THE EFFECT OF GAMIFICATION ON ELEMENTARY STUDENTS' SPANISH

LANGUAGE ACHIEVEMENT AND ACADEMIC SELF-EFFICACY

by

Jason Richard Rachels

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

Liberty University

April 2016

THE EFFECT OF GAMIFICATION ON ELEMENTARY STUDENTS' SPANISH

LANGUAGE ACHIEVEMENT AND ACADEMIC SELF-EFFICACY

by Jason Richard Rachels

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

Liberty University, Lynchburg, VA

April 2016

APPROVED BY:

Amanda J. Rockinson-Szapkiw, Ed.D., Committee Chair

Melanie Dunn, Ed.D., Committee Member

Jennifer Courduff, Ph.D, Committee Member

Scott Watson, Ph.D., Associate Dean, Advanced Programs

ABSTRACT

A quasi-experimental, pretest-posttest, non-equivalent control group design was used to examine the effect of gamification on third and fourth grade students' Spanish language achievement and student academic self-efficacy. In this study, the primary means of incorporating gamification into the experimental group's Spanish language instruction was through the use of *Duolingo®,* a computer and mobile app that uses gamification and adaptive learning technology to teach foreign languages. Students in the control group received their regularly scheduled English L1/Spanish L2 class learning activities. The study was 12 weeks in duration. Students were assessed with a 50 question, multiple-choice English to Spanish and Spanish to English pretest covering vocabulary and grammar to control for prior Spanish language achievement. Students were assessed with the Pattern of Adaptive Learning Scales' (PALS) Academic Efficacy subscale to control for prior academic self-efficacy. The same two instruments were used as posttests with questions arranged in a different order. Analysis showed no significant difference in students' Spanish achievement between students who used *Duolingo®* and students who were taught with traditional means. Similarly, analysis showed no significant difference in students' academic self-efficacy who were taught with *Duolingo®* versus those who were taught with traditional face-to-face instruction. This demonstrates that *Duolingo®* is a useful tool for teaching Spanish to elementary students.

Keywords: gamification, serious game, digital game-based learning, *Duolingo®*, Spanish language, foreign language, elementary school, flow theory, zone of proximal development, self-efficacy

Acknowledgements

I humbly acknowledge the fact that this dissertation could never have been completed without the help of family, friends and colleagues. It has been a journey, and I must say that I agree with the author of Ecclesiastes who stated, "The end of a matter is better than the beginning."

To my wife, Jennifer, I want to thank you for sticking by me throughout the lengthy process. Thank you for caring for the girls and so many things so as to make it possible for me to spend the hours, weeks and months on this project. I'm looking forward to our first vacation together in which I will not be working on the dissertation.

To Dr. Szapkiw, it has truly been an honor to have you as the chair of the committee. You are a great example of a professor, a top-notch researcher and a Christian. Thank you for the hours you invested in this research and in me.

To my committee members, thank you for the time invested in reviewing the research and in making it better through your many reviews of the writing and the study. You both truly added so much to the process.

To Espe, your willingness to take on this twelve-week study, to adjust your curriculum for months, to work on so much background work, and to continue to answer my questions and requests for additional information even up to this past week has been incredible. You may not have known the full extent of what you were getting into when I first spoke to you regarding the study, so thank you so much for sticking with it to the end. It would not have been possible without you.

To Edla, thank you for the help with the statistics and SPSS. You helped me save valuable time through your assistance with the numbers.

To Maria, Josie, Stacy, Joan, Renie, thank you for the hours you invested in working with data, proofing the manuscript, and reviewing Spanish tests.

To my mom and dad, family, and extended family, and so many others who encouraged me and prayed for me along the way, thank you.

