

Elementary students' motivation to learn increased after 30 hours of gaming over a course of three months (Divjak & Tomic, 2011). Similar findings were discovered through research conducted with students in grades five and seven (Divjak & Tomic, 2011). Including gaming elements can support student interest in math. Elementary students' enjoyment in math increased after playing an online math quest with gaming elements (Chen et al., 2012). For middle school students, enjoyment facilitated learning, while qualitative data revealed students

immersed in gameplay and using terms like “awesome” to describe their experience (Giannakos, 2013). Enjoyment is a key construct in education because studies indicate that enjoyment is tied to performance; as enjoyment increases, so does student learning (Giannakos, 2013).

DGBL and SDT

Previous research into video games and how they fulfill the BPN yields potentially promising results for DGBL. Although an abundance of research has investigated the motivational outcomes and appeal of digital games in the classroom, only a few have done so using the SDT as the theoretical framework (e.g. Peng, Lin, Pfeiffer & Win, 2012).

Motivation and enjoyment. There are several explanations for the motivational appeal of video games. First, even if students are not accustomed to playing learning games, they are curious to move forward within the gaming environment (Dickey, 2011) or enjoy the in-game or between-players competition (Barzilai & Blau, 2014; Karakus et al., 2008; Tuzun et al., 2008). Competition does not even have to be built into the games; there is a tendency for students to create a natural competition to fare better within the gaming environment (Beserra et al., 2014) and a penchant for students to showcase their abilities as they challenge others for higher scores (Cheng et al., 2013). However, competition does not automatically equate to increased interest and enjoyment over a non-competitive counterpart (Vandercruysse, Vandewaetere, Cornillie, & Clarebout, 2013). Second, games can motivate by offering means for students to explore (Dickey, 2011; Tuzun et al., 2008) in a dynamic environment (Struppert, 2010) while being entertained at the same time (Karakus et al., 2008; Struppert, 2010). Third, although students may express a desire for games to include a multitude of audio and video dynamics (Papastergiou, 2009), even if a game is not visually stimulating, they can offer satisfaction (Otta & Tavella, 2010). It is difficult, however to generalize the effects of DGBL due to the variability

in game characteristics (Girard et al., 2013; Ke, 2008; Sampayo-Vargas et al., 2013; Vos, van der Meijden, & Denessen, 2011). And, it does not mean DGBL is the preferred method to learn. For example, while third- through fifth-grade students enjoyed playing a simple quiz-show type digital game, they preferred a multimedia project more (Schaaf, 2012).

Choice. Although video games are motivationally appealing for students, it is admitted that digital educational games may not have the same appeal due to the lack of student choice to play (Wouters et al., 2013). Providing undergraduate students with the ability to manipulate the game avatar and make choices within the game satisfied their psychological need for autonomy, and the fulfillment of autonomy led to greater enjoyment and motivation for future play (Peng et al. 2012). Critique of gaming systems is offered when they lack choice and other SDT supportive features such as feedback during gameplay and clear goals (Ronimus, Kujala, Tolvanen, & Lyytinen, 2014).

Competence. Research reveals that competence is supported in games by adjusted difficulty mechanisms, performance tracking meters, and achievement badges, all of which led to greater enjoyment and motivation for future play (Peng et al., 2012). Perceived competence has shown to be higher if students were playing competitively against the computer (Vandercruysse et al., 2013).

DGBL and the Role of the Teacher

Digital game-based learning faces challenges because teachers do not always see the benefit of students interacting with a computer and prefer a traditional teacher-centered approach to instruction (Razak & Connolly, 2013). This could be due to their relative inexperience with video games in general (Bourgonjon, De Grove, De Smet, et al., 2013). There is a concern that incorporation of DGBL into the classroom takes away from instructional time, or that the

learning objectives are not aligned to state standards (Sadler et al., 2013). There is evidence, however, that most teachers do not view gaming in the classroom as a pariah either; teachers realize the benefits of DGBL even if they are not rushing to incorporate it (Bourgonjon et al., 2013).

Summary

After a review of the literature of SDT, several points of summary can be made. First, there are limitations in the ability to generalize results due to the variety and duration of tasks (Benita et al., 2013; Patall et al., 2008; Rieger et al., 2014). For example, perceived competence did not have a strong association with engagement in a garden- based class likely due to scholastic abilities not necessarily being vital for said course (Skinner et al., 2012). The duration of the task also impacted motivation. In one study, motivation was gauged after fulfilling BPN in a task that only took one class period (van Nuland et al., 2012). In another, autonomy supportive teaching was measured after a two-day period (Furtak & Kunter, 2012).

Another point of summary concerning SDT is the complex nature of motivation. Self-determination theory studies reveal motivation to be a complex construct affected by a host of internal and external variables that are difficult to control (Zhang et al., 2012). This is especially true for IM, which fluctuates in the classroom setting and between individuals (Tsai et al., 2008). Vallerand (2007) affirms that factors exist at a contextual level, specific within a given setting, that are mediated by autonomy, competence, and relatedness, that effect the level of IM. Assor et al. (2002) agree: there is no one-size-fits-all approach for supporting needs like autonomy; it is very situation specific. It is also subjective to student interests. Patell (2013) discovered autonomy support to be vital to enhance motivation; however, students' initial interest given the context of the class played a significant role. At the situational level, motivation is dependent on

the circumstances, at a given time. This can be affected by variables such as providing feedback, choice, rewards, competition, and meeting the three BPN (Vallerand, 2007). Researchers vary, however, in how they incorporate choice (e.g. Benita et al., 2013), making it difficult to generalize any results of choice provisions. Moreover, even given a specific situation, there are differing perceptions of how needs are satisfied (Taboada et al., 2010). It is believed that these needs can be manipulated within a situation to hopefully boost interest and optimal motivation (Tsai et al., 2008). However, it is cautioned that initial interest in an activity is vital; merely offering support such as choices can be viewed as overwhelming, unnecessary, and overall, not motivating (Patall, 2013).

Lastly, there are weaknesses in the methodologies used in assessing the effects of the BPN. For one, many studies did not look at specific psychological needs, particularly in the class setting (Darner, 2012; Reeve et al., 2003). Darner (2012) suggests more accurate and specific studies to hone in on the aspects of the classroom environment that helps fulfill needs, while Reeve et al. (2003) assert the need for more studies outside the lab setting. Further, additional and more rigorous studies are in order, with larger sample sizes, and instruments that gauge the fulfillment of the needs in a more robust manner (Darner, 2012: Furtak & Hunter, 2012).

There are several concerns about the enjoyment of DGBL and its motivational appeal found throughout the literature. First, motivation can be dependent on how difficult the gaming task is, students' abilities, and the overall attractiveness of the game (Otta & Tavella, 2010). This was found with college students as well. Participants played an educational game once yet yielded low satisfaction from it (Huang, 2011). This was attributed to the cognitive demands of the game; the mental effort needed to succeed likely demotivated the participants (Huang, 2011).

However, simplifying the game can be equally as detrimental. Elementary students' IM to play a literature-based game was low and researchers attributed this to the simplicity of the game (Vos et al., 2011). Researchers suggest future research is needed to gauge motivation, employing games across varying levels of complexity (Miller et al., 2011; Sampayo-Vargans et al., 2013; Vos et al., 2011). Second, over utilization of DGBL can cause student boredom or indifference as well. Interest can peak then level out if games are played over time (Ronimus et al., 2014) or worse, lead to boredom if overused (Struppert, 2010). In a study done using science-based games, researchers found high school students' interest to be waning by the end of the second class period (Magnusse et al., 2014). However, Struppert (2010) found that even when students claim games to be boring, they admit they were still better than traditional activities. This is important for teachers who may be reluctant to use DGBL within their classrooms (Bourgonjon et al., 2013).

Overall, there has been insufficient research concerning how need satisfaction affects motivation and enjoyment in DGBL. Enjoyment plays a central role for all types of players as it leads to persistence to continue playing and is directly affected by the amount of autonomy and competence players perceive (Neys et al., 2014). Peng et al. (2012) added to the limited research on the underlying mechanisms by which the BPN of autonomy and competence impact players' motivation. However, their research was limited to the sample population of undergraduate students. They admit that future research is needed using other populations of students for more robust results (Peng et al., 2012). The purpose of this study is to fill a gap in the literature on SDT as it applies to DGBL. This study proposes to uncover how the BPN of autonomy and competence are satisfied by teachers using DGBL tasks, and how that impacts students' perceptions of autonomy, competence, and IM with the DGBL tasks.

CHAPTER THREE: METHODS

Design

A quasi-experimental, posttest only, static-group comparison design was employed for this research. This design was chosen due to the practicality of using non-random groups in the form of intact classrooms occurring naturally in a school setting (Gall, Gall, & Borg, 2007). The purpose of this design was to measure the effect of an intervention that could be manipulated for three of the four groups (Gall et al., 2007). A quasi-experimental design was appropriate because this study had treatments, outcome measures, and experimental units; thus rendering random assignment impractical (Mitchell & Jolley, 1996). The independent variables for this study were the contexts by which students played DGBL tasks: (a) autonomy-supportive, with structure; (b) autonomy-supportive without structure; (c) non-autonomy supportive, with structure; and (d) non-autonomy supportive, without structure. To measure the effect of autonomy and structure support, a control group was utilized. The control had neither autonomy supportive or non-supportive treatment, nor supports for structure. They were essentially told to log on and play the games. Perceived autonomy, perceived competence, and interest/enjoyment were three of the four dependent variables. They were measured via the Intrinsic Motivation Inventory (IMI) which was used in previous research using similar independent variables (van Loon et al., 2012) and has the appropriate subscales to gauge the three previously-mentioned dependent variables (McCauley et al., 1989). Mean student scores attained from the gaming platforms provided in the procedures were used to gauge the fourth dependent variable, game scores.

Research Question

The following research question was proposed:

RQ1: What is the effect of structure and autonomy support in motivation and game scores among middle school students completing digital game-based learning tasks?

In general, autonomy support meant teachers provided instructions for the digital game-based learning tasks, the relevance for each game, explanatory rationales, and opportunities for choice within the game (Reeve & Halusic, 2009). Students had control over aspects of the game that allowed for student choice (van Loon et al., 2012). Language in the pre-game oral teacher instructions was non-directive (i.e. "you can" statements versus "you should" or "you are expected to") (Reeve & Halusic, 2009; van Loon et al., 2012).

The non-autonomy supportive groups were provided no relevance or explanatory rationale before gameplay (Reeve & Halusic, 2009). Controlling language was used for Group C within the oral instructions (i.e. "you should" and "you are expected to" versus "you can" statements) (Reeve & Halusic, 2009; van Loon et al., 2012). In addition, participants in Group C were not given any choice during gameplay; the teacher prescribed the game factors that would usually be left to student choice (van Loon et al., 2012).

In general, supports of competence meant providing structure to support students' achievement of the learning goals and hints on how to succeed during gameplay (van Loon et al., 2012). Students were told the overall expectations, ways to achieve success, as well as how long each game was expected to take (van Loon et al., 2012). Groups without supports of competence and the control group were provided no structure. There was no information provided by the teacher in either oral or written form on how to achieve the learning goals, nor were there tips given on how to succeed (van Loon et al., 2012). Students were not provided overall expectations for each online learning game nor were they told how long each game would take to complete (van Loon et al., 2012).

Null Hypotheses

The following null hypotheses were proposed:

$H_0$1: There is no significant difference in middle school students' perceived autonomy, as measured by the perceived choice subscale of the IMI, among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments.

$H_0$2: There is no significant difference in middle school students' perceived competence, as measured by the perceived competence subscale of the IMI, among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments.

$H_0$3: There is no significant difference in middle school students' interest/enjoyment, as measured by the perceived interest and enjoyment subscale of the IMI, among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments.

$H_0$4: There is no significant difference in middle school students' average game scores, as measured by students' end scores on the five digital game-based learning tasks, among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments.

Participants and Setting

The participants for the study were a convenience sample of naturally occurring social studies class groups consisting of students in grades six through eight, selected from three different schools, in Pennsylvania, during the spring semester of the 2015-2016 school year. According to the Pennsylvania Department of Education (PDE), social studies is "the integrated study of human society and its contributions, influences and impact on the world" (Pennsylvania Department of Education, 2015). The content areas that combine to create the concept of social studies, according to PDE, are civics and government, economics, geography, history and student interpersonal skills. These schools are public schools consisting mostly of students from middle-income backgrounds.

District One was chosen based on the researcher's professional relationship with the social studies teachers within the district. District One consists of three schools with a total of 1,137 students. District One is located in a rural area of western Pennsylvania. A sample population was taken from District One's intermediate school. School One of the study is a third through sixth grade-only school located in District One. There are 363 students enrolled in School One. School One consists of 98.35% White (non-Hispanic) and 1.65% Black of African-American (non-Hispanic) students. The student body consists of 47.66% males and 52.34% females. The school also consists of 46.56% economically disadvantaged students. A sixth grade teacher was recruited in School One by the researcher to have her social studies' classes participate in the study. There are 95 students in sixth grade; 73 participated in the study. Each class group had social studies as a year-long course. A sample population was take from District One's high school as well. School Two of the study is a seventh through twelfth grade high school located within District One. There are 489 students enrolled in School Two. School Two

consists of 99.18% White (non-Hispanic) and .82% Black or African-American (non-Hispanic) students. The student body consists of 49.08% males and 50.92% females. The school also consists of 40.90% economically disadvantaged students. A seventh grade teacher was recruited in School Two by the researcher to have his social studies' classes participate in the study. There are 93 students in seventh grade; 85 participated in the study. Each class group had world geography as a year-long course. The study was introduced to the participating teachers in Schools One and Two via e-mail. The e-mail provided a link to a Google Doc containing the teachers' instructions during the study (See Appendix I).

District Two was chosen based on the researcher's professional relationship with a colleague who taught within the district. District Two consists of two schools with a total of 806 students and is located in a rural area of western Pennsylvania. The sample population was taken from District Two's junior/senior high school. School Three of the study is a seventh through twelfth grade-only public school located within District Two. There are 395 students enrolled in School Three. School Three consists of 93.42% White (non-Hispanic), 2.03% Black of African-American (non-Hispanic), 1.77% Asian (non-Hispanic), .76% Hispanic, .51% Native Hawaiian or other Pacific Islander (non-Hispanic), and 1.52% Multiracial (non-Hispanic) students. The student body consists of 45.32% males and 54.68% females. The school also consists of 29.11% economically disadvantaged students. A seventh grade teacher was recruited in School Three by the researcher to have her social studies' classes participate in the study. There are 68 students in seventh grade; 61 participated in the study. Each class group had World Geography as a year-long course. An eighth grade teacher was also recruited from School Three by the researcher. There are 53 students in eighth grade; 48 participated in the study. Each class group in eighth grade had Civics/Intro to U.S. History as a year-long course. The study was introduced to the

participating teachers in School Three via e-mail. The e-mail provided a link to a Google Doc containing the teachers' instructions during the study (See Appendix I).

Class groups within each school were randomly assigned to one of the three treatment variables or to the control group. The total sample size was $N = 222$, with at least 36 students in each treatment group and the control group, which exceeded the required minimum for a medium effect size with a statistical power of .7 at the .05 alpha level (Gall et al., 2007).

Instrumentation

Intrinsic Motivation Inventory

The instruments used from this study were taken from the IMI, which was developed by Richard Ryan, Edward Deci, and their colleagues from the Rochester Motivation Research Group, during the 1980's (McCauley et al., 1989). McCauley et al. (1989) reported internal consistencies of the overall scale to have a Cronbach's Alpha score of .85. Each of the subscales were administered online via Google Forms. The subscales take approximately 15 minutes to complete. Each item was administered in random order, according to the advice of the instrument creators (Ryan & Deci, 2014), and scored by the researcher. Permission to use the instruments was granted by registering on www.selfdeterminationtheory.org, which is the website founded by Richard Ryan and Edward Deci. See Appendix A for instruments.

The IMI contains seven subscales. It is a multi-dimensional measure of an individual's subjective experience with experimental tasks (McCauley et al., 1989). The IMI was thus designed as a post-experimental instrument (McCauley et al., 1989). According to their website, the founders of SDT claim researchers can use the necessary subscales as individual instruments based on the relevancy of the study (Self-Determination Theory, 2015). The scales can be used for a variety of tasks as the statements are written in a generic manner (McCauley et al., 1989).

The purpose of these instruments was to measure intrinsic motivation (IM), and perceived competence and autonomy, both believed to be positive predictors of IM (Deci et al., 1991).

Three subscales from the IMI were used from this study: interest/enjoyment, perceived competence, and perceived choice. Subscales were validated through factor analysis by McCauley et al. (1989) and further by Tsigilis and Theodosiou (2003). A Greek version of the same instrument had an overall Cronbach's score of .82 (Tsigilis & Theodosiou, 2003). Each item on the subscales is rated on a Likert scale with variation in scores ranging from 1, "not at all true," to 3, "somewhat true," to 7, "very true."

The interest/enjoyment subscale is considered the self-report measure of IM. It consists of seven items, two of which are reverse scored. Reverse scoring is achieved by subtracting the given value from eight. Maximum score on this scale is 49 and minimum is 7. Higher scores are considered self-reports of higher IM. The subscale of interest/enjoyment was reported to have a Cronbach's alpha score of .78 (McCauley et al., 1989). The subscale has been used in numerous studies as a self-report of IM (Cortright et al., 2013; Liu et al., 2014; Loukomies et al., 2013; Rieger et al., 2014; van Nuland et al., 2012)

The perceived competence subscale is considered to be a positive predictor of both self-report and behavior measures of IM (Self-Determination Theory, 2015). It consists of six items, one of which is reverse scored. Maximum score is 42 and minimum is 6. Higher scores are considered higher predictors of self-reports and behavior measures of IM. It was reported to have a Cronbach's alpha score of .80 (McCauley et al., 1989). The perceived competence subscale has been used in numerous studies to gauge subjective experiences related to target activities (Cortright et al., 2013; Loukomies et al., 2013; van Loon et al., 2012; van Nuland et al., 2012),

by Rieger et al. (2014) to gauge competence after playing a digital entertainment game, and by Vandercruysse (2013) to gauge perceptions of competence after playing a DGBL task.

The perceived choice subscale is considered to be a positive predictor of IM (Self-Determination Theory, 2015). It consists of seven items, five of which are reverse scored. The maximum score is 49 and minimum is 7. Higher scores are considered higher perceived autonomy and a higher predictor of self-report and behavior measure of IM (Self-Determination Theory, 2015). It was reported to have a Cronbach's alpha score of .84 (Tsigilis & Theodosiou, 2003). The perceived choice subscale has been used in numerous studies to gauge subjective experiences of autonomy related to target activities (Cortright et al., 2013; Loukomies et al., 2013; Rieger et al., 2014; van Loon, et al., 2012; van Nuland et al., 2012).

Game Scores

The fourth dependent variable, average games scores, was reported through the iCivics website. According to their website, iCivics is a "non-profit organization dedicated to reinvigorating civic learning through interactive and engaging learning resources" (iCivics, n.d.). The resources provided by iCivics are free and include a multitude of game-based learning activities that allow players the chance to take on real-world issues (iCivics, n.d.). To take advantage of the free curriculum, one needs to register for a free account. However, to play the game-based learning activities, one only needs to access them via the website. The following iCivics games were utilized within this study: (a) Argument Wars; (b) Counties Work; (c) Executive Command; (d) Power Play; and (e) Represent Me. Games were chosen based on the ability to complete them in one 40-minute class period each. Game scores vary in range. Each of the five iCivics games yields an independent result, calculated within the game, based on correct responses, and awarded via points or number of correct answers. For instance, in Executive

Command, participants are awarded 50 points for making a correct choice, and given additional points at the game's end if they resolved the war. Scores from each participant were reported through the iCivics website. Top scores for each of the games are as follows: (a) Argument Wars: 2,850; (b) Counties Work: 5,000; (c) Executive Command: 4,750; (d) Power Play: 2,600; and (e) Represent Me: 2,160. The sum of the maximum scores is 17,360, which would average to 3472 .

Procedures

The procedures for this study included setting up iCivics for the research, eliciting participants, and gaining Institutional Review Board (IRB) approval, consent from the participating schools, parental consent from participants, and assent from the students who took part of the study.

Prior to the Study

Before research was conducted, steps were taken to elicit participants for the study, gain IRB approval, as well as consent from participating schools and participants. Furthermore, participating teachers were informed on the procedures and expectations during the course of participation.

Eliciting participants. The researcher initiated the study by eliciting participants. Four middle school social studies teachers from western Pennsylvania were contacted via e-mail to determine their willingness to be a part of the study. The teachers were chosen based on their professional relationship with the researcher. Permission was sought from the districts' superintendents via e-mail. An email was sent with attachments that included a letter of intent, the proposal for the study, and the instruments to be administered to the student participants (see Appendix E).

Institutional Review Board (IRB) and parent consent. Before any research was conducted, approval was gained from the IRB. An Application for the use of Human Research Participants was completed and submitted to the IRB. A parental consent form (Appendix B) was created and attached to the application as well as child assent form (Appendix C). See Appendix D for IRB approval. The parent consent forms and child assent forms were copied and hand delivered to the teachers who volunteered their classes for their study. Also delivered to teachers participating in the study were hard copies of the research instructions (see Appendix I). Teachers were instructed to hand out the consent forms to the participating students to take home for parental signatures and return within a week if they wished to take part in this study. If students brought back a signed parent consent form, teachers were instructed to have students sign a student assent form. All signed consent and assent forms were kept in a locked drawer once they were returned to the researcher.

Setting up iCivics for the study. Several steps were taken to set up the online gaming platform within the iCivics website. First, the researcher created a "teacher account" on the iCivics website. This was done by navigating to the iCivics homepage (See Appendix H for web address), and clicking "Join iCivics" at the top right of the page. The researcher's name, e-mail, and school information was provided on the subsequent page (See Appendix F for how the researcher joined iCivics). Next, the researcher logged into the iCivics account, and clicked the "Classes" tab on the account homepage (See Appendix F). The researcher clicked "Create a New Class" on the subsequent page (See Appendix F). On the next page, the researcher titled the class as "Group A," ensured the dates provided were adequate for the study, clicked the "disable Facebook Like," and set the default password to be given to all students. The "enable discussions" was left unchecked, and the class code was noted. The description was filled in with

the name of the class (See Appendix F for screen shot instructions). The same steps were done to create classes for "Group B", "Group C," and "Group D." Next, the researcher navigated to the "My iCivics" tab on the upper right screen (See Appendix F), and clicked "Classes" to reveal the homepage of the four created classes. The researcher then navigated to each Class and clicked "add students" (See Appendix F). "Add multiple students" was clicked on the "students" page within each of the four classes (See Appendix F). Instead of listing names of students, numbers were listed within the "add students" box. The researcher added numbers, or numbers and initials of teachers participating in the study, to each box, instead of specific names, to represent the students participating in the study. One hundred number and number/initial representations were created for each of the four classes with iCivics (See Appendix F). The researcher then went back to each of the four class account home pages and clicked "Students" to view the list of usernames generated for each of the fifty "names" added to each class (See Appendix F). The usernames were downloaded as a spread sheet by clicking on "Download as spreadsheet" (See Appendix F). Next, spreadsheets with student usernames (Appendix O) were hand-delivered to the participating teachers along with instructions for how students were to log into iCivics using a username and a given password (See Appendix I). Lastly, five different assignments were added to each class. The assignments were the five games prescribed for the study (See Appendix H for a list of the games and their respective web addresses).

Teacher training. Once the consent forms were returned, teachers were trained on how to access the games via the iCivics website and of their responsibilities during the study. In order to train the teachers, the researcher created a Google Doc that was shared with each participating teacher (See Appendix I). The finished document explained how students were to log into iCivics using the researcher created usernames and passwords. The written instructions also

included the specific iCivics games students were to access and play, the order they were to be played, the time frame in which they were to be played, and what to do with the written instructions for student participants in each gaming group. Copies of the scripts for each gaming group were created and also hand-delivered to each teacher participating in the study (See Appendices J through N for each game's script). Each script included four different sets of oral instructions teachers read prior to gameplay. Group A's pre-game instructions were provided with autonomy support and with structure. Group B's pre-game instructions were provided with autonomy support but without structure. Group C's pre-game instructions were provided without autonomy support, with controlling language, but with structure. Group D's pre-game instructions were provided without structure.

Prior to the study, the researcher communicated with each of the participating teachers to discern the specific number of students they had in each social studies class they taught. The researcher then randomly assigned each class to one of the three treatment groups – Group A: with autonomy support, with structure; Group B: with autonomy support, without structure; Group C: without autonomy support, but with structure; and Group D: the control group.

Intervention Procedures

During the intervention stage of the study, the three treatment groups and the one control group each played five different online learning games as assigned through the iCivics class page created by the researcher. Gameplay took place over five consecutive school days, determined by the participating teachers within the study time frame. Teachers were instructed to read specific oral instructions, created by the researcher, to the respective treatment groups, prior to each game (See Appendices J through N).

Gameplay. Each gameplay day began in the same manner. The teacher provided instructions to the participants based on the class group they were assigned by the researcher. Teachers then read the specific game day's oral instructions created by the researcher to the respective groups for the respective games assigned to each day. There were four different scripts for each game corresponding to the support or non-support provided to students. On day one, teachers read the "Argument Wars" script (Appendix J); on day two, they read the "Counties Work" script (Appendix K); on day three, they read the "Executive Command" script (Appendix L); on day four, they read the "Power Play" script (Appendix M); and on day five, they read the "Represent Me" script (Appendix N). Each day's gameplay began in a similar fashion. Students were instructed to log onto their computer and open a web browser. Participants were asked to open www.icivics.org in their web browser. They then clicked "Log in" from the upper right home screen (See Appendix G for screen shot). Students logged into iCivics using their given user name and password (See Appendix G for screen shot). Participants then clicked on "Classes" (See Appendix G for screen shot). They then chose the game assignment as provided by the teachers (See Appendix G for screen shot). The teacher was instructed to ensure each student was on the correct website.

In general, autonomy support meant teachers provided instructions for the DGBL task, the relevance of the specific game, explanatory rationales, and opportunities for choice within the game, and during gameplay (Reeve & Halusic, 2009). Students had control over aspects of the game that allowed for student choice (van Loon et al., 2012). Language in the pre-game oral teacher instructions was non-directive (i.e. "you can" statements versus "you should" and "you are expected to") (Reeve & Halusic, 2009; van Loon et al., 2012). Non-autonomy supportive groups were provided no relevance or explanatory rationale for gameplay (Reeve & Halusic,

2009). Controlling language was used within the oral and written instructions (i.e. “you should” and “you are expected to” versus “you can” statements) (Reeve & Halusic, 2009; van Loon et al., 2012). In addition, participants were allowed no choice during gameplay; they were prescribed from the set of choices (van Loon et al., 2012).

In general, supports of competence meant providing structure to support students’ achievement of the learning goals and hints on how to succeed during gameplay (van Loon et al., 2012). Students were told the overall expectations of the specific online learning games and how long the game was expected to take (van Loon et al., 2012). Groups without supports of competence were provided no structure. Students in these groups were no given any instructions on how to achieve the learning goals or tips on how to succeed (van Loon et al., 2012). Students were not provided overall expectations of the specific online learning games nor were they told how long each game was to take (van Loon et al., 2012).

During gameplay, the teacher was instructed to be available in the classroom for questions, but otherwise were not to provide students with feedback or praise. The first DGBL task took approximately 10 minutes to complete. The next three tasks took approximately 20-30 minutes to play. The fifth day of gameplay included a game that took approximately 10 minutes to play. Once participants completed day five’s game, their teachers were instructed to instruct their students to click on the announcement section within their respective iCivics classroom. Within the announcements was a link to copy and paste into a new browser. The link took them to a Google Form. Participants answered whether they played all five games, then filled out a 20-item survey, taken from the IMI, on the subsequent screens. Participants then clicked “submit” to finish survey.

Data Analysis

In this study, the null hypotheses indicate a need to examine the mean levels of perceived competence, perceived autonomy, interest/enjoyment, and game scores (dependent variables) among four groups of students who played online learning games with and without supports of autonomy and with and without structure (four independent variables).

As described in the instrumentation section, the IMI prompted participants to use a Likert type scale from 1 to 7 to differentiate between "not at all true" and "very true" respectively, describing participants' opinions. The perceived choice subscale contains seven questions, allowing for a variation in score from 7 to 49. The perceived competence subscale contains six questions, allowing for a variation in score from 6 to 42. The interest/enjoyment subscale also contains seven questions, allowing for a variation in score from 7 to 49.

Data analysis was conducted using SPSS software to compile the data post-test only. One-way analyses of variance (ANOVA) were the appropriate statistical test to use to analyze the data. Data screening included examining histograms of each data set for normality of distribution and creating boxplots to test for extreme outliers. When conducting an ANOVA between four groups, there are several assumptions that must be tested. After data entry, a preliminary analysis was conducted to examine these assumptions for each null hypothesis. First, a Shapiro-Wilk's test analyzed the assumption of normal distribution of data. Second, homogeneity of variances was tested in SPSS using the Levene's Test. Once the initial assumption tests for each null hypotheses were evaluated, a one-way ANOVA was used for each hypothesis. The ANOVA was the appropriate statistical test because the researcher analyzed the difference between more than two independent variables for one dependent variable for each null hypothesis (Gall et al., 2007). The significance level of $p < .05$ was used as an indicator of

rejecting each null hypothesis; this is standard for educational research (Gall et al., 2007). Tukey's HSD test was considered for Post Hoc analysis assuming homogeneity of variances. If variances were not homogenous, a Games-Howell post-hoc analysis was considered. The effect size was measured via the partial Eta-squared statistic and interpreted based on Cohen's *d* (Cohen, 1992). Although the omega squared statistic is more accurate, it requires the same number of participants in each group and this study will likely have differing group numbers (Randolph & Myers, 2013).

CHAPTER FOUR: FINDINGS

Introduction

Chapter Four includes a summary of the results for the research question contained in this study plus a description of the study's hypotheses. The data in Chapter Four was used to establish the effect on supports for motivation, interest and enjoyment, and average game scores in middle-school aged students when completing five different civics themed online game-based learning tasks. Students played the online learning games in four different gaming groups. There were three experimental gaming groups: Group A) with supports of autonomy and structure; Group B) with supports of autonomy, but without structure; Group C) without supports of autonomy, but with structure. There was one control group (Group D). Perceived autonomy, perceived competence, and interest/enjoyment data were collected from 222 students while average five-day game scores were collected from 218 of these students. Statistical analyses were conducted to compare the data between the four groups of students for each of the dependent variables.

Demographics

The participants in this study consisted of 222 sixth, seventh, and eighth grade students enrolled in two public junior/senior high schools and one public intermediate school located in rural western Pennsylvania.

Research Question

The following research question is proposed:

RQ1: Is there a significant difference in middle school students' motivation and game scores among groups completing digital game-based learning tasks in autonomy supportive with

structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments?

Null Hypotheses

The following null hypotheses are proposed:

$H_0$1: There is no significant difference in middle school students' perceived autonomy, as measured by the perceived choice subscale of the IMI, among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments.

$H_0$2: There is no significant difference in middle school students' perceived competence, as measured by the perceived competence subscale of the IMI, among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments.

$H_0$3: There is no significant difference in middle school students' interest/enjoyment, as measured by the perceived interest and enjoyment subscale of the IMI, among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments.

$H_0$4: There is no significant difference in middle school students' average game scores, as measured by students' end scores on the five digital game-based learning tasks, among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy

supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments.

Descriptive Statistics

Table 1 represents the descriptive statistics for the scores on the perceived choice subscale on the Intrinsic Motivation Inventory (IMI) for students (N = 222) in the control group and the three experimental groups. The perceived choice mean score for Group D (n = 53), the control group, was 37.70 with a standard deviation of 9.63. The perceived choice mean score for Group A (n = 53), with autonomy support, with structure, was 38.92 with a standard deviation of 10.18. The perceived choice mean score for Group B (n = 61), with autonomy support, without structure, was 45.51 with a standard deviation of 4.33. The perceived choice mean score for Group C (n = 55), without autonomy support, with structure, was 39.51 with a standard deviation of 9.28.

Table 1

Means and Standard Deviations on the Perceived Choice Subscale of the IMI

		Perceived choice score	
Gaming Group	*n*	*M*	*SD*
A	53	38.92	10.18
B	61	45.51	4.33
C	55	39.51	10.17
D	53	37.70	9.63

Note. The maximum score is 49. The minimum score is 7.

Table 2 represents the descriptive statistics for the scores on the perceived competence subscale on the IMI for students in the control group and the three experimental groups. The

perceived competence mean score for Group D (n = 53), the control group, was 32.13 with a standard deviation of 6.43. The perceived competence mean score for Group A (n = 53), with autonomy support, with structure, was 32.08 with a standard deviation of 6.96. The perceived competence mean score for Group B (n = 61), with autonomy support, without structure, was 34.79 with a standard deviation of 4.32. The perceived competence mean score for Group C (n = 55), without autonomy support, with structure, was 31.89 with a standard deviation of 6.54.

Table 2

Means and Standard Deviations on the Perceived Competence Subscale of the IMI

		Perceived competence score	
Gaming Group	*n*	*M*	*SD*
A	53	32.08	6.96
B	61	34.79	4.32
C	55	31.89	6.54
D	53	32.13	6.43

Note. The maximum score is 42. The minimum score is 6.

Table 3 represents the descriptive statistics for the scores on the interest/enjoyment subscale on the IMI for students in the control group and the three experimental groups. The interest and enjoyment mean score for Group D (n = 53), the control group, was 41.32 with a standard deviation of 7.46. The interest/enjoyment mean score for Group A (n = 53), with autonomy support, with structure, was 36.85 with a standard deviation of 10.27. The interest/enjoyment mean score for Group B (n = 61), with autonomy support, without structure, was 44.77 with a standard deviation of 4.39. The interest/enjoyment mean score for Group C (n

= 55), without autonomy support, with structure, was 41.40 with a standard deviation of 7.36.

Table 3

Means and Standard Deviations on the Interest/Enjoyment Subscale of the IMI

		Interest/enjoyment score	
Gaming Group	*n*	*M*	*SD*
A	53	36.85	10.27
B	61	44.78	4.39
C	55	41.40	7.36
D	53	41.32	7.46

Note. The maximum score is 49. The minimum score is 7.

Table 4 represents the descriptive statistics for the average game scores of the five digital learning games students played in their classes. Scores for each game were averaged for each student creating a student average, which was entered into SPSS as the game score variable. The mean game score for Group D (n = 51), the control group, was 977.82 with a standard deviation of 420.16. The mean game score for Group A (n = 53), with autonomy support, with structure, was 980.62 with a standard deviation of 408.02. The mean game score for Group B (n = 62), with autonomy support, without structure, was 977.70 with a standard deviation of 353.39. The mean game score for Group C (n = 52), without autonomy support, with structure, was 960.98 with a standard deviation of 404.97.

Table 4

Means and Standard Deviations for Average Game Five-Day Game Scores

		Five-day game scores	
Gaming Group	*n*	*M*	*SD*
A	53	980.62	408.02
B	62	977.70	353.39
C	52	960.98	404.97
D	51	977.82	420.16

Note. The minimum score is 0.

Results

There were several key assumptions made when analyzing the data: assumption of normality, homogeneity of variance, data at an interval level, and independence of observations. An assumptions of normality was conducted via the Shapiro-Wilk test for each null hypothesis. Univariate group analyses, as conducted within this study, is robust to moderate violations of homogeneity of variances, so long as the sample sizes in each group are approximately equal (Glass, Peckham, & Sanders, 1972).

Null Hypothesis One

The first null hypothesis stated that there was no statistical difference in students' perceived autonomy among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments. Data screening was conducted via SPSS to ensure there were no missing values and to ensure no values entered into

the perceived choice data set were out of range. During data screening, a histogram was created to show the distribution of the data for each group (see Figure 1 below).

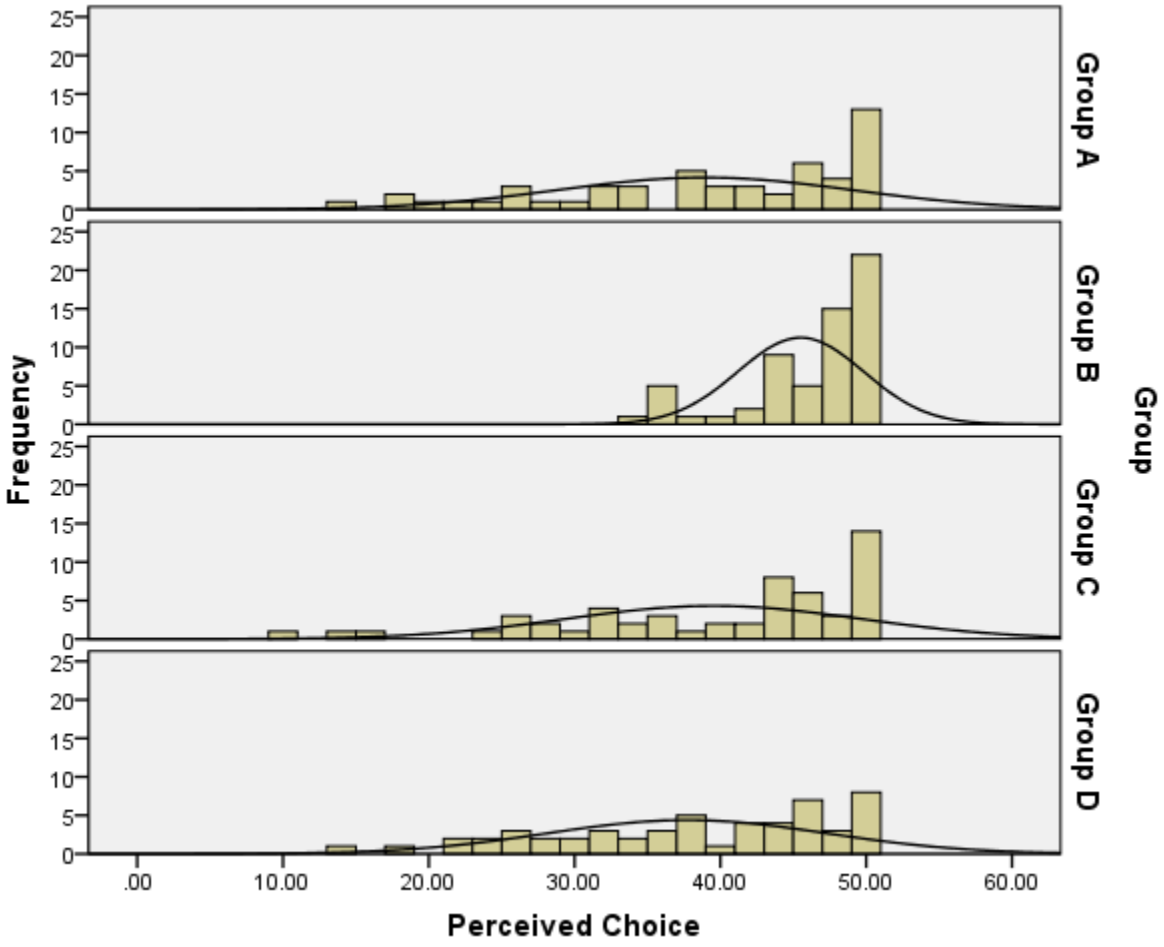

Figure 1 Histogram of Perceived Choice Results

Also during data screening, box plots were created to check for extreme outliers. See Figure 2 below.

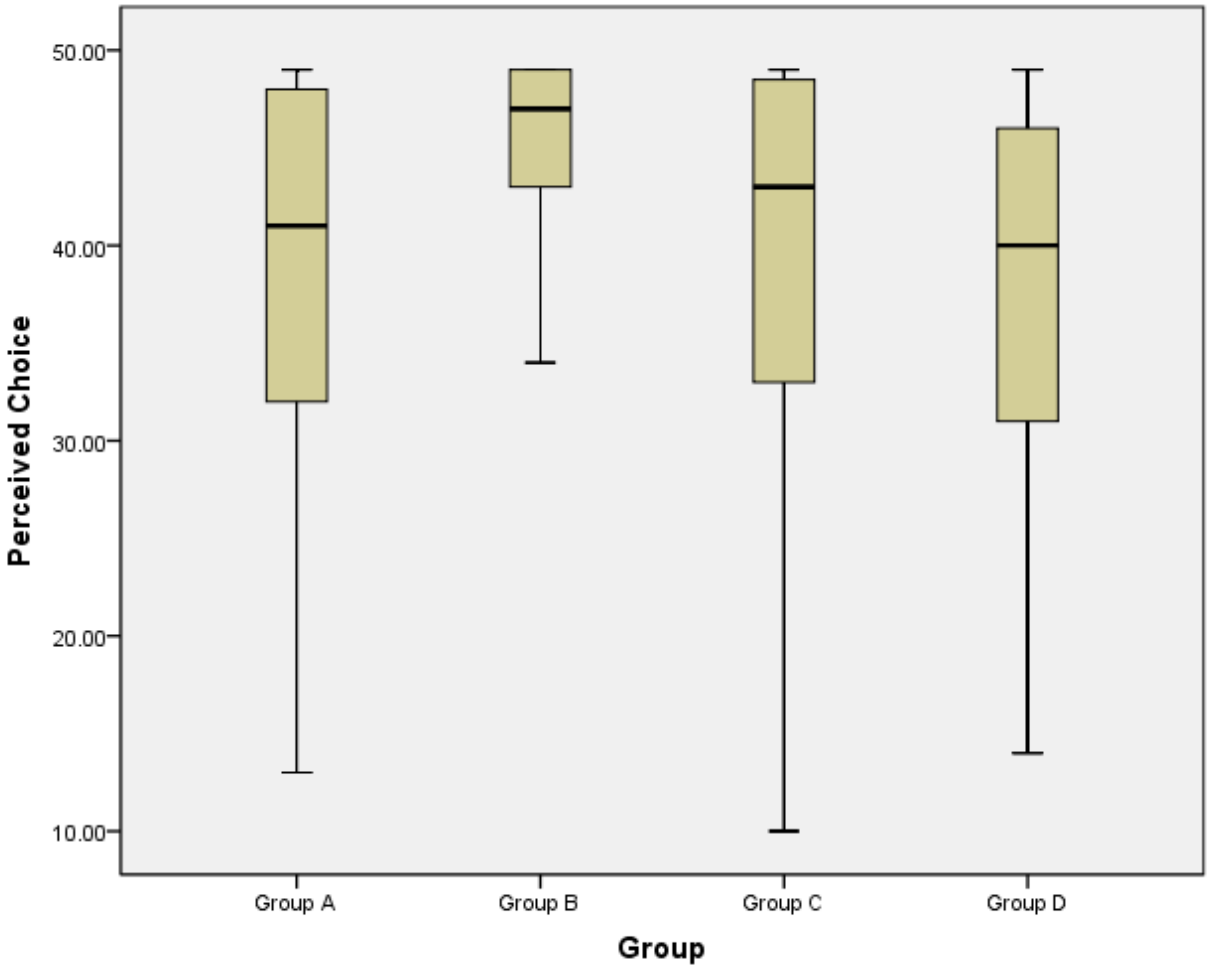

Figure 2 Boxplots of Perceived Choice Results

Analysis was conducted to test for the assumption of normality. The Shapiro-Wilk Test for normally distributed data revealed a *p* value of .000 for Group A, Group B, and Group C. Group D yielded a *p* value of .002 (see Table 5 below). Since the test revealed $p < .05$, it can be stated with 95% confidence that the scores are not normally distributed. The significance result for homogeneity of variance was conducted via a Levene's test and revealed $p = .00$. Because $p < .05$, the error variance of the dependent variable is not equal across the groups. The

significance level of the Levene statistic does not exceed .05 which indicates that the variances are not homogenous. However, univariate group analyses are robust to moderate violations of homogeneity of variances, so long as the sample sizes in each are approximately equal (Glass, Peckham, & Sanders, 1972).

Table 5

Test of Normality for Perceived Choice

Variables	Shapiro-Wilk test of normality		
	Statistic	*df*	Significance
Group A	.877	53	.00
Group B	.784	61	.00
Group C	.853	55	.00
Group D	.008	53	.00

N = 222, The significance level is set at $p < .05$.