Table of Contents

List of Figures

List of Abbreviations

Exceptional Student Education (ESE)

Foreign Language in Elementary School (FLES)

Face-to-face (FTF)

Native Language (L1)

Second Language (L2)

No Child Left Behind (NCLB)

Pattern of Adaptive Learning Scales (PALS)

Zone of Proximal Development (ZPD)

CHAPTER ONE: INTRODUCTION

Introduction

Foreign language literacy is of great value to national security, economic growth, and international relations (Lacorte, 2013; Pavlenko, 2003; Pufahl & Rhodes, 2011). Students who start foreign language study before the age of 12 can attain higher levels of foreign language proficiency than students who start later than 12 (Abrahamsson & Hyltenstam, 2009), yet the United States has placed a low priority on the amount of time devoted to foreign language study in elementary schools (Pufahl & Rhodes, 2011). In the United States, most schools do not teach foreign language classes until upper middle school and high school. A recent study showed that only 25% of elementary schools in the U.S. teach foreign language (Pufahl & Rhodes, 2011). Less than half of the elementary schools that offer a foreign language provide a middle school program that allows for continuity of study from where the students finished in elementary. They either do not offer the foreign language in middle school, or the students begin in an introductory text along with other students who had no elementary foreign language study (Pufahl & Rhodes, 2011). Limited time and resources, combined with other academic requirements placed upon schools, have resulted in the limited amount of time given to foreign language study in elementary schools (Jennings & Rentner, 2006; Pufahl & Rhodes, 2011; Rosenbusch, 2005).

School budget limitations are a cause for lack of foreign language instruction. Math, language arts, and science programs receive greater scrutiny under programs like the No Child Left Behind Act (No Child Left Behind Act of 2001, 2008), and schools spend their resources accordingly (Jennings & Rentner, 2006; Pufahl & Rhodes, 2011;

Rosenbusch, 2005; Taylor & Lafayette, 2010). In order to increase foreign language instruction in the elementary grades, there is a need for creative, low cost, low resource intensive solutions. Gamification could be one of these solutions. Gamification is the building of game-like elements into contexts to create greater user engagement and improve user experience (Deterding, Dixon, Khaled, & Nacke, 2011; Frey, 2012; Giannetto, Chao, & Fontana, 2013). Free, gamification-incorporated software for foreign language instruction is available (Shuler, 2012), and students can have it with them during school as well as on their mobile devices and at home on any personal computer.

Additionally, educators may be able to use gamification to improve education (Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012). Gamification has been used in a variety of fields; human resource managers use it to increase productivity, while web designers use it to increase the engagement of website visitors with their websites, and marketers use it to connect people with their brand (Frey, 2012). Gamification may be used in education to increase engagement and student achievement and to improve students' attitudes towards subject matter (Giannetto et al., 2013; Zhi-Hong, Liao, Cheng, Yeh, & Tak-Wai, 2012).

Like many technologies adopted for educational uses, the research is lagging behind adoption. While there are a growing number of studies being conducted on the topic of gamification (Connolly et al., 2012; Deterding et al., 2011; Frey, 2012; Grant & Shawgo, 2013; Hamari, 2014), the number of empirical studies remains comparatively small (Falloon, 2013). In addition, a review of the literature shows that the vast majority of studies on gamification do not explore these top selling, free, or inexpensive mobile apps (Connolly et al., 2012; Deterding et al., 2011; Frey, 2012; Grant & Shawgo, 2013;

Hamari, 2014). Most of the applications that have been studied are for personal computers and have a much higher price tag (Bressler & Bodzin, 2013; Connolly et al., 2012; Kelle, Klemke, & Specht, 2013; Zhi-Hong et al., 2012). There is a need to investigate these free and low cost apps, especially for elementary foreign language programs, since budget constraints are a key factor that limits the Foreign Language in Elementary School (FLES) programs (Pufahl & Rhodes, 2011).

Thus, the purpose of this study was to determine the effectiveness of the use of a mobile learning app that uses gamification for Spanish instruction in comparison to the traditional teaching methods. The context of the study was within the highly practiced, elementary school method of once per week Spanish instruction. Gamification was operationally defined in this study as the two-fold incorporation of *Duolingo*®, an app that integrates adaptive learning and gamification for teaching foreign languages and a leaderboard for the classroom that shows student progress in the app. This study is significant because it provided much needed empirical research for the effects of gamification (Connolly et al., 2012) and its potential effect on third and fourth grade students' Spanish language achievement and academic self-efficacy. The study also addresses the distinct lack of empirical research on free, inexpensive mobile foreign language apps that are available to millions of people who now use mobile phones and tablets. The method of gamification used in this study provides the learner with an experience which is geared to be within the student's zone of proximal development (ZPD) (Vygotsky, 1978), and this is understood to be a key factor in foreign language learning (Davin, 2013; Feng, 2009; Peterson, 2010; Wu, Lowyck, Sercu, & Elen, 2013).

The significance of the study, the theoretical framework of the research including a discussion of Vygotsky's (1978) zone of proximal development and scaffolding, Csikszentmihalyi's (1991) flow theory, and Bandura's social cognitive theory and the relation to gamification, achievement, and self-efficacy will be discussed in this chapter. The problem regarding English L1/Spanish L2 instruction in American elementary schools will be more thoroughly explained. This will be followed by a review of the purpose of the study, the significance of the study, the research questions, hypotheses, and an identification of the variables. Finally, the research summary and the assumptions and limitations of the study will be reviewed.

Theoretical Framework

Numerous theories have served as the theoretical framework for research on gamification in education (McGonigal, 2011; Wu, Hsiao, Wu, Lin, & Huang, 2012). The theoretical framework that underpins this study, and provides the rationale for the variables under study, has its roots in the work of Vygotsky (1978), Csikszentmihalyi (1990), and Bandura (1977). Vygotsky developed the idea of the zone of proximal development; Csikszentmihalyi (1990) developed the theory of flow to explain optimal involvement in a given task; and Bandura (1977) developed social cognitive theory.

Zone of Proximal Development and Scaffolding

Vygotsky (1978) held that in the range of difficulty of tasks there is a zone of proximal development that is appropriately challenging for the learner, but not so difficult to render the learner incapable of completing the task. This zone of proximal development is the prime zone for learning, and it changes as the student develops. While working in the zone of proximal development, the student may need support or

scaffolding from a more knowledgeable peer, teacher or adult to successfully accomplish the learning task (Vygotsky, 1978).

Scaffolding refers to support given to the learner by another person (peer, teacher, parent or other) to help the learner to be able to accomplish a task that she would not have been able to do on her own (Stone, 1998; Vygotsky, 1978). The metaphor of the scaffold is a useful one. In a building project, scaffolding can be used to help a structure stand while being built. Without the scaffolding, the building could collapse. In later construction phases, the scaffolding can be removed and the structure can continue to stand on its own. In the same way, the learner in the zone of proximal development, needs scaffolding to accomplish a new learning task. Later, as the student becomes more experienced with the learning task, the support can be removed, and the learner is able to accomplish the task on her own (Vygotsky, 1978).

While a peer or teacher has traditionally provided scaffolding, technological advancements, such as intelligent adaptive learning and adaptive learning systems, enable technology tools to provide scaffolding. Gamification systems and educational games can be designed as adaptive learning systems; thus, they can be designed to scaffold the student within his or her zone of proximal development. Many adaptive learning systems, like the one that was used in this study, start the student at a very easy level and incrementally increase the difficulty as the student shows mastery. For example, a student may need to show 80% mastery of the learning concept in a particular level of play in a game before the game will allow the player to advance to the next level. This simultaneously challenges the player to want to be successful at the learning task and keeps the player from moving on to levels that are beyond his zone of proximal

development. The continual challenge, immediate feedback, and opportunity to tackle bigger challenges are part of what makes games enjoyable. It is why thinkers have encouraged educators to design their classes like video games (Heick, 2013). These qualities of games are similar to many of the qualities that Csikszentmihalyi (1990) explains lead to flow. This leads to a discussion of what it is like to be thoroughly engaged in a challenging and meaningful task.

Flow Theory

Csikszentmihalyi (1990) and his colleagues studied athletes, musicians, artists, and rock climbers, among others, as they engaged in various activities. He found that when people are involved in challenging and meaningful work, they tend to lose track of time, have high levels of enjoyment, and be very engaged. Csikszentmihalyi referred to this optimal state as *flow*.