A one-way between subjects ANOVA was conducted to compare the differences between the control and experimental groups according to the perceived choice mean scores. The mean and standard deviations are represented in Table 1. There was a significant effect on perceived choice at the $p < .05$ level for the four conditions [$F(3, 218) = 9.147$, $p = .000$, $\eta^2 = .11$]. The effect size was calculated using partial Eta-squared and interpreted using Cohen's *d*, revealing a medium effect on perceived choice between groups. Table 8 (below) showcases the post hoc comparisons using the Games-Howell test. The Games-Howell test was chosen due to the assumption of normality not being met (Hilton & Armstrong, 2006). The post hoc indicated that the mean score for Group A ($M = 38.92$, $SD = 10.18$) was significantly lower than Group B ($M = 45.51$, $SD = 4.33$). Group B ($M = 45.51$,$SD = 4.33$) was also significantly higher than Group C

(*M* = 39.51, *SD* = 10.17) and Group D (*M* = 37.70, *SD* = 9.63). See Table 9 below for post-hoc results. Based on the results on the perceived choice subscale of the IMI the researcher rejected the null hypotheses. It was expected that gaming groups that received supports of autonomy would score significantly higher than non-autonomy supportive groups, but this was not necessarily the case. Meanwhile, the group that received no structure and autonomy support in tandem scored significantly higher in perceived choice than two of the groups that received no supports of autonomy, they also scored higher than a group that did receive autonomy support and also structure. It was expected that autonomy support would yield significantly higher perceived choice scores, however it was unexpected to find the inclusion of structure support to have a potential detrimental effect on perceived choice.

Table 6

One-Way Analysis of Variance for the Perceived Choice Subscale on the IMI

Source	*Df*	*SS*	*MS*	*F*	*p*	Partial Eta-Squared
Between groups	3	2130.02	710.01	9.15	.00	.11
Within groups	218	16921.86	77.62			
Total	221	19051.87				

Note. Significance level set at $p < .05$

Table 7

Games-Howell Comparison of Perceived Choice

(I) Group	(J) Group	Mean Difference (I – J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Group A	Group B	-6.58*	1.50	.00	-10.55	-2.62
	Group C	-.58	1.96	.99	-5.70	4.53
	Group D	1.23	1.92	.92	-3.80	6.25
Group B	Group A	6.58*	1.50	.00	2.62	10.55
	Group C	6.00*	1.48	.001	2.11	9.89
	Group D	7.81*	1.43	.000	4.04	11.58
Group C	Group A	0.58	1.96	.99	-4.53	5.70
	Group B	-6.00*	1.48	.00	-9.89	-2.11
	Group D	1.81	1.91	.78	-3.16	6.78
Group D	Group A	-1.23	1.92	.92	-6.25	3.80
	Group B	-7.81*	1.43	.00	-11.58	-4.04
	Group C	-1.81	1.90	.78	-6.78	3.16

* The mean difference is significant at the .05 level

Null Hypothesis Two

The second null hypothesis stated that there was no statistical difference in students' perceived competence among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments. Data screening was conducted via SPSS to ensure there were no missing values and to ensure no values entered into the perceived competence data set were out of range. During data screening, histograms were

created to showcase distribution of the perceived competence scores for each gaming group (see Figure 3 below)

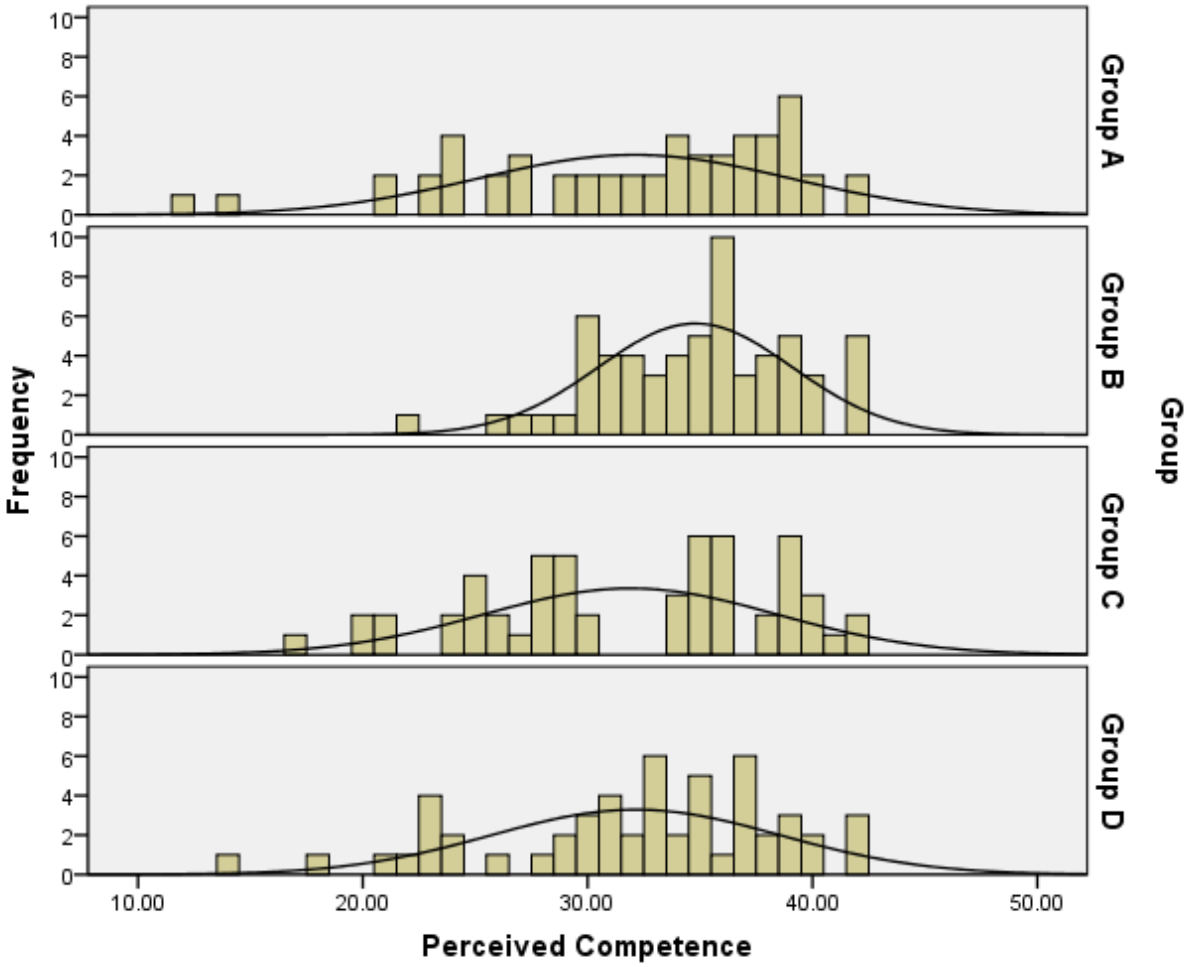

Figure 3 Histogram of Perceived Competence Results

Data screening also included boxplots to check for statistical outliers. See Figure 4 below.

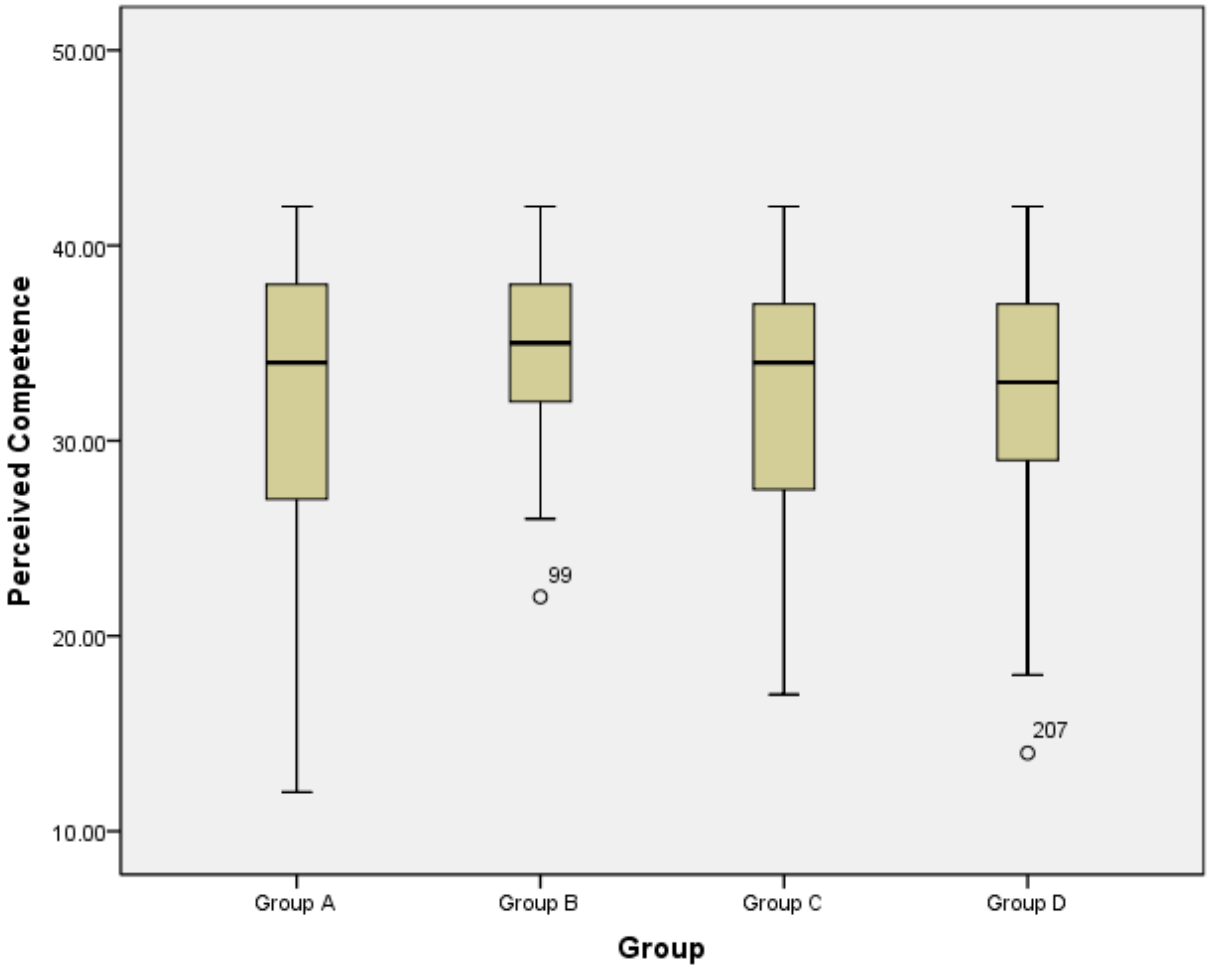

Figure 4 Boxplots of Perceived Competence Results

Analysis was conducted to test for the assumption of normality. The Shapiro-Wilk Test for normally distributed data revealed a *p* value of .00 for Group A, .02 for Group C, and .02 for Group D (see Table 8 below). Since the test revealed $p < .05$ for those three groups, it can be stated with 95% confidence that their scores are not normally distributed. Group B revealed a *p* value of .17. Since it revealed $p > .05$, it can be stated with 95% confidence that the scores are normally distributed in Group B. The significance result for homogeneity of variance was

conducted via a Levene's test and revealed $p = .00$. Because $p < .05$, the error variance of the dependent variable is not equal across the groups. The significance level of the Levene statistic does not exceed .05 which indicates that the variances are not homogenous. However, univariate group analyses are robust to moderate violations of homogeneity of variances, so long as the sample sizes in each are approximately equal (Glass, Peckham, & Sanders, 1972).

Table 8

Test of Normality for Perceived Competence

Variables	Shapiro-Wilk test of normality		
	Statistic	*df*	Significance
Group A	.927	53	.00
Group B	.972	61	.17
Group C	.946	55	.02
Group D	.949	53	.02

$N = 222$, The significance level is set at $p < .05$.

A one-way between subjects ANOVA was conducted to compare the differences between the control and experimental groups according to the perceived competence mean scores (see Table 9 below). The mean and standard deviations are represented in Table 2. There was a significant effect on perceived competence at the $p < .05$ level for the four conditions [$F(3, 218) = 3.031$, $p = .03$, $\eta^2 = .04$]. Effect size was calculated using partial Eta-squared and interpreted using Cohen's *d*, revealing a small effect on perceived competence between groups. Post hoc comparisons using the Games-Howell test indicated a significant difference in perceived competence between Group B ($M = 34.79$, $SD = 4.32$) and Group C ($M = 31.89$, $SD = 6.54$) at the $p < .05$ level. The Games-Howell test was chosen due to the assumption of normality not

being met (Hilton & Armstrong, 2006). See Table 10 below for post-hoc results. Based on the results on the perceived competence subscale of the IMI the researcher rejected the null hypothesis. It was expected that groups receiving structure support would have higher perceived competence scores; however that was not the case. A group that received no support of structure scored higher in perceived competence than the group that did receive structure support. It must be noted that the higher perceived competence group received autonomy support while the structure supportive group did not.

Table 9

One-Way Analysis of Variance for the Perceived Competence Subscale on the IMI

Source	*df*	*SS*	*MS*	*F*	*p*	Partial Eta-Squared
Between groups	3	337.70	112.57	3.03	.03	.04
Within groups	218	8097.35	37.14			
Total	221	8435.05				

Note. Significance level set at $p < .05$

Table 10

Games-Howell Comparison of Perceived Competence

(I) Group	(J) Group	Mean Difference (I – J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Group A	Group B	-2.71	1.10	.08	-5.61	0.18
	Group C	0.18	1.30	1.00	-3.21	3.58
	Group D	-0.06	1.30	1.00	-3.46	3.34
Group B	Group A	2.71	1.10	.08	-0.18	5.61
	Group C	2.90*	1.04	.03	0.17	5.62
	Group D	2.65	1.04	.06	-0.07	5.38
Group C	Group A	-0.18	1.30	1.00	-3.58	3.21
	Group B	-2.90*	1.04	.03	-5.62	-0.17
	Group D	-0.24	1.25	1.00	-3.50	3.02
Group D	Group A	0.06	1.30	1.00	-3.34	3.46
	Group B	-2.65	1.04	.06	-5.38	0.07
	Group C	0.24	1.25	1.0	-3.02	3.50

* The mean difference is significant at the .05 level

Null Hypothesis Three

The third null hypothesis stated that there was no statistical difference in students' interest/enjoyment among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments. Data screening was conducted via SPSS to ensure there were no missing values and to ensure no values entered into the interest/enjoyment were out of range. During data screening, histograms were created to showcase the distribution of data (see Figure 5 below).

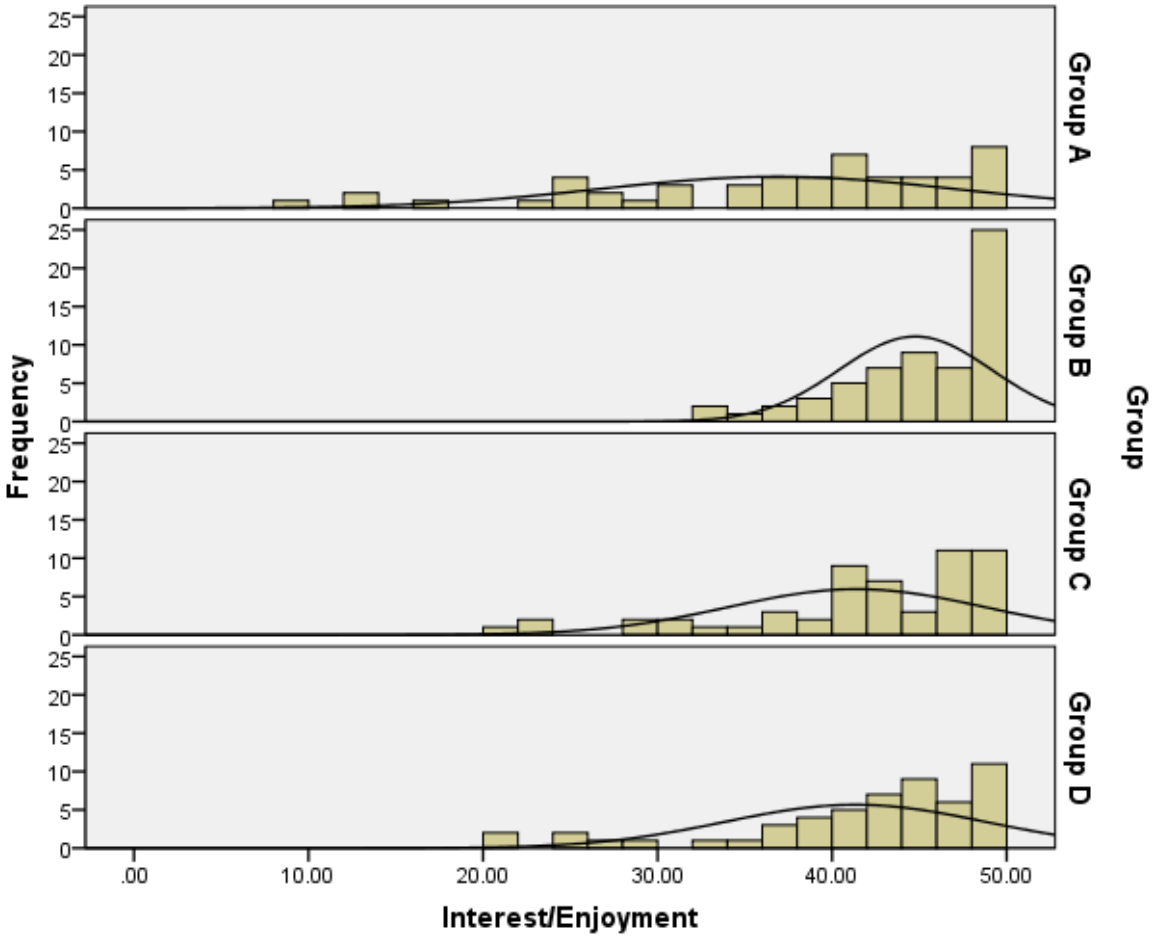

Figure 5 Histograms for Interest/Enjoyment Results

Also during data screening, boxplots were created to show any statistical outliers for the interest/enjoyment measure (see Figure 6 below).

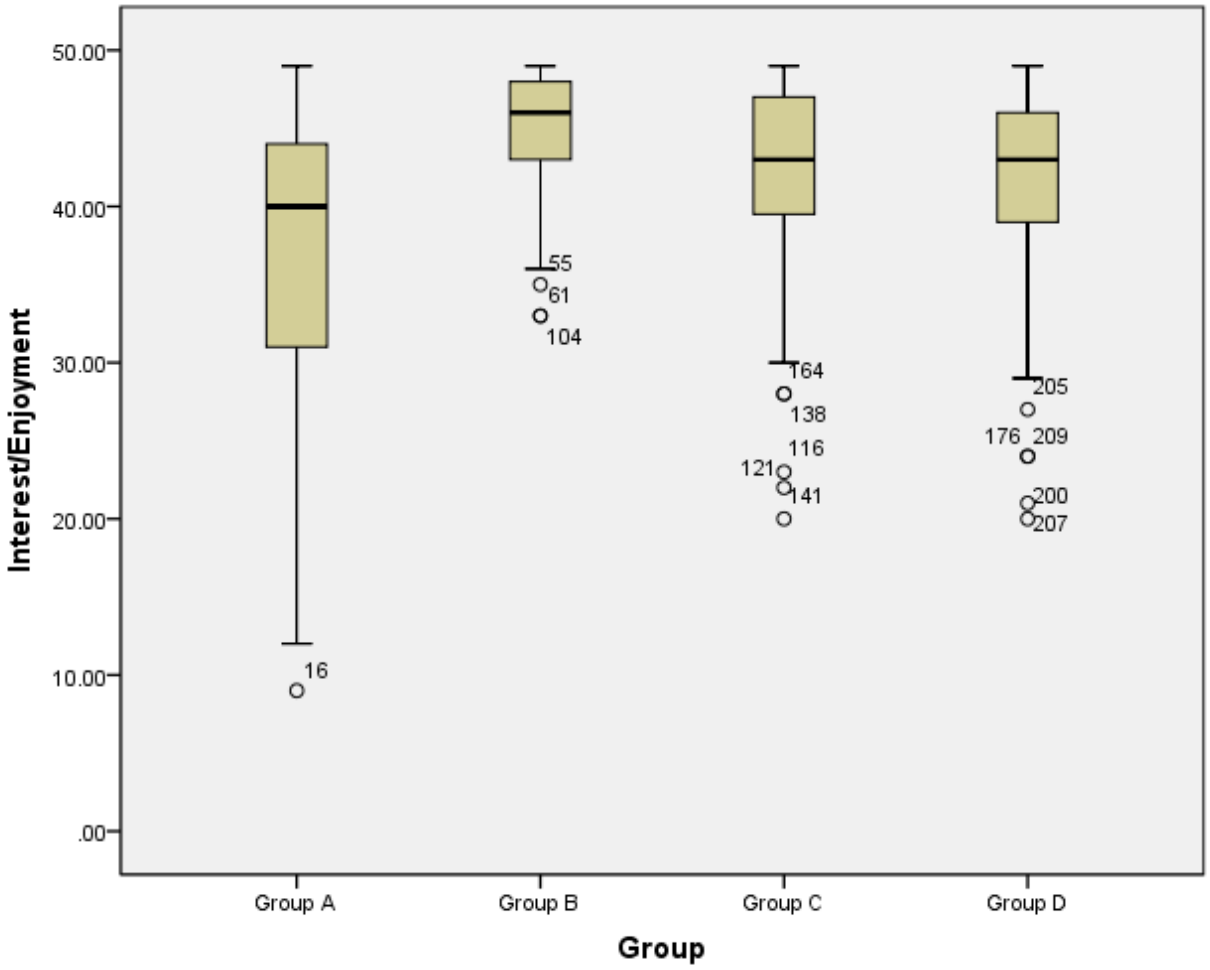

Figure 6 Boxplots of Interest/Enjoyment Results

Data analysis was conducted to test for the assumption of normality. The Shapiro-Wilk Test for normally distributed data revealed a *p* value of .000 for all four groups (see Table 11 below). Since the test revealed $p < .05$ for each group, it can be stated with 95% confidence that their scores are not normally distributed. The significance result for homogeneity of variance was conducted via a Levene's test and revealed $p = .00$. Because $p < .05$, the error variance of the dependent variable is not equal across the groups. The significance level of the Levene

statistic does not exceed .05 which indicates that the variances are not homogenous. However, univariate group analyses are robust to moderate violations of homogeneity of variances, so long as the sample sizes in each are approximately equal (Glass, Peckham, & Sanders, 1972).

Table 11

Test of Normality for Interest/Enjoyment

Variables	Shapiro-Wilk test of normality		
	Statistic	*Df*	Significance
Group A	.902	53	.00
Group B	.862	61	.00
Group C	.861	55	.00
Group D	.847	53	.00

N = 222, The significance level is set at $p < .05$.

A one-way between subjects ANOVA was conducted to compare the differences between the control and experimental groups according to the interest/enjoyment mean scores (see Table 12 below). The mean and standard deviations are represented in Table 3. There was a significant effect on interest/enjoyment at the $p < .05$ level for the four conditions [$F(3, 218) = 10.408$, $p = .000$, $\eta^2 = .13$]. Effect size was calculated using partial Eta-squared and interpreted using Cohen's *d*, revealing a medium effect on interest/enjoyment between groups. Post hoc comparisons using the Games-Howell test indicated that the mean score for Group A ($M = 36.85$, $SD = 10.27$) was significantly lower than Group B ($M = 44.77$, $SD = 4.39$) and Group C ($M = 41.40$, $SD = 7.36$) at the $p < .05$ level (see Table 13 below). The Games-Howell test was chosen due to the assumption of normality not being met (Hilton & Armstrong, 2006). In addition, Group B was statistically higher than Group C and Group D ($M = 41.32$, $SD = 7.46$). Post hoc

analysis reveals no other significant differences at the $p < .05$ level. Based on the findings, the research rejected the null hypothesis. It was expected that supporting students' needs of autonomy and structure would yield higher motivation. However, the group that received both these supports did not score significantly higher in interest/enjoyment than any group. As a matter of fact, the group that received the most supports scored lower in interest/enjoyment than the group that received only autonomy support and no structure.

Table 12

One-Way Analysis of Variance for the Interest/Enjoyment Subscale on the IMI

Source	*df*	*SS*	*MS*	*F*	*p*	Partial Eta-Squared
Between groups	3	1783.86	594.62	10.41	.00	.13
Within groups	218	12454.38	57.13			
Total	221	14238.18				

Note. Significance level set at $p < .05$

Table 13

Games-Howell Comparison of Interest/Enjoyment

(I) Group	(J) Group	Mean Difference (I – J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Group A	Group B	-7.92*	1.52	.00	-11.92	-3.92
	Group C	-4.55*	1.72	.04	-9.06	-0.04
	Group D	-4.47	1.74	.06	-9.03	0.09
Group B	Group A	7.92*	1.52	.00	3.92	11.92
	Group C	3.37*	1.14	.02	0.38	6.36
	Group D	3.45*	1.17	.02	0.39	6.52
Group C	Group A	4.55*	1.72	.04	0.04	9.06
	Group B	-3.37*	1.14	.02	-6.36	-0.38
	Group D	0.08	1.43	1.00	-3.64	3.80
Group D	Group A	4.47	1.74	.06	-0.09	9.03
	Group B	-3.45*	1.17	.02	-6.51	-0.39
	Group C	-0.08	1.43	1.00	-3.80	3.64

* The mean difference is significant at the .05 level

Null Hypothesis Four

The fourth null hypothesis stated that there was no statistical difference in students' game scores among groups completing digital game-based learning tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments. Data screening was conducted via SPSS to ensure there were no missing values and to ensure no values entered into the average

game score data set were out of range. During data screening, histograms were created to showcase distribution of the data (see Figure 7 below).

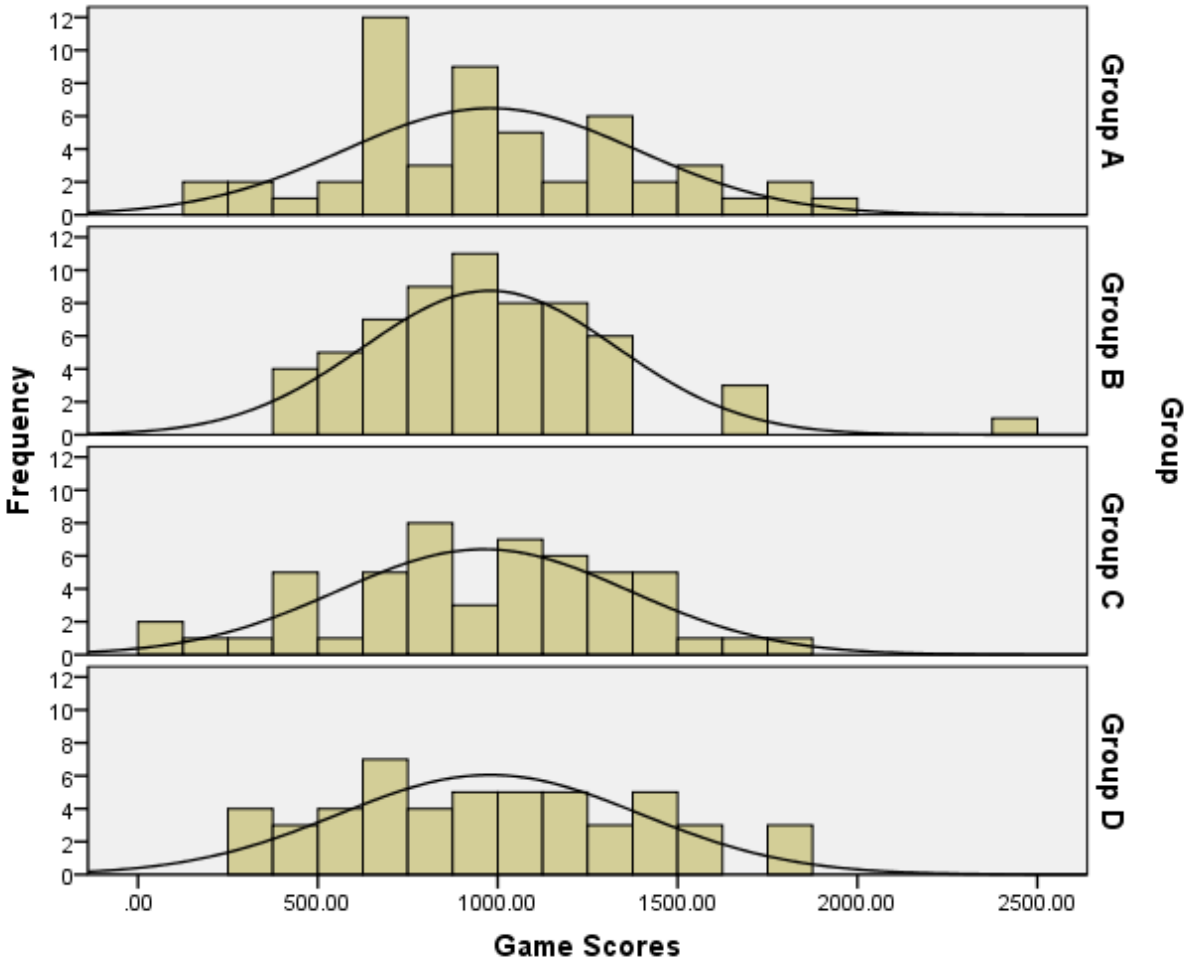

Figure 7 Histograms for Game Score Results

Also during data screening, boxplots were created to check for statistical outliers in average game scores for each gaming group (see Figure 8 below).

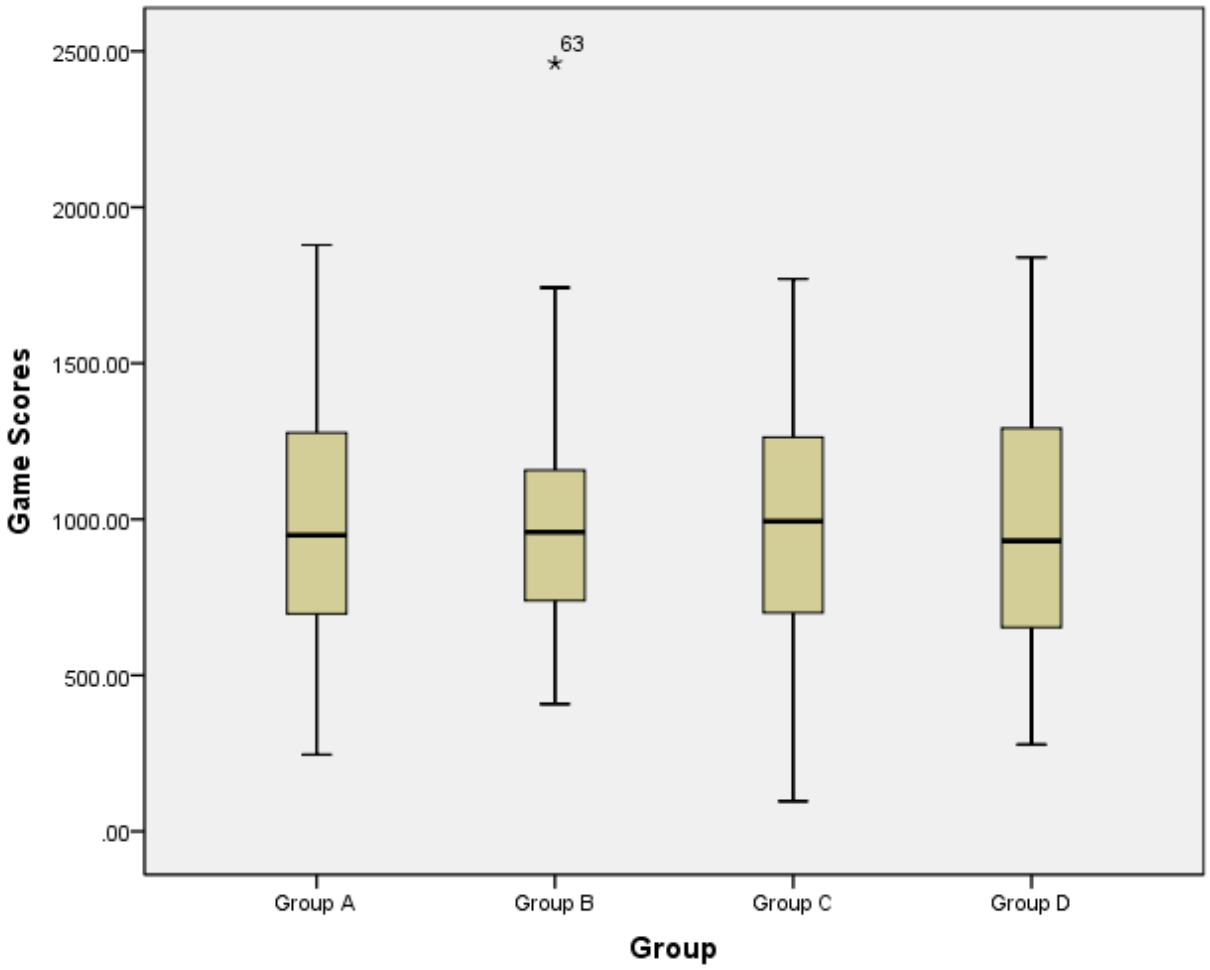

Figure 8 Boxplots of Game Score Results

Data analysis was conducted to test for the assumption of normality. The Shapiro-Wilk Test for normally distributed data revealed a *p* value of .183 for Group A, .587 for Group C, and .209 for Group D (see Table 14 below). Since the test revealed $p > .05$ for those three groups, it can be stated with 95% confidence that their scores are normally distributed. The normality test revealed a *p* value of .000 for Group B. Since the test revealed $p < .05$ for Group B, it be stated with 95% confidence that that group's scores are not normally distributed. The significance result of homogeneity of variance was conducted via a Levene's test and revealed $p = .15$. The

error variance of the dependent variable, average game scores, is equal across the groups because $p > .05$.

Table 14

Test of Normality for Five-Day Average Game Scores

Variables	Shapiro-Wilk test of normality		
	Statistic	*df*	Significance
Group A	.969	53	.18
Group B	.915	62	.00
Group C	.981	52	.59
Group D	.969	51	.21

$N = 218$, The significance level is set at $p < .05$.

A one-way between subjects ANOVA was conducted to compare the differences between the control and experimental groups according to their averaged game scores. The mean and standard deviations are represented in Table 4. There was no significant effect on game scores at the $p < .05$ level for the four conditions [$F(3, 214) = 0.03$, $p = .99$, $\eta^2 = .00$] (See table 15 below). Partial-Eta squared was used to analyze effect; no effect was discovered on average game scores between groups. Based on the findings the researcher failed to reject the null hypothesis. This finding was surprising to the researcher. It was expected that students who received motivational supports in terms of structure and autonomy would in turn achieve better within the games; however, this was not the case. Regardless of receiving supports of autonomy and structure or not, game scores were not statistically different between the four groups.

Table 15

One-Way Analysis of Variance for the Five Day Average Game Scores

Source	*df*	*SS*	*MS*	*F*	*p*	Partial Eta-Squared
Between groups	3	12687.51	4229.17	0.03	.99	.00
Within groups	218	33465845.45	15638.46			
Total	221	33478532.96				

Note. Significance level set at $p < .05$

CHAPTER FIVE: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Discussion

The purpose of this study was to see the effect of autonomy and structure support, during digital game-based learning (DGBL) tasks, on intrinsic motivation (IM), the facilitators of IM, and game scores. The study investigated one research question: Is there a significant difference in middle school students' motivation and game scores among groups completing DGBL tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments?

The research question included four null hypotheses addressing whether there was a difference in students' perceived choice, perceived competence, interest/enjoyment, and game scores among the game-playing groups described above.

Students completed five DGBL tasks over five consecutive days. Students played in one of four groups: three experimental and one control. Group A received autonomy supportive language, a rationale statement, tips for success, and objectives for each game. The students in this group were provided with the time expected to complete each game and were allowed choice at the onset of each game. Group B received autonomy supportive language, rationale for each game, and were allowed choice at the onset of each game. Group C was provided controlling language ("you must," "you will," etc.), were not allowed choice at the onset of each game nor provided rationale statements. They were, however, given the games' objectives, time expected to complete each game, and tips for in-game success. Group D, the control group, was given instructions to merely log into the gaming website and begin play. They were not given any other instructions.

The first null hypothesis stated that there is no significant difference in perceived autonomy among students completing DGBL tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments. The results of the one-way analysis of variance (ANOVA) showed a significant difference between groups and thus the researcher rejected the null hypothesis. Students in Group A scored significantly lower in perceived choice than Group B; the only difference is Group A received structure support, while Group B did not. This result supports Sierens et al. (2009) whose research revealed autonomy support and structure to be empirically differentiated by students. This is also consistent with findings by Furtak and Kunter (2002); they revealed seventh-grade students to have lower perceptions of autonomy even in an environment where students were provided choice in a non-controlling manner. Students completing DGBL tasks in Group B had significantly higher perceptions of choice than each of the other groups. This is consistent with self-determination theory (SDT) which claims feelings of autonomy are gained by providing choices (Deci & Ryan, 2000). Peng et al. (2012) found that being able to manipulate the game avatar and make choices within the game affected players' need satisfaction of autonomy. Students in Group B were allowed choices within gameplay, while Group C was not, and thus Group B scored higher in perceived choice than Group C. Group D, the control group, was allowed to play each game without any support; essentially, they were told to log in and play. Their perceived choice scores were significantly less than Group B which is contrary to Wallace, Sung, and Williams' (2014) results; they found students' perceptions of autonomy to be greater when students were allowed to use their own methods to complete classroom activities. This does support, however, the notion that autonomy support has to do with the teacher's language (Reeve & Halusic, 2009; Young-Jones, Cara, &

Levesque-Bristol, 2014). Students playing in Group B were provided instructions in an autonomy supportive manner prior to each game. They heard words such as "you should" and "I invite you." Group B thus scored significantly higher in perceived choice than students in Group C who heard non-autonomy supportive language such as "you must" and "you will." Both Groups A and Group B received autonomy supportive language and rationale for gameplay, yet Group A scored significantly lower in the perceived choice results. This seemingly contrasts research conducted by Benita, Roth, and Deci (2013); they found middle school students' perceived choice was enhanced when their teachers used autonomy supportive language and provided rationale for the task at hand.

The second null hypothesis stated that there is no significant difference in perceived competence among students completing DGBL tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments. The results of the one-way ANOVA showed significant difference among the four groups and thus the researcher rejected the null hypothesis. Post hoc analysis revealed students in Group B scored significantly higher on the perceived competence subscale of the IMI than students in Group C. Group B received autonomy-supportive language, rationale of each game, and provisions of choice prior to gameplay, while Group C did not. This finding is consistent with previous research. Sheldon et al. (2009) found that supporting students' needs for autonomy, such as providing choices, predicts other BPN, such as perceived competence. Previous quantitative studies revealed that students who received autonomy supportive language by their teachers scored higher in perceived competence and that providing choice facilitates feelings of competence (Mandingo et al., 2008; Patall, 2013). Even brief autonomy-supportive language can have a strong impact on

perceptions of competence (Young-Jones et al., 2014). The results are also in line with Benita et al (2013) who found no difference in perceived competence among three groups of students receiving autonomy supportive, autonomy suppressive, or neutral language prior to a task. Group B was the only group who differed significantly from any other group; the other three groups were not statistically different in perceived competence despite the differences in autonomy supportive, or non-supportive language received.

The third null hypothesis stated that there is no significant difference in interest/enjoyment among students completing DGBL tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments. The results of the one-way ANOVA showed a significant difference among the four groups and thus the researcher rejected the null hypothesis. Post hoc analysis revealed students receiving autonomy support and structure (Group A) scored significantly lower in interest and enjoyment than students who received autonomy support but no structure (Group B) and lower than students receiving no autonomy support, but with structure (Group C). It must be noted that Group B scored significantly higher in perceived choice than Group A as well. This is consistent with prior findings. According to Ryan and Deci (2008), the higher the feeling of autonomy the more likely interest will be fostered. Peng et al. (2012) discovered autonomy supportive game features led to greater enjoyment of gameplay. Further, while autonomy and competence directly affect enjoyment of gameplay, autonomy support is the most important factor affecting enjoyment (Neys et al., 2014). These assertions are supported within this finding. Although Group B lacked structure, they scored higher in perceived choice and interest/enjoyment than all the other groups. Van

Loon et al. (2012) also discovered meeting students' needs for both competence and autonomy in an online learning environment are not necessary to boost interest.

The fourth null hypothesis stated that there is no significant difference in average game scores among students completing DGBL tasks in autonomy supportive with structure, autonomy supportive without structure, non-autonomy supportive with structure, and non-autonomy supportive without structure environments. The results of the one-way ANOVA showed no significant difference among the four groups and thus the researcher failed to reject the null hypothesis. It is not surprising that students' game scores were not significantly different across the groups. According to Deterring et al. (2011) 97% of young people play computer and video games; thus, it was likely the participants were used to playing games and figuring out how to succeed. The work of Beserra et al. (2014) supports this notion; they discovered elementary students advancing within a game-based learning environment through trial and error. Dourda et al. (2014) revealed similar findings; primary school students experimented within the game to advance through the levels. Thus, although students received varying levels of support in terms of objectives and tips to succeed, they could have learned how to play on their own, or they could have re-started the game.

Conclusion

Based on the findings within this study, several conclusions can be made. First, having teachers provide supports of autonomy and structure, prior to gameplay, does not equate to students perceiving their environment as autonomy supportive. Group A perceived their environment as more controlling, scoring significantly less in perceived choice than Group B, while both groups received the same supports of autonomy. Both groups were allowed to make choices at the onset of gameplay, were provided autonomy-supportive language, and were told

the rationale for each game. The only difference was that Group A received structure support by the teacher who provided the learning objectives, tips to succeed, and expected gameplay time, prior to each of the five games while Group B received no such structure support. Providing no structure, as was done for Group B, could have led students to not equate playing the game with learning (Magnussen, et al., 2014). Providing too much structure prior to gameplay could have boosted students' anxiety levels, resulting in lower perceived choice (Deci et al., 1991; Miserandino, 1996; Tsai et al., 2008). Students in Group A were possibly overwhelmed with the task at hand, thus causing the perception of choice to be lower when structure was provided versus when it was not (Furtak and Kunter, 2002). This notion is supported by previous research in which more controlling environments led to greater anxiety (Deci et al., 1991; Tsai et al., 2008).

Second, DGBL is supposed to allow students to immerse themselves into the learning environment; they learn to do versus being told information (Chee & Tan, 2012). While Group D, the control, was given no information prior to gameplay, Group A was possibly given too much information; their script was considerably longer than any other group. This possibly had a detrimental effect on their IM. Group A scored significantly lower in interest/enjoyment than any other group. It is thus concluded that Group A was likely given too much information at the expense of discovery and rewarding gameplay.

Perceived competence was only significantly different between Groups B and C. However, Group B had higher perceived choice and higher interest/enjoyment as well. While Group C scored lower in perceived competence than Group B, there was no other difference in competence among the three other groups. Students likely learned how to play the games,

figuring them out as they went along, which has been documented in previous studies (Hwang et al., 2012; Kim, 2012).

Another conclusion made as a result of this study is the vitality of context within the classroom as a means to boost interest. Students in Group B were more interested in gameplay and enjoyed their experience significantly more than any other group. They were provided supports of autonomy but no structure. Group B also scored significantly higher in perceived choice than any other group. This is in line with the work of Bieg et al. (2011) who discovered perceived autonomy to correlate to higher interest and enjoyment in a task. According to SDT, providing choice leads to the perception that one is free to follow his or her own interests, leading to a higher internal locus of causality and higher IM (Deci & Ryan, 2000). This held true for Group B. Although Group A received the same supports of autonomy as Group B, their perceptions of autonomy was weaker, as well as their interest and enjoyment. The context of playing the game, established by the teacher, supports the notion that individual perception of teacher support is vital for fostering interest and enjoyment (Bieg et al., 2011).

The prior conclusion is consistent with CET. Prior research asserts that video gaming is a self-determined activity; it is a source of entertainment and thus players seek video games for the pleasure they provide (Neys et al., 2014). Intrinsic motivation to play, however, can be thwarted if the activity feels externally controlled (Deci & Ryan, 2000). Students who perceived the game-based learning environment as less autonomy supportive (Group A) also felt less interest and enjoyment than students who perceived the game as more supportive (Group B). Group B seemed to be the most optimal configuration for the DGBL environment. They only received supports of autonomy yet were more interested and enjoyed their game-playing experience than any other group. However, it is interesting that although they enjoyed the game more, Group B's

game-scores were not statistically different than the other groups. This is contrary to a finding by Rieger et al. (2014) where in-game success significantly affected enjoyment. It must be noted that this was conducted using an entertainment video game, not a digital learning game. It is concluded that students' external learning environment has an effect on motivational outcome, in this case interest and enjoyment, when playing digital learning games, as stated in CET and uncovered in previous research (Deci & Ryan, 2000; Gherasim et al, 2011).