Csikszentmihalyi (1990) stated that there are certain elements shared among activities that lead individuals to a state of flow. These elements are: (a) a challenging activity that requires skill, (b) merging of action and awareness, (c) clear goals and feedback, (d) paradox of control, (e) loss of self-consciousness, (f) transformation of time, and (g) an autotelic experience. The experience of flow does not require that all elements be present (Csikszentmihalyi, 1990). Gamification and serious games share these elements that make up flow. A good serious game must be a challenging activity that requires skill; otherwise users will not be motivated to play.

In the merging of action and awareness, a person is no longer conscious of what he or she is doing. People become so involved in what they are doing that the activity becomes spontaneous, almost automatic; they lose awareness of themselves as separate

from the actions they are performing (Csikszentmihalyi, 1991). Many have experienced this merging of action and awareness while engrossed in a video game and the same merging can occur in serious games that are designed to teach.

Clear goals and feedback provide direction and help people to know whether or not they are being successful (Csikszentmihalyi, 1991). This is often accomplished in gamification through badges, levels, or various other methods of helping the user to know when she has made progress in the game. While there is debate over whether badges are good or bad for intrinsic motivation (Grant & Shawgo, 2013), the point is that gamification provides clear goals and feedback, a key element of flow.

Flow is characterized by the sense of exercising control in difficult situations. Csikszentmihalyi (1991) explains that it is not the sense of being in control that people enjoy but the sense of exercising control in difficult situations. In serious games, players are confronted with difficult situations that require the player to exercise control so as to overcome the obstacles at hand.

When a player is caught up in a game, the concept of self can slip below the threshold of awareness (Chen, 2007), and this is a satisfying experience that Csikszentmihalyi (1991) refers to as the loss of self-consciousness. This loss of self-consciousness is another element of flow. Gamification has the potential to bring this loss of self-consciousness to the educational experience. In addition to the loss of the concept of self, research has also shown that players of video games can lose track of time while immersed in game play (Wood, Griffiths, & Parke, 2007). Csikszentmihalyi (1990) referred to this as the transformation of time, and it is another element of flow.

The final element of flow, and one that Csikszentmihalyi (1990) describes as the key element, is that the activity be an autotelic experience. The term *autotelic* comes from the Greek for self (auto) and the Greek for end (telic), and the word refers to something that is done for its own sake. Games are one of the most naturally autotelic experiences because they are generally played simply for enjoyment, and not as a means to some other end. Gamification may create an autotelic experience that leads to a learning outcome. If the students are doing the activity simply because they enjoy it, it is still an autotelic experience even though other effects (in this case learning) may result from the game. Again, it is important to note that not all of the elements of flow have to exist in an activity for a person to experience flow (Csikszentmihalyi, 1990).

Researchers have made connections between flow theory and gamification and serious games (Bressler & Bodzin, 2013; Hoffman & Nadelson, 2010). Flow represents a high level of engagement (Csikszentmihalyi, 1990) and serious games and gamification have been shown to lead to high levels of engagement (Hoffman & Nadelson, 2010; Watson, Mong, & Harris, 2011).

Gamification is likely to increase students' flow. Doing so also increases engaged learning and the likelihood that the tasks are appropriately challenging. This leads to greater learning, and a propensity to lose track of time as one is happily engaged in the activity (Csikszentmihalyi, 1990). A high level of engagement leads to greater learning and success in school (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006; Watson et al., 2011). Engagement is also linked to self-efficacy, which Linnenbrink and Pintrich (2003) explain is key to promoting both engagement and learning.

Self-Efficacy

Self-efficacy is a term to describe what a person believes he or she can accomplish. Self-efficacy is a more significant predictor of a person's willingness to attempt an action than the person's actual ability to do the action (Bandura, 1995). Research has demonstrated a positive association between self-efficacy and foreign language achievement (Mills, Pajares, & Herron, 2007; Xiao, 2012). Bandura (1995) denotes four primary ways people develop self-efficacy: (1) mastery experiences, (2) vicarious experiences, (3) social persuasion, and (4) physiological and emotional states (Bandura, 1995).