Implication

The results of the study add to the existing body of knowledge around DGBL and the application of self-determination theory (SDT) to knowledge of online learning.

First, this study advances SDT, providing empirical evidence on the role of autonomy and competence in the digital learning environment (Darner, 2012) conducted in a class setting (Bergers et al., 2015) over an extended period of time (van Loon et al., 2012). It provides specific evidence of how autonomy and competence are perceived in an online gaming environment (Shen et al., 2013). It advances how teachers support or hinder perceived autonomy and competence within the classroom (Garn & Jolly, 2014). While autonomy support and structure has been shown to boost interest and enjoyment in digital learning environments, they are perceived different for DGBL tasks (van Loon, Ros, & Martens, 2012). This study showed that having too much structure, in terms of expressed objectives, expected gameplay time, and tips to succeed, might be detrimental to interest in game-based learning tasks, while ensuring the environment is perceived as autonomy supportive is beneficial. This knowledge helps assess the genesis of IM in game-based learning and what factors can boost or predict interest (Chen & Jong, 2010; Radel et al., 2014; Wormington et al., 2012). It also shows that the learning environment, namely the interactions between learner and instructor, has an effect on the

motivational outcome (Gherasim et al., 2011). Overall, the research findings affirm that need satisfaction differs between the types of tasks that individuals experience (Leverson et al., 2012).

This study provides quantitative data revealing how the antecedents that support more intrinsic types of motivation are perceived in a game-based learning environment. There has been an assumption that DGBL is motivating because of students' innate interest in playing video games (Li & Tsai, 2013; Papastergiou, 2009). The motivational appeal of DGBL is a prevalent reason for teachers to incorporate the strategy into the classroom (Wouters et al., 2013). However, the results of this study reveal that the types of support provided by the teacher can potentially affect interest and enjoyment in game-based learning.

Lastly, the study adds to the knowledge of DGBL usage in the classroom. It shows that planning is a necessary component; teachers still need to consider best pedagogical practices within classrooms using DGBL as a means to learn (Struppert, 2010). Although this study did not assess learning per se, it did gauge the conditions that facilitate learning within the classroom (Skinner et al., 2012). Skinner et al. (2012) discovered that higher perceptions of autonomy and competence led to increased engagement and success within the classroom. This study supports that notion: students who felt higher feelings of competence and autonomy support had greater interest and enjoyment in gameplay. Thus, it can be inferred, based on previous research, that they would have been more engaged in the activity.

Limitations

There are threats to the internal and external validity of the results. The results of the independent variables on each dependent variable could have been affected by extraneous factors, thus explaining the outcome of the study. Such confounding variables could have included students' initial interest in video gaming (Deci et al., 1991), their learning style (Hwang

et al, 2012), and their satisfaction with school in general (Tsai et al., 2008). A second external threat was population validity. According to Loukomies et al. (2013), students have subjective feelings that affect how their psychological needs are met. Students in this study were rather homogenous and thus likely had similar subjective feelings. This resulted from researching schools in a rural area with little ethnic diversity. Thus, the results may not be generalized to schools outside this demographic. The results are also limited to the type of games played during the study. There are too many features and parameters within games to generalize these results to similar situations using different games (Giard, Ecalle, & Magnan, 2013).

A threat to internal validity was through the selection process. Students completing the study were naturally tracked into academic and applied groups. While the researcher was unaware which classes were tracked into what specific groups, there is a possibility that there were more academically tracked or applied tracked students in a specific experimental groups or in the control group.

Recommendations for Further Research

Based on the findings within this research, several recommendations for future research can be made.

A similar study employing different genres, different subjects of games, and different within-game characteristics is suggested. According to Miller et al. (2011), easier games affects student achievement within the games. Further, the effectiveness of DGBL is dependent on subject and game type (Chiu et al., 2012).

A similar study, using the same games and age group, that incorporates competition within gameplay is suggested. While game-scores in this study were not statistically different across the groups, previous research reveals competition to boost game scores compared to non-

competitive gaming environments. Vandercruysse et al. (2013) revealed higher perceived competence within competitive gaming groups as well. This could also lead to students receiving structure support by the teacher to feel more autonomous as they pay attention to the objectives and means to win the game as a way to compete with and beat their classmates (Cheng et al., 2013).

It is suggested that future studies focus on specific aspects within self-determination theory, particularly the effect of structure support in the game-based learning environment. It is suggested that participants complete an interest survey and a perceived level of competence measure prior to and after gameplay in a learning environment that provides structure - similar to the structure provided within this study - and in a learning environment that does not. Jackson and McNamara (2013) showed competence to increase in an online gaming environment for 15 year olds in a lab setting. It would be interesting to see how structure supports or lack thereof affects perceived competence in a class setting. It would also be beneficial to combine this type of study with a gauge of students' interest after completing a DGBL task once and then again after several gameplays. Prior research shows enthusiasm for completing tasks tends to wane or at best level off as the task becomes more familiar, especially for game-based learning tasks (Ronimus et al., 2014; van Nuland et al., 2012). It would therefore be helpful to know if interest in game-based tasks decreases as they too become more familiar and less novel.

Future research using a similar study that controls for confounding variables such as learning style, anxiety levels, and perceptions of school climate are suggested. In previous studies students who played a game matched with their learning style scored significantly higher in learning motivation (Hwang et al., 2012). In addition, satisfaction with school has been shown effect motivation (Deci et al., 1991). Lastly, it was concluded that anxiety could have played a

role in lowering students' perceived autonomy, even though they were in an autonomy supportive environment. Research is needed to see if providing structure in a DGBL environment does indeed affect student anxiety levels.

Another recommendation for a future study would be to use a similar study and assess learning gains. While students varied in their perceived interest and enjoyment, perceived choice, and perceived competence across the various groups, their game scores were not statistically different. Having similar game-scores does not mean students learned the intended content within the game however. In previous studies, students were able to do well within games, yet were not able to answer questions supposedly learned within gameplay (Tsai et al., 2012). Still, digital learning games have proven to produce learning gains compared to non-gaming environments (Ku et al., 2014). It would be useful to know which configuration yields optimal learning.

Lastly, qualitative data could add to the robustness of the study concerning SDT as it applies to DGBL. A study assessing whether students continue to play these games at home is recommended. Research assessing intention to play beyond the classroom and its dependency on meeting the BPN according to SDT is suggested. According to Vallerand (2007), if the needs of autonomy and competence are being fulfilled, students will engage in activities out of their own will, without external persuasion.

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Wouters, P., van Nimwegan, C., van Oostendorp, H., & van der Spek, E. (2013). A meta-analysis of the cognitive and motivational effects of serious games. *Journal of Educational Psychology, 105*(2), 249-265. doi: 10.1037/a0031311

Yang, Y-T.C. (2012). Building virtual cities, inspiring intelligent citizens: Digital games for developing students' problem solving and learning motivation. *Computers & Education, 59,* 365-377. doi: 10.1016/j.compedu.2012.01.012

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Young-Jones, A., Cara, K.C., & Levesque-Bristol, C. (2014). Verbal and behavioral cues: Creating an autonomy-supportive classroom. *Teaching in Higher Education, 19*(5), 497-509. doi: 10.1080/13562517.2014.880684

Zhang, T., Solmon, A., & Xiangli, G. (2012). The role of teachers' support in predicting students' motivation and achievement outcomes in physical education. *Journal of Teaching in Physical Education, 31,* 329-343.

APPENDIX A: Assessment Instruments

THE POST-EXPERIMENTAL INTRINSIC MOTIVATION INVENTORY

- The IMI instrument is not included in this Appendix due to possible copyright infringement
- The assessment instrument can be accessed at http://selfdeterminationtheory.org/intrinsic-motivation-inventory/
- In order to access the instrument, register for a free account and download the IMI packet
- The subscales used were Perceived Choice, Perceived Competence, and Interest and Enjoyment

APPENDIX B: Informed Consent Form

PARENTAL CONSENT FORM

Title of study: Differences in motivation and game scores between middle school students completing digital game-based learning tasks with and without supports of autonomy and structure.

Principal investigator's name: Joe Harmon

Liberty University

Academic department: Department of Education

Your child is invited to be in a research study of motivation and supports for motivation in a classroom using digital game-based learning tasks. They were selected as a possible participant because the focus of the study is students in grades six through eight. I ask that you read this form and ask any questions you may have before agreeing to be in the study.

Joe Harmon, a doctoral candidate in the Department of Education at Liberty University is conducting this study.

Background Information:

The purpose of this study is to see the effect of autonomy and structure support, during game-based learning tasks on motivation and game scores.

Procedures:

If you agree for your child to take part in this study, I would ask them to do the following things:

Your child's class will be randomly assigned to one of four study groups or to a control group. Each group will play five different online civics-based games over the course of five days. The differences between the groups concerns the amount of structure provided by the teachers and the choices allowed within the game. After five days of gameplay, students will complete an online survey. They will not be video or audio recorded. All student data will remain confidential and anonymous.

Risks and Benefits of being in the Study:

The risks for participation in this study are minimal. The largest risk will be a loss of class time. The study requires students to play five different online learning games over the course of five class periods. A minor risk is student boredom or frustration while playing the games.

Students will not receive any direct benefits for participating in this study. However, their participation will aid in furthering research in motivation and game-based learning.

Compensation:

Students will not receive any payment or other compensation for participating in this study. They will not receive or lose classroom points based on their performance.

Confidentiality:

The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify a subject. Research records will be stored securely and only the researcher will have access to the records. Survey data will be anonymously entered via an online survey and students' game scores will be registered on the gaming website via a pseudonym assigned by the students' teachers.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to allow your child participate will not affect you or your child's current or future relations with Liberty University or your respective schools. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:

The researcher conducting this study is Joe Harmon. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact him at (814) 365-5557 or via e-mail at. You may also contact the chairperson of this study, Dr. David Holder, at (434) 582-2418, or via e-mail at deholder@liberty.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd, Suite 1837, Lynchburg, VA 24515 or email at irb@liberty.edu.

Please notify the researcher if you would like a copy of this information to keep for your records.

Statement of Consent:

I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS IRB APPROVAL INFORMATION WITH CURRENT DATES HAS BEEN ADDED TO THIS DOCUMENT.)

Signature of parent or guardian: _____ Date: _____

Signature of Investigator: _____ Date: _____

APPENDIX C: Child Assent Form

The Liberty University Institutional Review Board has approved this document for use from 3/25/16 to 3/24/17 Protocol # 2443.032516

Assent of Child to Participate in a Research Study

What is the name of the study and who is doing the study?
The name of this study is *Differences in motivation and game scores between middle school students playing digital game-based learning tasks with and without supports of autonomy and structure*. The study is being conducted by Mr. Joe Harmon.

Why are we doing this study?
We are interested in studying students' motivation after playing online learning games in their middle school classrooms.

Why are we asking you to be in this study?
You are being asked to be in this research study because the online learning games are intended for students in grades six through eight.

If you agree, what will happen?
If you are in this study you will play five different online learning games over the course of five school days, during your social studies class time. After playing the games, you will fill out an online survey.

Do you have to be in this study?
No, you do not have to be in this study. If you want to be in this study, then tell the researcher. If you don't want to, it's OK to say no. The researcher will not be angry. You can say yes now and change your mind later. It's up to you.

Do you have any questions?
You can ask questions any time. You can ask now. You can ask later. You can talk to the researcher. If you do not understand something, please ask the researcher to explain it to you again.

Signing your name below means that you want to be in the study.

_____ _____
Signature of Child Date

Principal Researcher: Mr. Joe Harmon, e-mail: jharmon16@liberty.edu
Research Chair: Dr. David Holder, e-mail: deholder@liberty.edu
Liberty University Institutional Review Board,
1971 University Blvd, Lynchburg, VA 24515
or email at irb@liberty.edu.

APPENDIX D: Approval letter from IRB

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

March 25, 2016

Joe Harmon
IRB Approval 2443.032516: Differences in Motivation and Game Scores between Middle School Students Playing Digital Game-Based Learning Tasks with and without Supports of Autonomy and Structure

Dear Joe,

We are pleased to inform you that your study has been approved by the Liberty IRB. This approval is extended to you for one year from the date provided above with your protocol number. If data collection proceeds past one year, or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. The forms for these cases were attached to your approval email.

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

G. Michele Baker, MA, CIP
Administrative Chair of Institutional Research
The Graduate School

LIBERTY
UNIVERSITY.
Liberty University | Training Champions for Christ since 1971

APPENDIX E: Communications to Participating Schools

Letter to administration introducing the study

Date

Name of School Administrator
Street Address of School
City, State Zip

RE: Permission to Conduct Research Study

Dear Mr./Mrs. (Name of school administrator),

I am writing to request permission to conduct a research study within your school district. I am currently enrolled in the Doctorate of Education program at Liberty University of Virginia and am in the process of writing my doctoral dissertation. The study is entitled "Differences in motivation and game scores between middle school students completing digital game-based learning tasks with and without supports of autonomy and structure."

I hope that the school administration will allow me to recruit ninety-five students, male and female, in grades six through eight from the district to take party in my study. Students will be asked to play five different civics-based online learning games, in their social studies classrooms, over a five day period. Afterward, they will complete a brief survey (copy attached). Interested students, who volunteer to participate, will be given a consent form to be signed by their parent or guardian (copy enclosed) and returned to the primary researcher prior to taking part in the study. Students will then be asked to provide assent to participate in the study.

If approval is granted, student participants will play five different civics-based online learning games in their social studies classes and complete the survey, over a five day period. The survey results will be pooled for the research project and individual results of this study will remain absolutely confidential and anonymous. Should this study be published, only pooled results will be documented. No costs will be incurred by either your school/center or the individual participants.

Your approval to conduct this study will be greatly appreciated. I will follow up with a telephone call next week and would be happy to answer any questions or concerns that you may have at that time. You may contact me at my email address: jharmon16@liberty.edu.

If you agree, kindly sign below and return the signed form in the enclosed self-addressed envelope. Alternatively, kindly submit a signed letter of permission on your institution's letterhead acknowledging your consent and permission for me to conduct this survey/study at your institution.

Sincerely,

Joseph Harmon, Liberty University

Enclosures

cc: Dr. David Holder, Research Chair, Liberty University

Approved by:

_____ _____ _____

Print your name and title here Signature Date

APPENDIX F: Setting up the iCivics website for research

www.icivics.org

June 27, 2016

To Whom It May Concern:

The purpose of this letter is to give expressed, written permission to Dr. Joseph Harmon to include screenshots from iCivics.org in the appendices of his dissertation, which we understand will be published by ProQuest in the Liberty University Digital Commons.

Thank you for your attention to this matter.

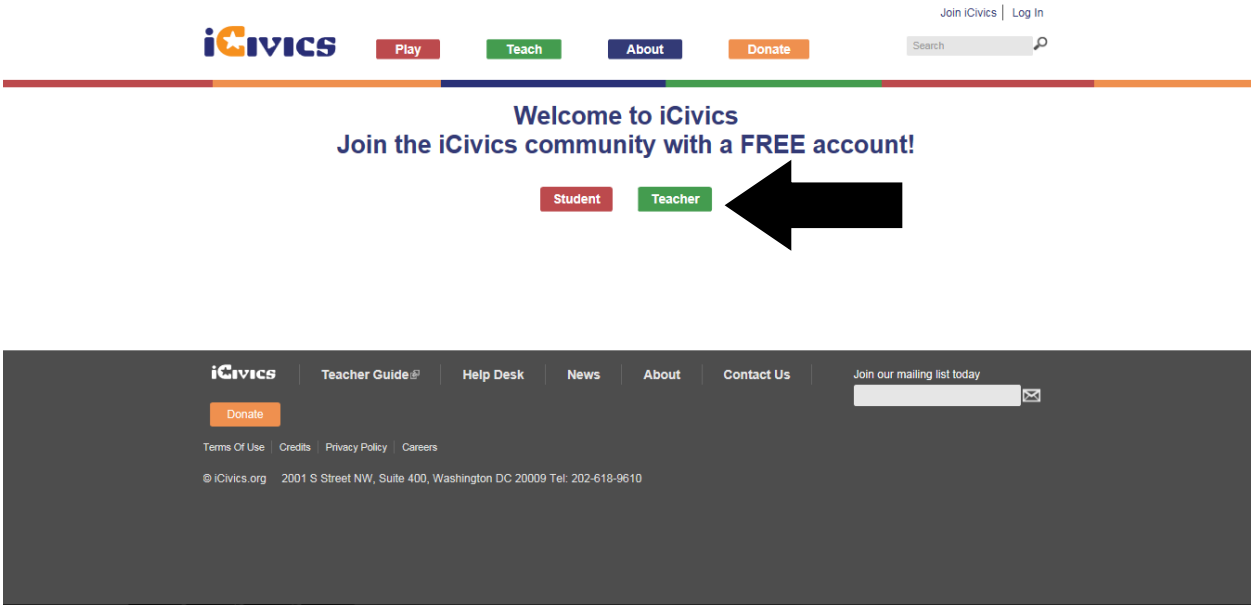
Warmly,

Emma Humphries, Ph.D.

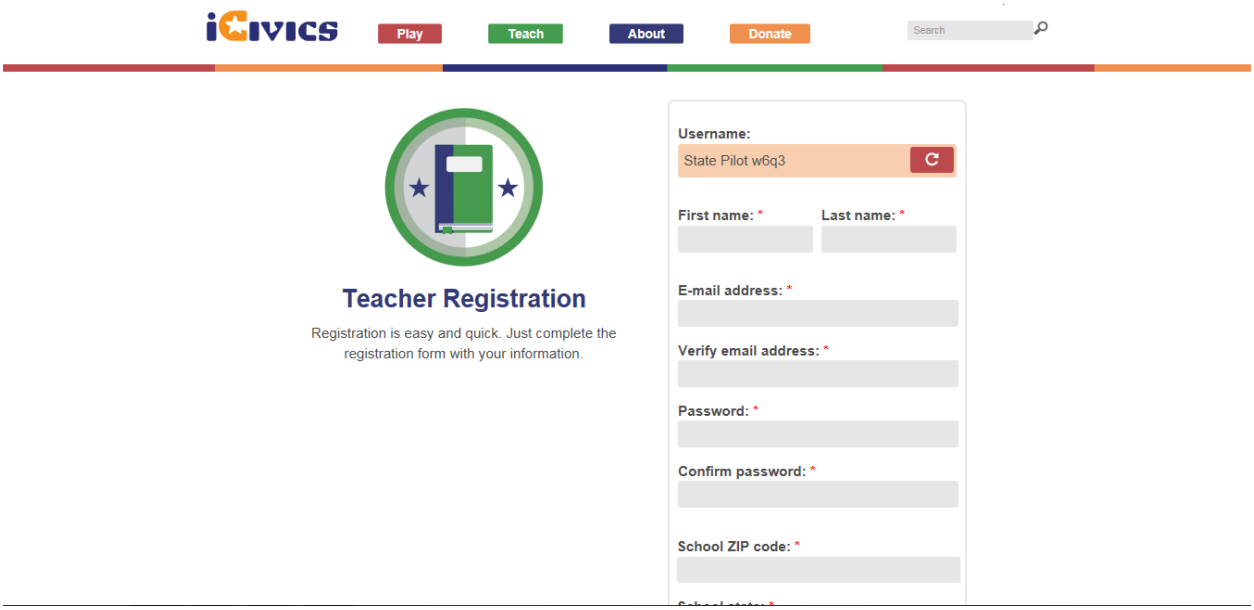
Chief Engagement Officer, iCivics

1035 Cambridge Street, Suite 400, Cambridge, MA 02141 T: (617) 356-8311
www.icivics.org

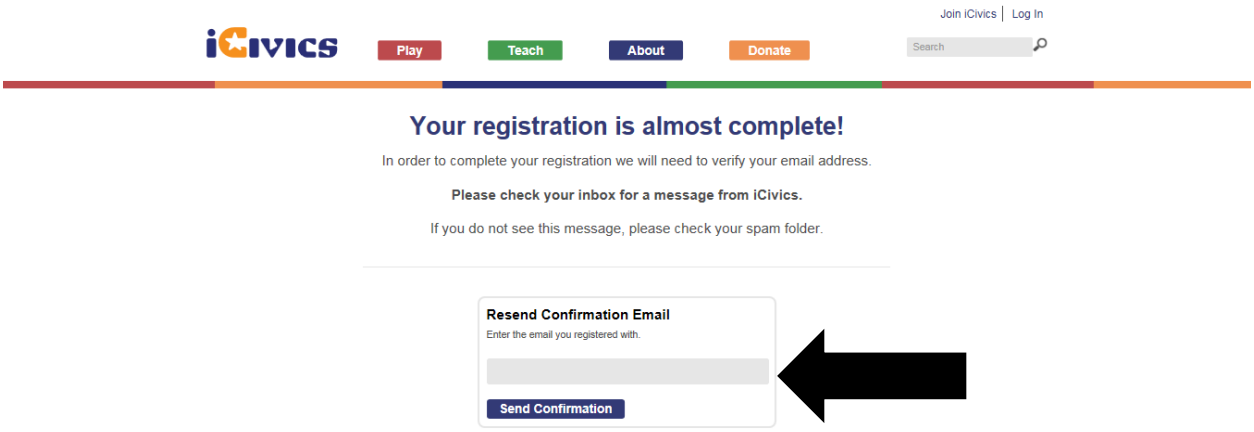
1. Enter www.icivics.org in address bar and then click Join iCivics, indicated on the arrow above