Mastery experiences involve experiencing success at a particular task. Mastery experiences are one of the strongest ways to build self-efficacy toward a particular task (Bandura, 1995). Gamification provides such mastery experiences by starting the game-player at a low difficulty level at which the player finds success, then incrementally increasing difficulty. Similarly, gamification provides a low risk way to attempt a task until mastery is reached.

Vicarious experiences involve seeing someone else attempt a particular type of task. The more similar the person is to oneself, and the more successful the person is at the task, the greater the likelihood that this will lead to an increase in self-efficacy via the vicarious experience. The opposite also holds true—the more unsuccessful the model and the more unlike oneself the model, the lower the positive impact on self-efficacy (Bandura, 1995). In gamification, players can see what other people have achieved (e.g., a higher level in the game), and from this vicarious experience their self-efficacy can be positively impacted because they see the task as achievable and attainable. Prior to this

vicarious experience, they may not have believed that the task was something that could be achieved. Seeing someone else having success with the task makes them believe that they can do it too.

Social persuasion involves motivating someone through encouraging them to believe they can be successful at a given task (Bandura, 1995). This type of motivation can lead to greater self-efficacy regarding that type of task. If this leads the person to try, and the person then succeeds, this can lead to even greater self-efficacy. But, if the person fails, gains in self-efficacy may be lost. It is highly beneficial to not only encourage the person to believe they can succeed but to also set up situations in which the person is likely to succeed so as to increase self-efficacy (Bandura, 1995). While gamification is a tool that may help students in various ways, the teacher is still critical to the learning process. Social persuasion requires a human sensitivity to understand who the student is and the best way to encourage that particular student to believe he or she can achieve greater things.

Physiological and emotional states influence self-efficacy. In attempting difficult tasks people may encounter physiological and emotional states such as fatigue, nausea, aches, and pains. The interpretation of these can impact self-efficacy. If a person interprets these as signs of inability, this will diminish self-efficacy more than another person who simply interprets these as natural outcomes related to the challenging activity (Bandura, 1995). Gamification tools may help to eliminate or mediate negative states compared to a traditional environment. Research has shown that a high percentage of students find the standard foreign language classroom to be a stressful environment (Elkhafaifi, 2005; Horwitz, Horwitz, & Cope, 1986; Xiao, 2012). Key traditional foreign

language classroom stressors are concerns of being evaluated by others when you are speaking in front of the class and self perception concerns related to one's inability to fully express oneself to others in the target language (Horwitz et al., 1986). These may have been mitigated by the gamification method in this study as the students interacted with their device rather than speaking alone in front of the class.

Some aspects of gamification elements in this study include elements Bandura (1977) states are linked to an increase in self-efficacy. Studies have demonstrated a positive association between self-efficacy and foreign language academic achievement (Mills et al., 2007; Xiao, 2012). Researchers have also found a connection between self-efficacy and flow (Ghani & Deshpande, 1994). People seek out challenging tasks, a key component of flow, because this helps them to better understand what they are capable of doing, and this leads to greater self-efficacy (Ghani & Deshpande, 1994).

Summary

Considering these three theories, there is reason to hypothesize that gamification has the potential to increase student Spanish language achievement and student academic self-efficacy. Vygotsky's theories that led to the idea of scaffolding to support the learner indicate that gamification that purposefully provides scaffolding could be expected to help students learn. Csikszentmihalyi's flow theory indicates that players caught up in a game experience become more engaged than what might be expected in the normal classroom experience. This could lead to greater academic achievement. Gamification has elements that seem likely to have a positive effect on Bandura's four primary means of developing self-efficacy.