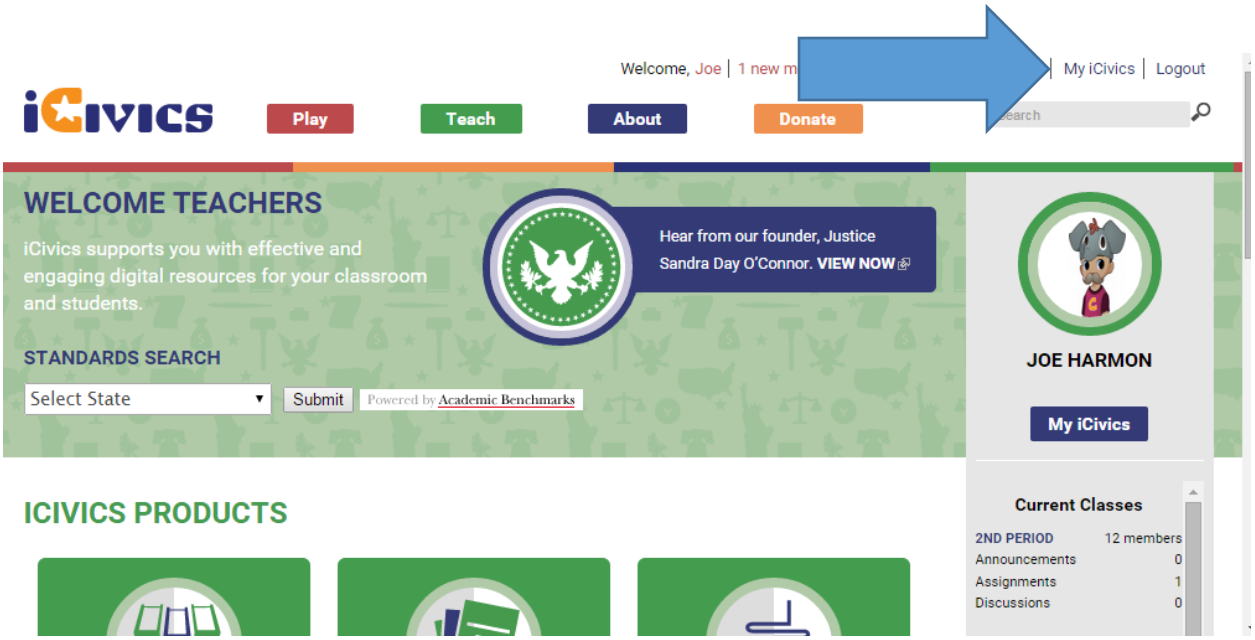
2. Click “Teacher” as indicated above



3. Fill in information: Username can be left the same or can be randomly generated by clicking arrow to right



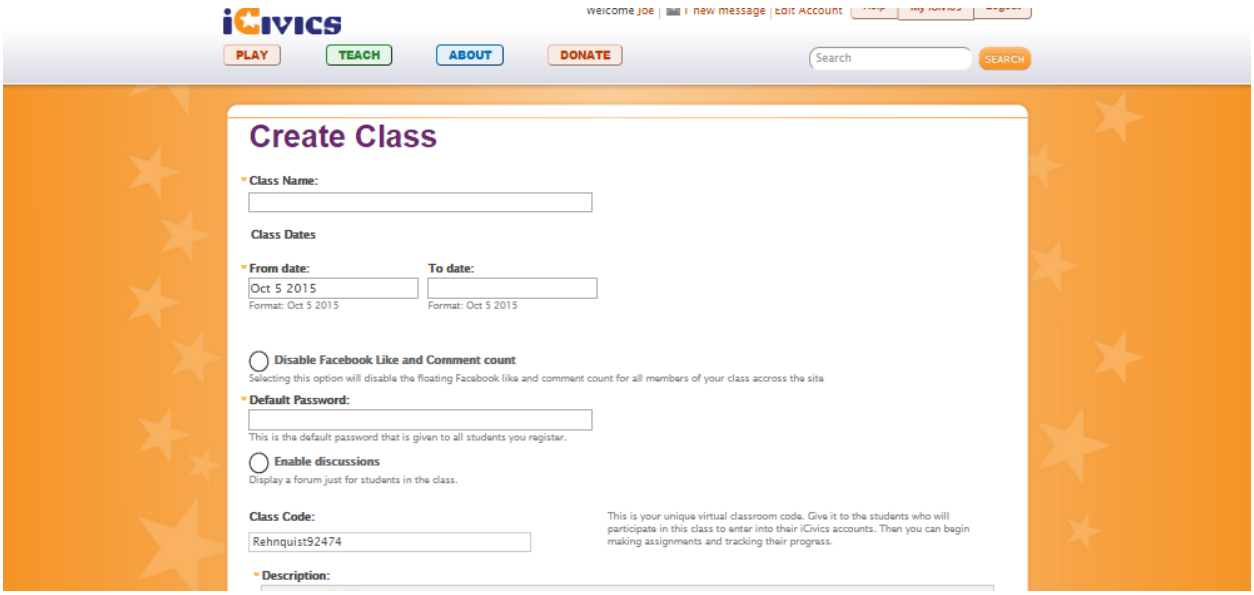
4. Enter e-mail used for initial registration and click “send confirmation” as indicated above



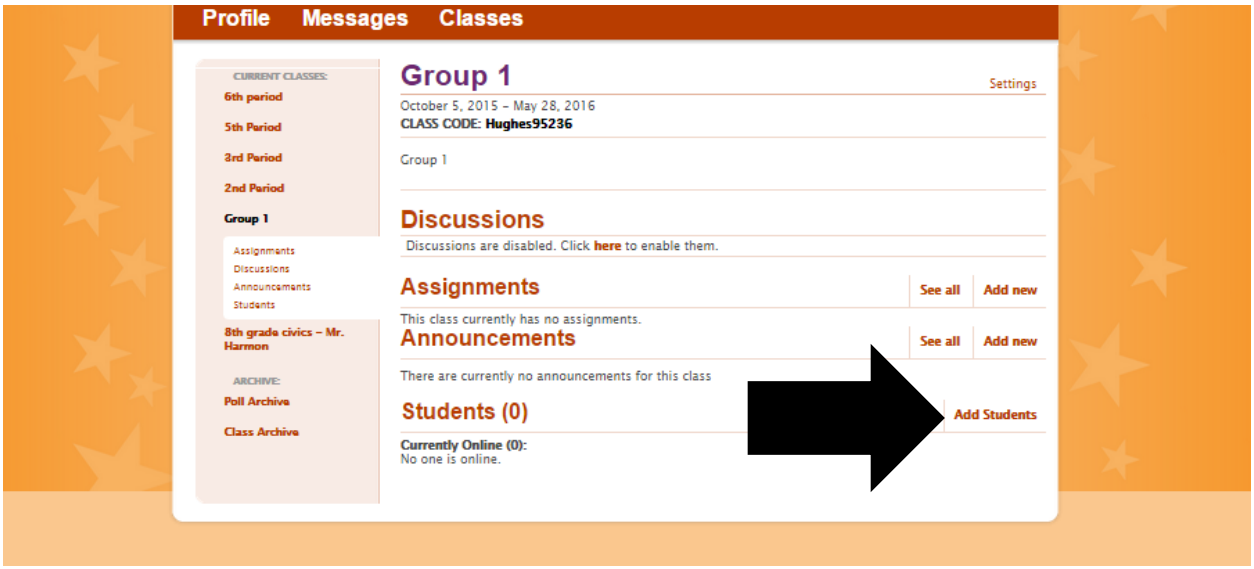
5. Home screen once an account is created. Click on "My iCivics" as indicated above

6. Click on "Classes" as indicated above

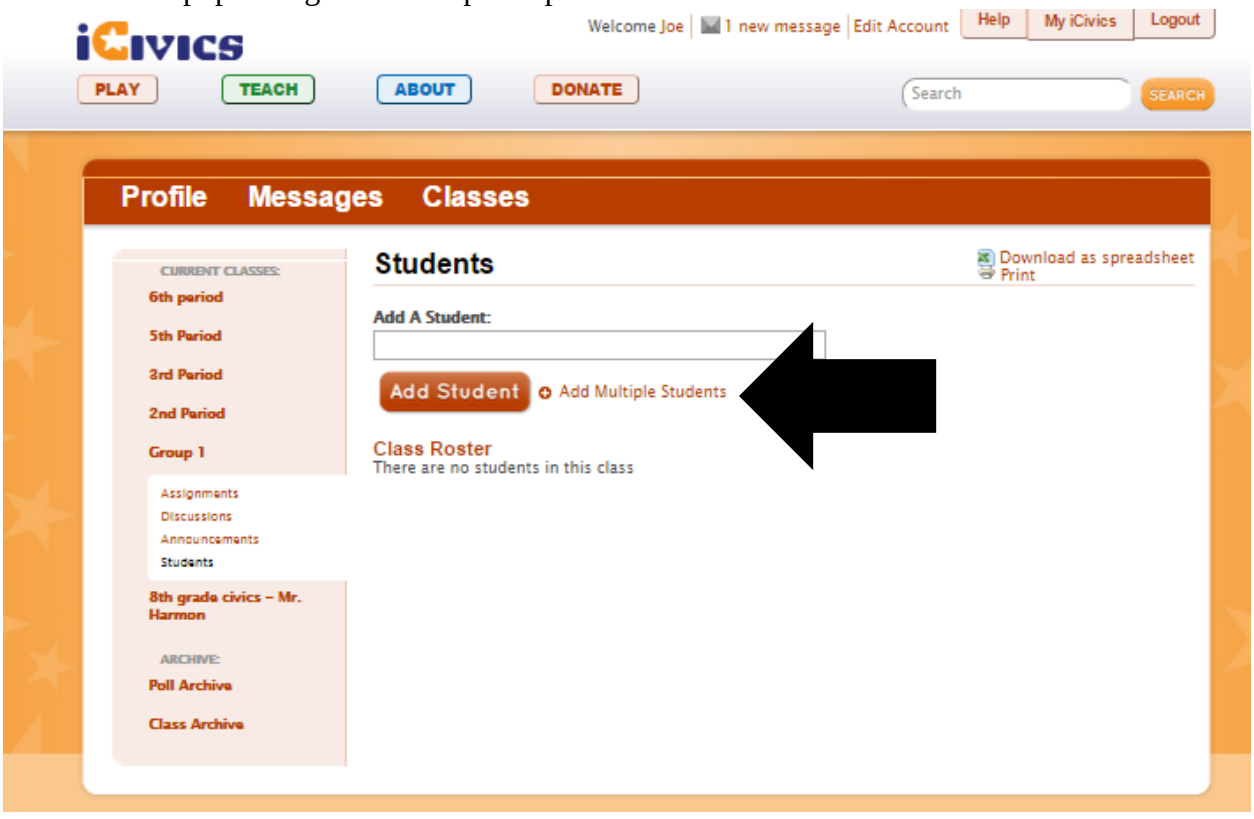
7. Click on “Create a New Class” as indicated above



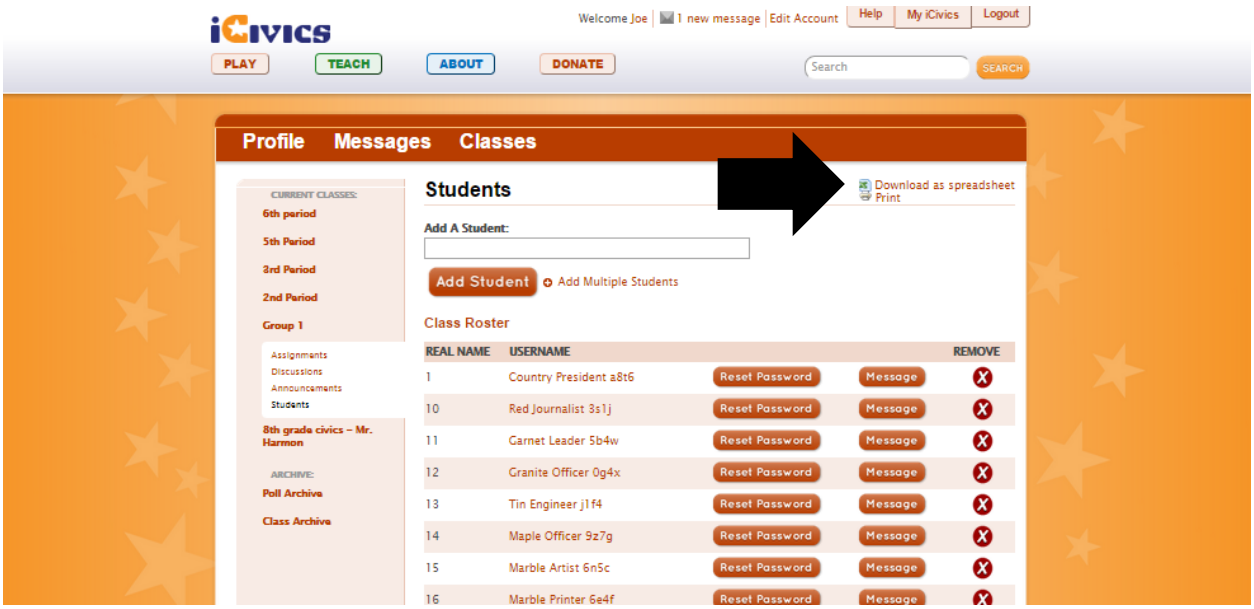
8. Create classes for each of the independent variables and one class for the control group



9. Sample home page of a created class on iCivics. Click "Add Students" as indicated above to start populating class with participants



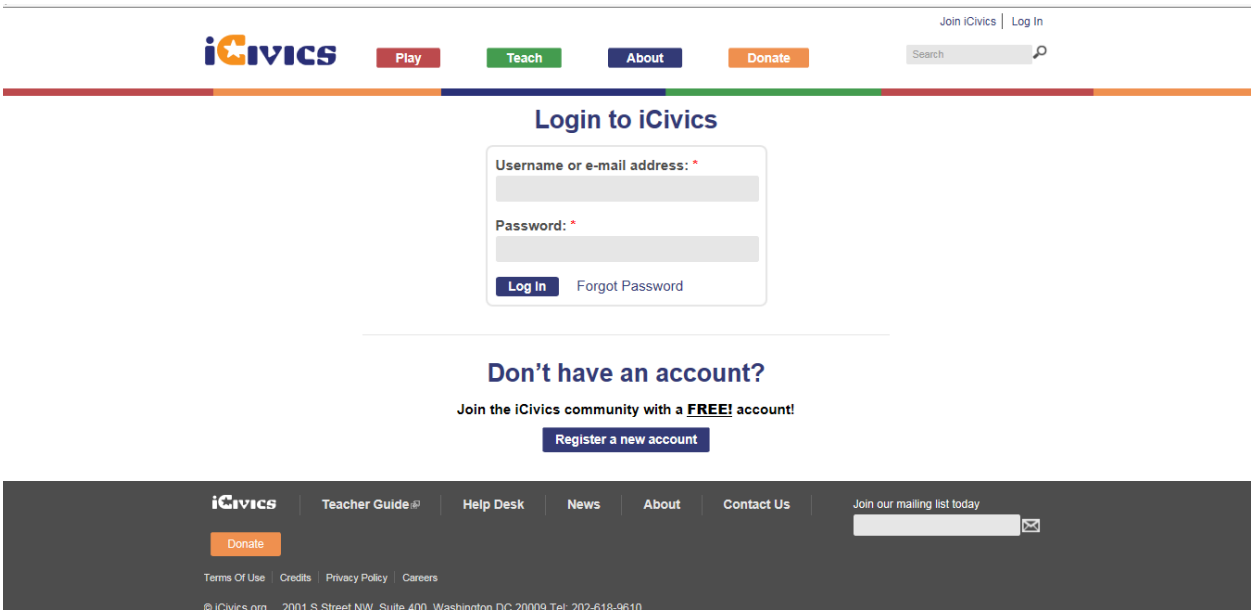
10. Click on "Add Multiple Students" and begin populating participants on subsequent page. Use numbers in place of student names



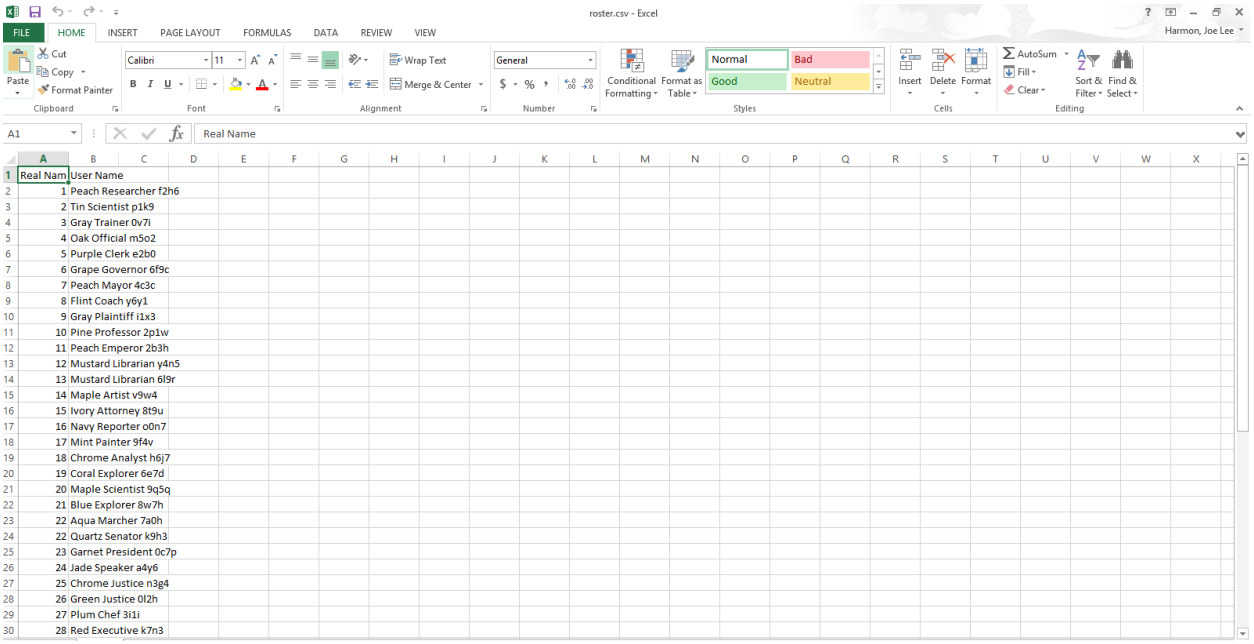
11. Real names are indicated above as numbers. Click on Download as a spreadsheet to provide a spreadsheet for teachers to use for participants

APPENDIX G: Screen-Shot Instructions for Participating Students

1. Home screen of iCivics, found at www.icivics.org. The arrow points to the Log in

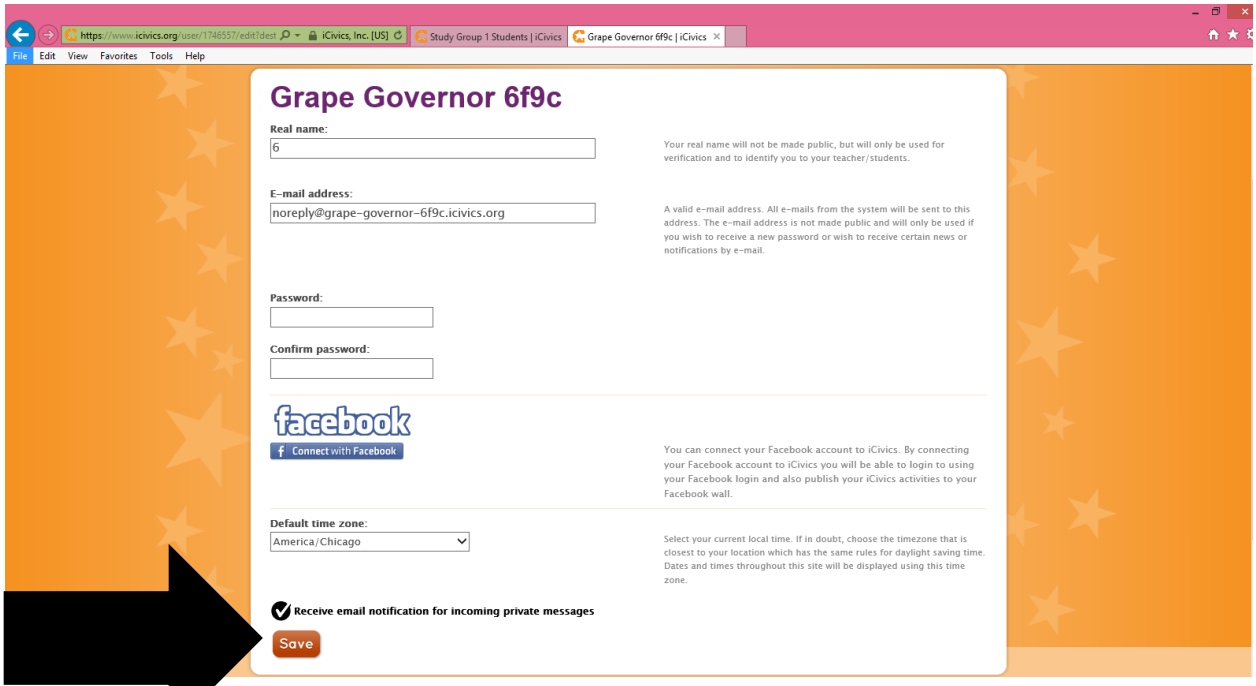


2. Student log in screen. Username provided via spreadsheets (see following screenshot for example). Password set as "icivics"

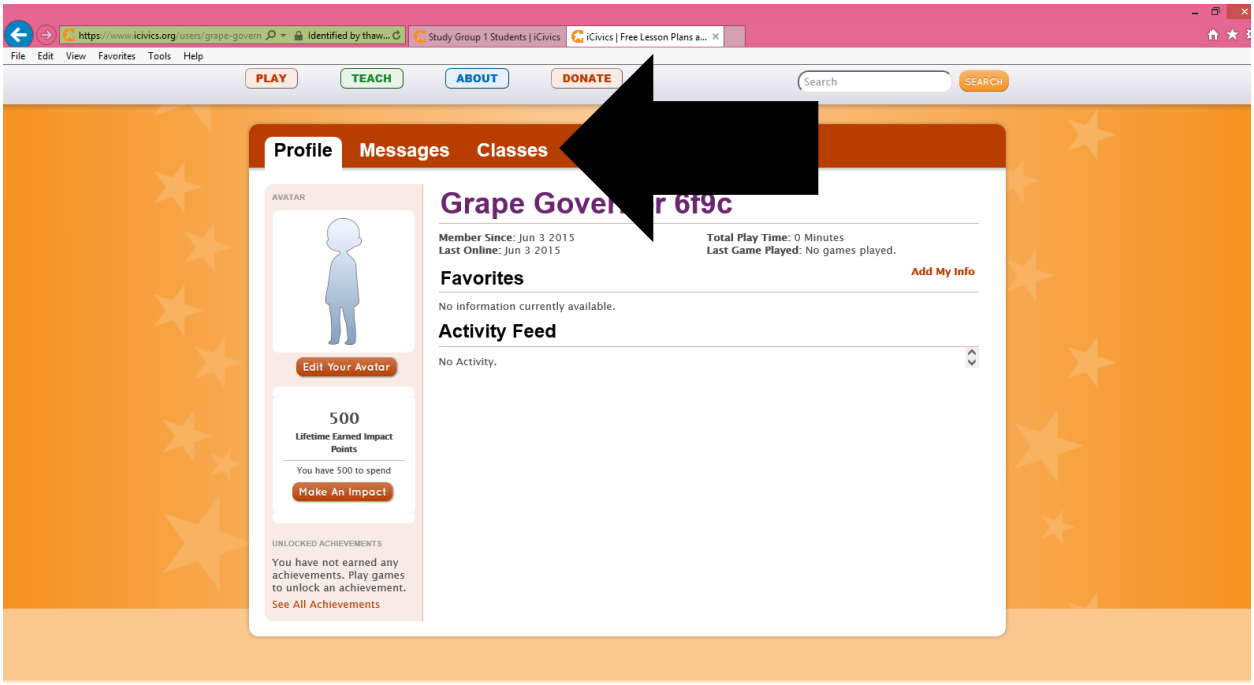


	A	B
1	Real Nam	User Name
2	1	Peach Researcher f2h6
3	2	Tin Scientist p1k9
4	3	Gray Trainer 0v7i
5	4	Oak Official m5o2
6	5	Purple Clerk e2b0
7	6	Grape Governor 6f9c
8	7	Peach Mayor 4c3c
9	8	Flint Coach y6y1
10	9	Gray Plaintiff i1x3
11	10	Pine Professor 2p1w
12	11	Peach Emperor 2b3h
13	12	Mustard Librarian y4n5
14	13	Mustard Librarian 6l9r
15	14	Maple Artist v9w4
16	15	Ivory Attorney 8t9u
17	16	Navy Reporter o0n7
18	17	Mint Painter 9f4v
19	18	Chrome Analyst h6j7
20	19	Coral Explorer 6e7d
21	20	Maple Scientist 9q5q
22	21	Blue Explorer 8w7h
23	22	Aqua Marcher 7a0h
24	22	Quartz Senator k9h3
25	23	Garnet President 0c7p
26	24	Jade Speaker a4y6
27	25	Chrome Justice n3g4
28	26	Green Justice 0l2h
29	27	Plum Chef 3i1i
30	28	Red Executive k7n3

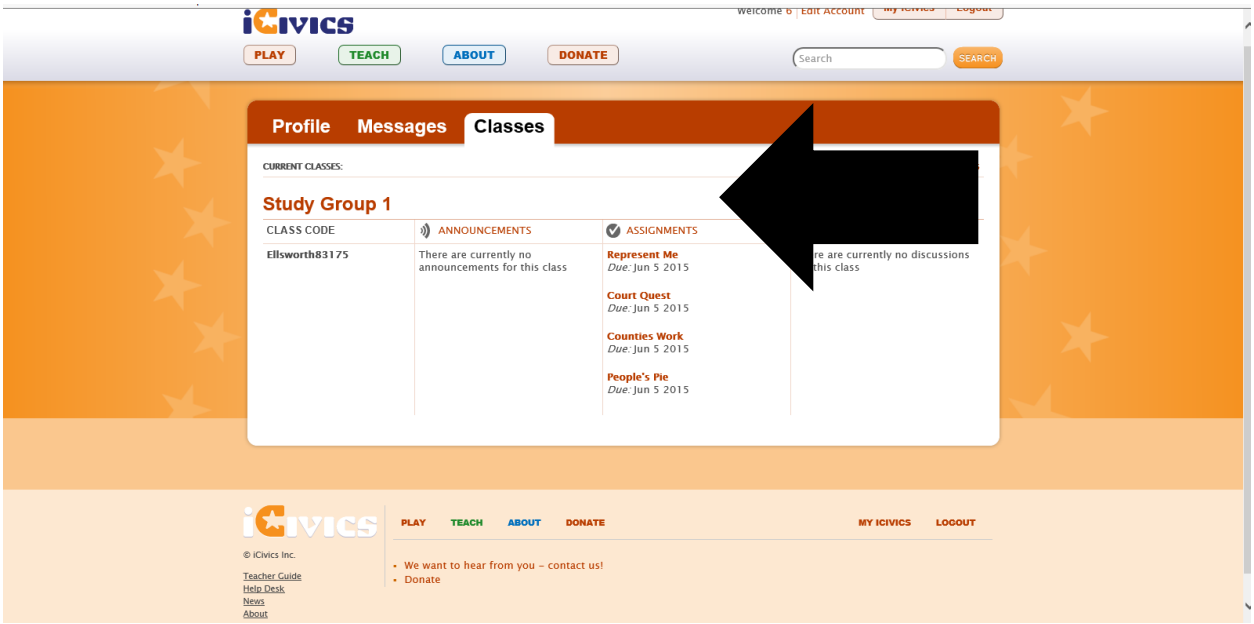
3. Sample usernames sent to teachers to assign to students. Real names issued as numbers for confidentiality



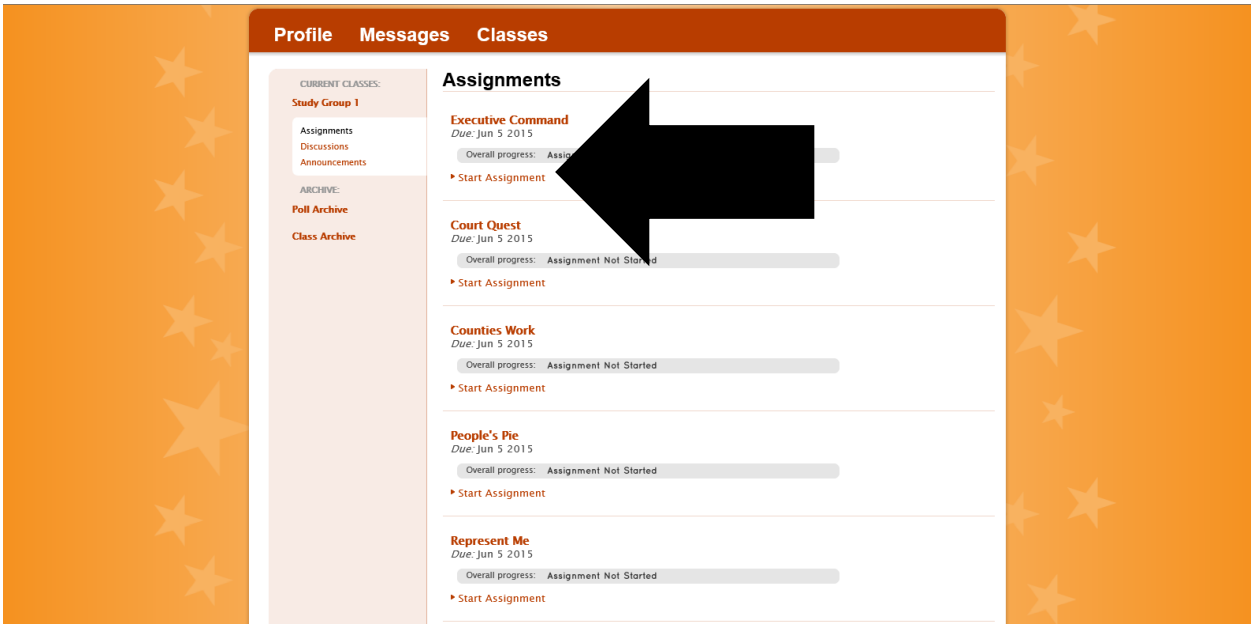
4. Sample page students will see when they initially log into iCivics. Students do nothing on this page except click “SAVE” as indicated above



5. Sample student home page. Students should click "CLASSES" as indicated above



6. Sample "CLASSES" screenshot. Students should click on "ASSIGNMENTS" as indicated above



7. Sample student "ASSIGNMENTS' page. The games are pre-assigned and in order of days to be played. Students are to click on "START ASSIGNMENT" (as indicated by the black arrow above) on the respective day

8. Sample game home page. Students are to click "NEW GAME" as indicated above. Subsequent games have similar instructions

APPENDIX H: Web links

iCivics Homepage: wwww.icivics.org

iCivics Games Page:

- Argument Wars: https://www.icivics.org/games/argument-wars
- Counties Work: https://www.icivics.org/games/counties-work1
- Executive Command: https://www.icivics.org/games/executive-command
- Power Play: https://www.icivics.org/games/power-play
- Represent Me!: https://www.icivics.org/games/represent-me

APPENDIX I: Written Instructions to Participating Teachers

Thank you for helping me complete my doctoral study. Below are your instructions.

Consent Forms

The blue and white copy are to go home with each student. The blue copy is to be returned with a parent signature if students are allowed to complete the study. Once the blue copy is returned, students sign the yellow form. Please put all forms back into the manilla envelope. I will collect these at the completion of the study.

Groups

I will randomly assign your classes to either Group A, Group B, Group C, or Group D. I have provided copies of scripts for each Group. On game-days, you will read the matching script to the specific groups (for instance: If your period 2 is Group A, read the Group A scripts for each game). The following is very important:

1. Do not deviate from the script. Read it word-for-word. Answering "yes" or "no" questions is fine.
2. Make sure you are reading the correct script to the correct Group.
3. During gameplay, you can only address technological difficulties, but do not help students otherwise (Treat it like giving the PSSA).

Setting up the study

- You will need PC's, laptops, or Chromebooks for the assigned games.
- I have created five "classes" on the iCivics website (Group A, Group B, Group C, and Group D). I have access to the classes and have assigned each class five different iCivics games.
- The games are as follows; please play the games in the following order:

  Day 1: Argument Wars

  Day 2: Counties Work

  Day 3: Executive Command

  Day 4: Power Play

  Day 5: Represent Me

I have created fake "students" for each class. Students' real names were not used; instead students are listed by numbers ("Real Name" in chart below).

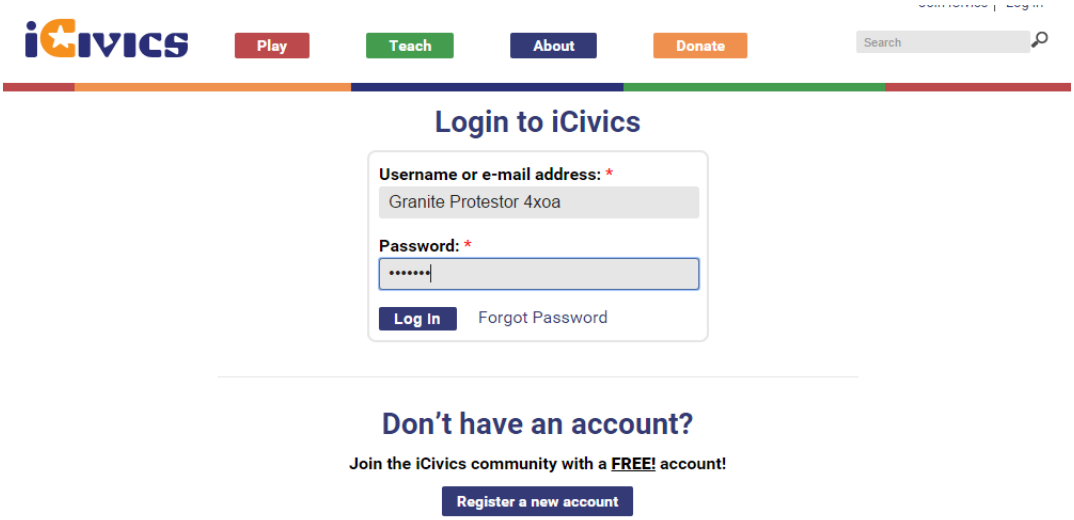
Real Nam	User Name
1	Quartz Official a1v6
2	Granite Protestor 4x0a
3	Diamond Politician y8n0
4	Marble Officer 1l8j
5	Pine Judge s2r4
6	Mint Lawyer g1p2
7	Peach Citizen f3h3
8	Yellow Journalist 9e6g
9	Diamond Analyst m8o3
10	Red President p0v7

Students' usernames on the left are what they are to use when they log into iCivics. I have highlighted which user names you are to use for your classes.

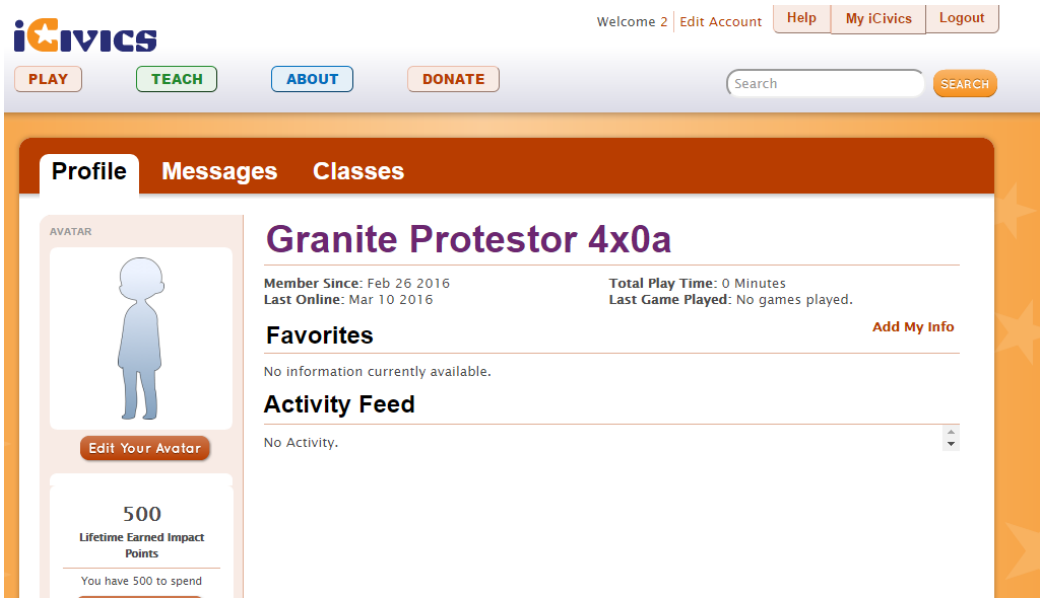
Study Instructions

1. Before reading the script, students should log into www.icivics.org - homescreen is shown below. Once students are at this screen, begin reading the appropriate script.

2. Students are to put their assigned username in the box as shown below; password is icivics (please write the password on the board).

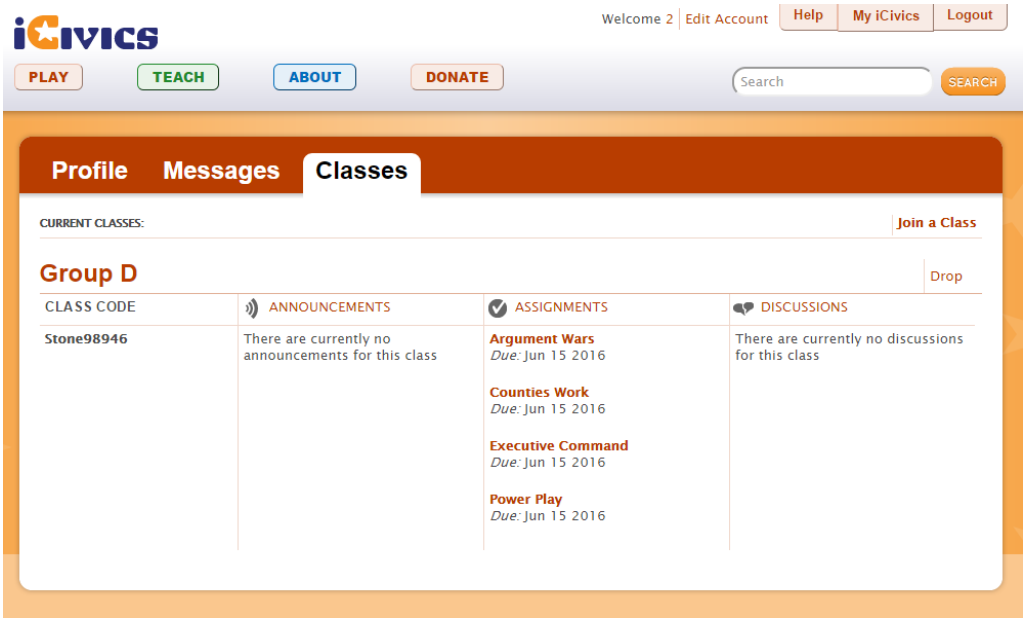


3. If successful, students should see a screen that looks like this:

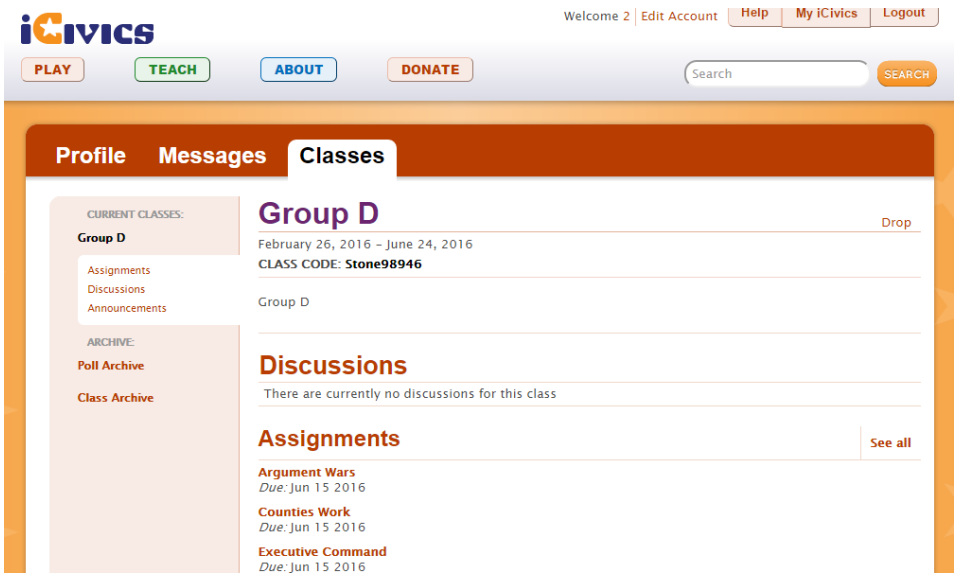


If students have trouble, have them keep trying to log in. Sometimes, students enter the user name incorrectly. Caps are not necessary. Spaces between the words in usernames ARE necessary. The '1' and 'l' look similar, as does the 'o' and '0'.

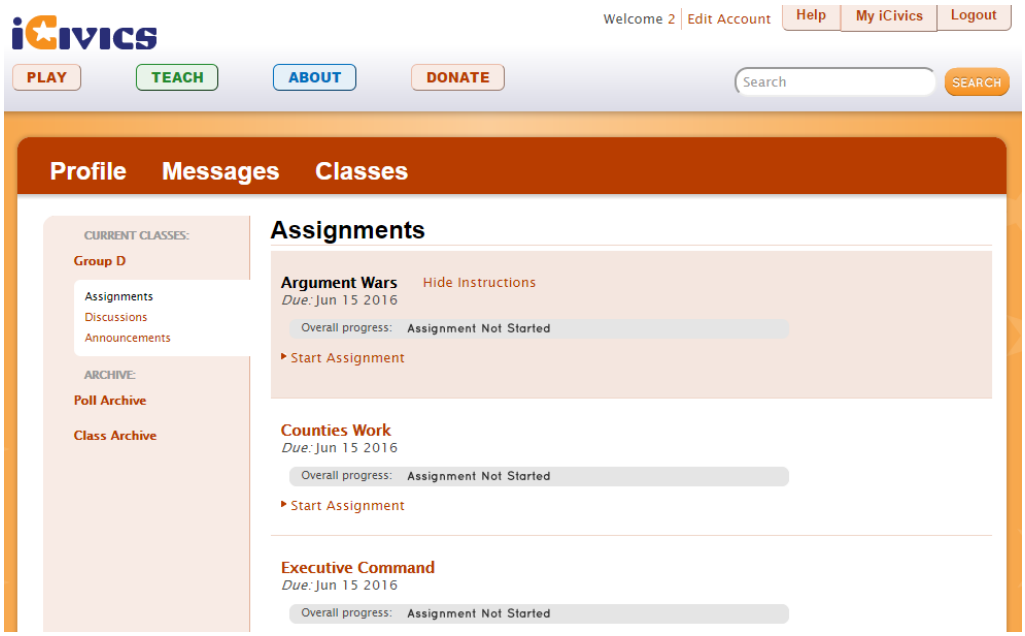
4. After clicking the "Classes" tab, they should see the following screen (This example if for Group D; Group A will see their group name).



5. After clicking on their Group letter, the next screen should look like this:



6. Under the Assignments (above) are the assigned games. Although the script does not state it, students have to click on the Assignment (e.g. Argument Wars) and on the next screen "Start Assignment" (as shown below)



Additional Notes

1. It is very important that students complete each of the games. This registers a score on the iCivics website that I have access to.
2. Students must complete each of the games before they can complete the survey. They can "make the game up" if you are able; but you must read their assigned script to them.
3. The assigned game on Day 1 takes approximately 15 minutes. This leaves time to ensure students get logged in appropriately. *Note: You may choose to give students their usernames and password prior to Day 1 to practice logging in.*
4. Games on Day 2 through 4 take approximately 15-25 minutes.
5. The assigned game on Day 5 takes approximately 15 minutes, leaving enough time to take the survey. I will post a link to the survey within the announcement page on iCivics.
6. If you have questions along the way, please contact me: jharmon@redbankvalley.net

APPENDIX J: Scripts for Argument Wars

Argument Wars : Group A (with autonomy-support, with structure)

READ: "I encourage you to log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "I invite you to click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "I now invite you to click on Group A."

Allow students time to click on the correct class (Group A)

READ: "You will see Argument Wars within the assignments. Before you click it, consider the purpose of this activity. In this online game you will try out your persuasive abilities by arguing a real Supreme Court case." *Pause.*

READ: "The objectives of this game are for you to:

1. Analyze the arguments and outcomes of landmark Supreme Court cases
2. Evaluate available support for an argument to see if it is relevant or irrelevant
3. Develop the strongest argument to win your case

Go ahead and click 'Argument Wars."