In this study, gamification was defined as the integration of the app, *Duolingo*®*,*
the most downloaded language-learning app available at the time of this writing. Due,
perhaps, to the newness of the app, it is not surprising that a database search for
Duolingo® on Academic Search Complete, on July 7, 2014, revealed only 19 results.
None of those results discussed the use of the app by elementary students. There was one
unpublished study for users 18 and over (Vesselinov & Grego, 2012) that *Duolingo*®
makes available on their website, www.Duolingo.com. Research on the effectiveness of
this top-rated, free app on language acquisition and academic self-efficacy for elementary
students is needed.

Problem Statement

Most U.S. elementary schools give one day, or less, each week to foreign
language study. Budgetary issues, as well as teacher's lack of time, have been a concern
and a challenge for the implementation of FLES (Jennings & Rentner, 2006; Pufahl &
Rhodes, 2011; Rosenbusch, 2005). When U.S. elementary schools do implement
programs, the primary methods for teaching foreign languages have resulted in little
increase in foreign language achievement (Pufahl & Rhodes, 2011). Gamification may
be one way to address these challenges. Gamification can be implemented with the use
of free software, such as the gamification component for this study, thus addressing
budgetary concerns. With the significant growth of mobile devices among elementary
age students (Bestwick & Campbell, 2010) and the high percentage of schools and
households that already possess computers or mobile devices (Urban, Tiefenbeck, &
Roth, 2011), gamification could be affordably integrated into a school's foreign language
instruction plan (Garcia, 2013; Giles, 2012; Simonite, 2013; Vesselinov & Grego, 2012).

The apps could then provide a significant increase in the amount of time the elementary students spend engaging in foreign language instruction simply by challenging the students to use the apps and then by tracking their progress in ways that many schools already do with programs such as Accelerated Reader. Thus, gamification could be a way to improve achievement in the elementary foreign language classroom in a manner that would not place an undue burden on the teacher's time.

Another reason for increasing the exploration of gamification usage among elementary students is gamification's convincing connection to leading educational and psychological theory including Vygotsky, Csikszentmihalyi, and Bandura (Boyle, Connolly, & Hainey, 2011; Bressler & Bodzin, 2013; Brom et al., 2014; Chen, 2007; Fu-Hsing, Kuang-Chao, & Hsien-Sheng, 2012; Wu et al., 2012). Gamification, in the form used in this study, provides the teacher with a tool to address individual student needs in line with the students' zone of proximal development (Vygotsky, 1978). Gamification may lead to higher student engagement as it causes the learning experience to be one that may be more likely to lead to flow (Csikszentmihalyi, 2008). Gamification also includes elements that Bandura states are likely to lead to an increase in self-efficacy (Bandura, 1977).

However, the use of gamification and its effect on foreign language achievement needs to be examined. Very little research attention has been devoted to the role that gamification could play in helping to improve elementary school education. Between 2000 and 2014 only 3 percent of the published papers on gamification dealt with elementary school students (Caponetto, Earp, & Ott, 2014). Elementary foreign language

programs are in need of significant improvement and gamification could be a viable tool for helping teachers make those improvements.

Purpose Statement

The purpose of this pretest-posttest, non-equivalent control group study (Campbell & Stanley, 1963) is to examine the effect of gamification on elementary students' Spanish language achievement and academic self-efficacy in a private school in South Florida.

The independent variable was the type of Spanish instruction (traditional elementary Spanish class or *Duolingo*® learning). The dependent variables were student Spanish language achievement and academic self-efficacy. To test Spanish language achievement, students completed a teacher-made, expert-validated test with questions that focused on vocabulary, phrases, and grammar. Academic self-efficacy was assessed via the PALS Academic Self-Efficacy scale (Midgley et al., 2000).

The control variables, the level of Spanish language achievement and academic self-efficacy at the initiation of the study, were statistically controlled through pretests, the Spanish language achievement test and the PALS Academic Self-Efficacy scale. Socioeconomic status and sex have been shown to influence academic achievement (Pomerantz, Altermatt, & Saxon, 2002; Sirin, 2005). The intervening variables, sex and socioeconomic status, were controlled for by the use of homogenous groups. The school has a process to intentionally place students into classrooms so that the following student attributes are as evenly distributed as possible: (1) sex, (2) academic level (gifted, high achieving, average achieving, low achieving), (3) behavior, (4) parental make-up (one or two-parent home), (5) ESE accommodations (participant in child study, learning

enrichment lab participant, tutoring), (6) level of assistance required (full time unique aide, part time unique aide, speech therapy, other assistance), (7) race, (8) reading level, and (9) math level.