Wait for students' game to begin loading

READ: "You may choose the case which you would like to argue by clicking the left or right arrow buttons. Once you have decided on a case, click 'GET STARTED'."

Pause to allow students time to choose their case

READ: "You may now choose your character and a character name."

Pause to allow students time to choose their character and character name.

READ: "You may now choose which side of the case you wish to argue."

Pause to allow students to time to choose their side.

READ: "Now I encourage you to click 'CONTINUE."

READ: "I invite you to read the on screen instructions. But before you do, consider the goal of 'Argument Wars'."

Pause

"The goal of this game is to win your case. You win the case by having the strongest argument within the game." *Pause*.

READ: "Here are three tips to help you succeed:

1. Make sure you read the explanations within the dialogue bubbles, do not skip through them.
2. Pay attention to the tutorial screens. If you get stuck you can click on the Help button in the upper right corner.
3. You win the game (and the case) if you earn more points than the opponent – there are a limited number of points."

READ: "The game will take you approximately 15-30 minutes. I encourage you to begin play and do your best."

Argument Wars: Group B (with autonomy support, without structure)

READ: "I encourage you to log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "I invite you to click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "I now invite you to click on Group B."

Allow students time to click on the correct class (Group B)

READ: "You will see Argument Wars within the assignments. Before you click it, consider the purpose of this activity. In this online game you will try out your persuasive abilities by arguing a real Supreme Court case." *Pause.*

"Go ahead and click 'Argument Wars'."

Wait for students' game to begin loading

READ: "You may choose the case which you would like to argue by clicking the left or right arrow buttons. Once you have decided on a case, click 'GET STARTED'."

Pause to allow students time to choose their case

READ: "You may now choose your character and a character name."

Pause to allow students time to choose their character and character name.

READ: "You may now choose which side of the case you wish to argue."

Pause to allow students to time to choose their side.

READ: "Now I encourage you to click 'CONTINUE'."

READ: "The game will take you approximately 15-30 minutes. I encourage you to begin play and do your best."

Argument Wars: Group C (without autonomy support, with structure)

READ: "You must log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "You have to now click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "You must now click on Group C."

Allow students time to click on the correct class (Group C)

READ: "You will see Argument Wars within the assignments. Before you click it, listen to the objectives of this game."

Pause

"The objectives of this game are for you to:

1. Analyze the arguments and outcomes of landmark Supreme Court cases
2. Evaluate available support for an argument to see if it is relevant or irrelevant
3. Develop the strongest argument to win your case

You must now click 'Argument Wars'."

Wait for students' game to begin loading

"Go ahead and click 'Argument Wars."

Wait for students' game to begin loading

READ: "You must use the case that is on the screen. Do not choose a new case. You will now click 'GET STARTED'."

Pause

READ: "You must choose the character on the right. Do not rename your character."

Pause

READ: "You will now click 'CONTINUE'."

Pause

READ: "Do not switch clients, click 'CONTINUE' again."

Pause

READ: "You will read the on screen instructions. But before you do, I will provide you the goal of 'Argument Wars'."

Pause

"The goal of this game is to win your case. You win the case by having the strongest argument within the game." *Pause*.

READ: "Here are three tips to help you succeed:

1. Make sure you read the explanations within the dialogue bubbles, do not skip through them.
2. Pay attention to the tutorial screens. If you get stuck you can click on the Help button in the upper right corner.
3. You win the game (and the case) if you earn more points than the opponent – there are a limited number of points."

READ: "The game will take you approximately 15 minutes. You will now begin play.

Argument Wars: Group D (Control)

READ: "Log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "Click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "Click on Group D."

Allow students time to click on the correct class (Group D)

READ: "Click 'Argument Wars'."

Wait for students' game to begin loading

READ: "Click 'NEW GAME'."

Allow students time to click on the New Game button to load the Official Ballot

READ: "Navigate through the gameplay, following the on-screen instructions."

APPENDIX K: Scripts for Counties Work

Counties Work : Group A (with autonomy-support, with structure)

READ: "I encourage you to log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "I invite you to click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "I now invite you to click on Group A."

Allow students time to click on the correct class (Group A)

READ: "You will see Counties Work within the assignments. Before you click it, consider the purpose of this activity. In this online game you will learn about local government by playing a county official responding to citizen requests." *Pause.*

READ: "The objectives of this game are for you to:

4. Simulate the role of county government, including organization, responsibilities, and services
5. Identify appropriate resources and departments of county government to solve problems
6. Consider how a budget and major sources of local revenue affect both services and citizens

Go ahead and click 'Counties Work."

Wait for students' games to begin loading

READ: "I invite you to click 'NEW GAME."

Allow students time to click on the New Game button to load Game Creation screen

READ: *(On the Game Creation screen)* "You may create the name of your county or choose 'Generate Random Name' and check 'Confirm Name Selection'. You may then choose a character and click 'Confirm Character Selection'. After, you may choose the symbols for your seal and click 'Confirm Seal Selection'.

Pause until students have made and confirmed their selections.

READ: "Now I encourage you to click 'START GAME'."

READ: "I invite you to read the on screen instructions. But before you do, consider the goal of 'Counties Work'." *Pause*

"The goal of this game is to gain points by keeping citizens happy by responding to their requests." *Pause*.

READ: "Here are four tips to help you succeed:

4. If a crisis strikes, decide quickly how to handle it. Press pause at the top of the screen if you need more time to act.
5. Try to make decisions to gain more citizens.
6. Too many taxes will keep citizens away.
7. Keep your citizen satisfaction over 50% to be re-elected and gain more points."

READ: "The game will take you approximately 15-30 minutes. I encourage you to begin play and do your best."

Counties Work: Group B (with autonomy support, without structure)

READ: "I encourage you to log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "I invite you to click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "I now invite you to click on Group B."

Allow students time to click on the correct class (Group B)

READ: "You will see Counties Work within the assignments. Before you click it, consider the purpose of this activity. In this online game you will learn about local government by playing a county official responding to citizen requests." *Pause.*

READ: "I invite you to click 'Counties Work."

Wait for students' game to begin loading

READ: "I invite you to click 'NEW GAME'."

Allow students time to click on the New Game button to load Game Creation screen

READ: *(On the Game Creation screen)* "You may create the name of your county or choose 'Generate Random Name' and check 'Confirm Name Selection'. You may then choose a character and click 'Confirm Character Selection'. After, you may choose the symbols for your seal and click 'Confirm Seal Selection'.

Pause until students have made and confirmed their selections.

READ: "Now I encourage you to click 'START GAME'."

Pause

READ: "I encourage you to begin play and do your best."

Counties Work: Group C (without autonomy support, with structure)

READ: "You must log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "You have to now click the 'CLASSES' tab"

Allow students time to navigate to the Classes tab

READ: "You must now click on Group C."

Allow students time to click on the correct class (Group A)

READ: "You will see Counties Work within the assignments. You must now click it." *Pause.*

READ: "The objectives of this game are for you to:

1. Simulate the role of county government, including organization, responsibilities, and services
2. Identify appropriate resources and departments of county government to solve problems
3. Consider how a budget and major sources of local revenue affect both services and citizens"

"You must now click 'Counties Work'."

Wait for students' game to begin loading

READ: "You must now click 'NEW GAME'."

Allow students time to click on the New Game button to load Game Creation screen

READ: *(On the Game Creation screen)* "Click 'Confirm Name Selection'; **do not randomly generate a name or create a new name for your county**. Click 'Confirm Character Selection'; **do not choose another character**. Finally, click 'Confirm Seal Selection'; **do not choose your seal design**."

Pause until students have made and confirmed their selections.

READ: "Now you must click 'START GAME'."

READ: "You must read the on screen instructions. But before you do, consider the goal of 'Counties Work'." *Pause*

"The goal of this game is to gain points by keeping citizens happy by responding to their requests." *Pause.*

READ: "Here are four tips to help you succeed:

1. If a crisis strikes, decide quickly how to handle it. Press pause at the top of the screen if you need more time to act.
2. Try to make decisions to gain more citizens.
3. Too many taxes will keep citizens away.
4. Keep your citizen satisfaction over 50% to be re-elected and gain more points."

READ: "The game will take you approximately 15-30 minutes. You will begin play now."

Counties Work: Group D (Control)

READ: "Log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "Click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "Click on Group A."

Allow students time to click on the correct class (Group D)

READ: "Click 'Counties Work."

Wait for students' game to begin loading

READ: "Click 'NEW GAME'."

Allow students time to click on the New Game button to load the Official Ballot

READ: "Navigate through the gameplay, following the on-screen instructions."

APPENDIX L: Scripts for Executive Command

Executive Command: Group A (with autonomy-support, with structure)

READ: "I encourage you to log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "I invite you to click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "I now invite you to click on Group A."

Allow students time to click on the correct class (Group A)

READ: "You will see Executive Command as your first assignment. Before you click it, consider the purpose of this activity. This interactive online video game will give you the experience of being the President of the United States. As the president, you will be faced with the daily challenges presidents must balance in running a government and keeping the country safe during one four-year term. You will propose an agenda to Congress, sign bills into law, delegate new laws to the appropriate federal agency, handle international diplomatic, and command the military during times of war." *Pause.*

READ: "The objectives of this game are for you to:

7. Analyze the structure, functions, and processes of the executive branch
8. Describe the various roles of the president
9. Identify the functions of the executive cabinet positions

Go ahead and click 'Executive Command'."

Wait for students' game to begin loading

READ: "I invite you to click 'NEW GAME'."

Allow students time to click on the New Game button to load the Official Ballot

READ: *(On the Official Ballot screen)* "You may choose any character on the screen to represent yourself. Once you select a character, I invite you to click 'VOTE'."

READ: "Now I encourage you to click 'INAUGURATE ME' or you can 'PICK SOMEONE ELSE'."

READ: "You can read the announcement on the television. But before you click 'CONTINUE', I invite you to listen to the goal of Executive Command." *Pause*

"The goal of this game is to gain points by signing bills into law, delegating them to the correct department, gaining the support of Congress, and solving diplomatic issues as quickly as possible." *Pause*.

READ: "Here are four tips to help you succeed:

8. You can track the years in office by looking at the clock in the lower left corner of the screen. Each turn represents the corresponding year in office.
9. To pause the game at any time, simply click on the pause button in the top right hand corner.
10. Make sure you go to speak to Congress when invited; you will gain more support.
11. Solving the war within your term will gain you more points."

READ: "The game will take you approximately 30 minutes. I encourage you to begin play and do your best."

Executive Command: Group B (with autonomy support, without structure)

READ: "I encourage you to log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "I invite you to click the 'CLASSES' tab"

Allow students time to navigate to the Classes tab

READ: "I now invite you to click on Group A."

Allow students time to click on the correct class (Group A)

READ: "You will see Executive Command as your first assignment. Before you click it, consider the purpose of this activity. This interactive online video game will give you the experience of being the President of the United States. As the president, you will be faced with the daily challenges presidents must balance in running a government and keeping the country safe during one four-year term. You will propose an agenda to Congress, sign bills into law, delegate new laws to the appropriate federal agency, handle international diplomatic, and command the military during times of war." *Pause.*

Go ahead and click 'Executive Command'."

Wait for students' game to begin loading

READ: "I invite you to click 'NEW GAME'."

Allow students time to click on the New Game button to load the Official Ballot

READ: *(On the Official Ballot screen)* "You may choose any character on the screen to represent yourself. Once you select a character, I invite you to click 'VOTE'."

READ: "Now I encourage you to click 'INAUGURATE ME' or you can 'PICK SOMEONE ELSE'."

READ: "I encourage you to begin play and do your best."

Executive Command: Group C (without autonomy support, with structure)

READ: "You must log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "You have to now click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "You must now click on Group C."

Allow students time to click on the correct class (Group A)

READ: "You will see Executive Command as your first assignment. You must now click it." *Pause.*

READ: "The objectives of this game are for you to:

1. Analyze the structure, functions, and processes of the executive branch
2. Describe the various roles of the president
3. Identify the functions of the executive cabinet positions

Go ahead and click 'Executive Command'."

Wait for students' game to begin loading

READ: "You must now click 'New Game'."

Allow students time to click on the New Game button to load the Official Ballot

READ: *(On the Official Ballot screen)* "**You must choose the character on the top right** of the screen to represent yourself. **You cannot choose another character**. Once you have selected him you must click 'VOTE'."

READ: "Now you have to click 'INAUGURATE ME'; **you can NOT** click 'PICK SOMEONE ELSE'."

READ: "You must now read the announcement on the television. But before you click 'CONTINUE', you must listen to the goal of Executive Command." *Pause*

"The goal of this game is to gain points by signing bills into law, delegating them to the correct department, gaining the support of Congress, and solving diplomatic issues as quickly as possible." *Pause.*

READ: "Here are four tips to help you succeed:

1. You can track the years in office by looking at the clock in the lower left corner of the screen. Each turn represents the corresponding year in office.
2. To pause the game at any time, simply click on the pause button in the top right hand corner.
3. Make sure you go to speak to Congress when invited; you will gain more support.
4. Solving the war within your term will gain you more points."

READ: "The game will take you approximately 30 minutes. You must now begin play."

GROUP D (Control)

READ: Log into iCivics.org using the username and password provided.

Allow students time to log in

READ: "Click the 'CLASSES' tab"

Allow students time to navigate to the Classes tab

READ: "Click on Group D."

Allow students time to click on the correct class (Group D)

READ: "Click 'Executive Command'."

Wait for students' game to begin loading

READ: "Click 'NEW GAME."

Allow students time to click on the New Game button to load the Official Ballot

READ: "Navigate through the gameplay, following the on-screen instructions."

APPENDIX M: Scripts for Power Play

Power Play : Group A (with autonomy-support, with structure)

READ: "I encourage you to log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "I invite you to click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "I now invite you to click on Group A."

Allow students time to click on the correct class (Group A)

READ: "You will see Power Play within the assignments. Before you click it, consider the purpose of this activity. In this online game you will learn about federalism. You will coach a team of players competing to win power for state or federal government." *Pause.*

READ: "The objectives of this game are for you to:

10. Distinguish between arguments that states or the federal government should have more power
11. For specific government powers, identify arguments about where each power should lie (state or federal government)
12. Dismiss irrelevant arguments

Go ahead and click 'Power Play'."

Wait for students' game to begin loading

READ: "I encourage you to click 'NEW GAME'."

Pause

READ: "I invite you now to choose your side: 'STATE' or 'FEDERAL'."

Pause

READ: "Now, you may click 'CONTINUE' at the bottom of the screen."

READ: "I invite you to read the on screen instructions. But before you do, consider the goal of 'Power Play'." *Pause*

"The goal of this game is to pull three statues into your end zone in each round. You accomplish this by applying the correct argument to a power (state or federal)."

Pause.

READ: "Here are three tips to help you succeed:

12. You can swap a player from either the bench or the field
13. Keep an eye on the timer. Each round lasts three minutes. The game ends after the third round.
14. Click the "i" button on any statue to read a description of the power. This also pauses the game.

READ: "The game will take you approximately 15 minutes. I encourage you to begin play and do your best."

Power Play: Group B (with autonomy support, without structure)

READ: "I encourage you to log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "I invite you to click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "I now invite you to click on Group B."

Allow students time to click on the correct class (Group B)

READ: "You will see Power Play within the assignments. Before you click it, consider the purpose of this activity. In this online game you will learn about federalism. You will coach a team of players competing to win power for state or federal government." *Pause.*

Go ahead and click 'Power Play."

Wait for students' game to begin loading

READ: "I encourage you to click 'NEW GAME'."

Pause

READ: "I invite you now to choose your side: 'STATE' or 'FEDERAL'."

Pause

READ: "Now, you may click 'CONTINUE' at the bottom of the screen."

READ: "I encourage you to begin play and do your best."

Power Play: Group C (without autonomy support, with structure)

READ: "You must log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "You have to now click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "You must now click on Group C."

Allow students time to click on the correct class (Group C)

READ: "You will see Power Play within the assignments. Before you click it, you have to listen to the objectives of this game."

Pause

"The objectives of this game are for you to:

1. Distinguish between arguments that states or the federal government should have more power
2. For specific government powers, identify arguments about where each power should lie (state or federal government)
3. Dismiss irrelevant arguments

You must now click 'Power Play'."

Wait for students' game to begin loading

READ: "You must click 'NEW GAME'."

Wait for students' game to begin loading

READ: "You must choose 'STATE' as your side. Do not choose 'FEDERAL'

Pause

READ: "You must now click 'CONTINUE' at the bottom of the screen."

Pause

READ: "You will read the on screen instructions. But before you do, I will provide you the goal of 'Power Play'."

Pause

"The goal of this game is to pull three statues into your end zone in each round. You accomplish this by applying the correct argument to a power (state or federal)."

Pause.

READ: "Here are three tips to help you succeed:

1. You can swap a player from either the bench or the field
2. Keep an eye on the timer. Each round lasts three minutes. The game ends after the third round.
3. Click the "i" button on any statue to read a description of the power. This also pauses the game.

READ: "The game will take you approximately 15 minutes. You must now begin play."

Power Play: Group D (Control)

READ: Log into iCivics.org using the username and password provided.

Allow students time to log in

READ: "Click the 'CLASSES' tab"

Allow students time to navigate to the Classes tab

READ: "Click on Group D."

Allow students time to click on the correct class (Group D)

READ: "Click 'Power Play'."

Wait for students' game to begin loading

READ: "Click 'New Game'."

Pause

READ: "Navigate through the gameplay, following the on-screen instructions."

APPENDIX N: Scripts for Represent Me!

Represent Me!: Group A (with autonomy-support, with structure)

READ: "I encourage you to log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "I invite you to click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "I now invite you to click on Group A."

Allow students time to click on the correct class (Group A)

READ: "You will see Represent Me! within the assignments. Before you click it, consider the purpose of this activity. In this online game you learn about the role of a legislator by taking on their role seeking re-election to office." *Pause.*

READ: "The objectives of this game are for you to:

13. Understand that a legislator's job is to represent constituents
14. Simulate the relationship between a legislator and a diverse constituency
15. Evaluate hypothetical legislation for impact on various groups

Go ahead and click 'Represent Me!."

Wait for students' game to begin loading

READ: "You may now click 'NEW GAME'."

Pause

READ: "You may now **choose** your legislator."

Pause to allow students time to choose their character.

READ: "Now I encourage you to click 'CONTINUE."

READ: "I invite you to read the on screen instructions. But before you do, consider the goal of 'Represent Me!." *Pause*

"The goal of this game is to support the people you represent. You do this by approving bills you think will best help your constituents." *Pause*.

READ: "Here are two tips to help you succeed:

15. Learn the different constituent groups. You will be paying attention to them throughout the game
16. The symbols below the constituents show you what groups they represent. The speech bubbles tell you whether they are pleased with your bill choices.

READ: "The game will take you approximately 15 miutes. I encourage you to begin play and do your best."

Represent Me: Group B (with autonomy support, without structure)

READ: "I encourage you to log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "I invite you to click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "I now invite you to click on Group B."

Allow students time to click on the correct class (Group B)

READ: "You will see Represent Me! within the assignments. Before you click it, consider the purpose of this activity. In this online game you learn about the role of a legislator by taking on their role seeking re-election to office." *Pause.*

"Go ahead and click 'Represent Me!."

Wait for students' game to begin loading

READ: "You may now click 'NEW GAME'."

Pause

READ: "You may now **choose** your legislator."

Pause to allow students time to choose their character.

READ: "Now I encourage you to click 'CONTINUE."

READ: "I encourage you to begin play and do your best."

Represent Me: Group C (without autonomy support, with structure)

READ: "You must log into iCivics.org using the username and password provided."

Allow students time to log in

READ: "You have to now click the 'CLASSES' tab."

Allow students time to navigate to the Classes tab

READ: "You must now click on Group C."

Allow students time to click on the correct class (Group C)

READ: "You will see Represent Me! within the assignments. Before you click it, listen to the objectives of this game:

Pause

1. Understand that a legislator's job is to represent constituents
2. Simulate the relationship between a legislator and a diverse constituency
3. Evaluate hypothetical legislation for impact on various groups

You must now click 'Represent Me!."

Wait for students' game to begin loading

READ: "You **must choose the character on the left side of the screen**. You cannot choose another character as your legislator."

Pause

READ*:* "You will now click 'CONTINUE'."

Pause

READ: "You will read the on screen instructions. But before you do, I will provide you the goal of 'Represent Me!'." *Pause*

"The goal of this game is to support the people you represent. You do this by approving bills you think will best help your constituents." *Pause*.

READ: "Here are two tips to help you succeed:

1. Learn the different constituent groups. You will be paying attention to them throughout the game
2. The symbols below the constituents show you what groups they represent. The speech bubbles tell you whether they are pleased with your bill choices.

READ: "The game will take you approximately 15 miutes. You must now begin play."

Represent Me: Group D (Control)

READ: Log into iCivics.org using the username and password provided.

Allow students time to log in

READ: "Click the 'CLASSES' tab"

Allow students time to navigate to the Classes tab

READ: "Click on Group D."

Allow students time to click on the correct class (Group D)

READ: "Click 'Represent Me!"

Wait for students' game to begin loading

READ: "Click 'New Game'."

Allow students time to click on the New Game button.

READ: "Navigate through the gameplay, following the on-screen instructions."

APPENDIX O: Screen Shot of Example Real Name and Usernames created in iCivics

Real Nam	User Name	GROUP A
1	Aspen Governor x1s9	
2	Tin Captain 6t8n	
3	Marble Citizen 2q2b	
4	Maple Manager 3o1t	
5	Oak President g3d1	
6	Quartz Founder b9s8	
7	Gray Artist o5u7	
8	Blue Justice 1l0m	
9	Flint Patriot g3s4	
10	Maple Operator 6m8b	
11	Iron Engineer 3w2c	
12	Crimson Marcher 9y8h	
13	Local Founder 9u2l	
14	Granite Voter p6t8	
15	Cedar Plaintiff z5b3	
16	Gray Artist m6v1	
17	Violet Attorney 7v1z	
18	Teal Patriot 4b0d	
19	Emerald Client 4q5v	
20	Maple Plaintiff q8e2	
21	Garnet Attorney s0g2	
22	Chrome Lawyer p4s1	