Significance of the Study

In a review of the literature, Connolly et al. (2012) found that gamification can lead to increased learning. Millions of dollars are being dedicated to commercial educational games, with the key player being Apple's App Store (Shuler, 2012). At the same time, more and more schools are adding one-to-one initiatives or at least increasing the number of devices at their schools so that students have better access to them (Falloon, 2013; Maninger & Holden). The research on these free or inexpensive applications is very limited at this time, and more studies should be devoted to this area (Connolly et al., 2012).

Apple's App Store did not exist until July 10, 2008, and at that time the number of learning applications available was significantly less than today. The learning applications that did exist, for personal computers or school system networks, tended to be more costly than those available on the App Store today (Shuler, 2012). Few empirical studies exist on gamification for elementary school use in general (Caponetto et al., 2014; Connolly et al., 2012). Even fewer exist for the low cost (free to $3 range) relatively new apps available on the App Store and its Android counterparts. There is still a need to understand how learning games can be used to make a difference in the classroom (Ke, 2008).

This study provided evidence on how the integration of gamification into elementary foreign language instruction is correlated to learning results and student

academic self-efficacy. Foreign language study at the elementary level in most American schools does not receive considerable academic time per week, and this has led to low results in foreign language achievement. While increasing the amount of time given to foreign language study in the elementary school classroom could lead to significant improvement, this study explores ways to improve foreign language achievement in elementary students even when schools are unable, or unwilling, to devote more academic time to foreign language study.

This study contributes theoretically and empirically by further reinforcing the body of research that investigates the correlation between gamification and students' learning (Connelly, et al 2012). The study provided more empirical evidence to support Csikszentmihalyi's flow theory and possible connections to academic achievement and student academic self-efficacy. The study also provides additional empirical evidence regarding Vygotsky's zone of proximal development and its relation to gamification that incorporates intelligent adaptive learning. If gamification is shown to have a significant impact on students' ability to learn a foreign language, this could meaningfully inform foreign language curriculum development at the elementary level and potentially beyond.

Research Question(s)

The research questions for this study are**:**

Research Question 1: Is there a statistically significant difference in the Spanish language achievement of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous Spanish language achievement?

Research Question 2: Is there a statistically significant difference in the academic self-efficacy of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous academic self-efficacy?

Hypotheses

The following are the research hypotheses:

H$_1$: There is a statistically significant difference in the Spanish language achievement of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous Spanish language achievement.

H$_2$: There is a statistically significant difference in the academic self-efficacy of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous academic self-efficacy.

Alternatively, the following are the null hypotheses:

H$_{o1}$: There is no statistically significant difference in the Spanish language achievement of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous Spanish language achievement.

H$_{o2}$: There is no statistically significant difference in the academic self-efficacy of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous academic self-efficacy.

Identification of Variables

The independent variable was the type of instruction (traditional elementary Spanish class or instruction with gamification). Traditional Spanish class is defined as the Spanish teacher using class time as she normally would. This includes introducing and practicing new vocabulary and phrases in Spanish and other elements of face-to-face instruction. Gamification is defined as the adding of game-like elements to contexts that normally do not have those game-like elements (Deterding, 2013; Frey, 2012; Giannetto et al., 2013). In this study, instruction with gamification is defined as students using the Spanish class period working with *Duolingo*® on a mobile device or a computer. See further definition of the independent variable in the problem statement and explanation of the setting in chapter 4.

The dependent variables are student Spanish language achievement and student academic self-efficacy. Spanish language achievement is defined as understanding of vocabulary and grammar as indicated by their score on the Spanish language achievement test. Student academic self-efficacy is defined as "students' perceptions of their confidence to do their classwork" as indicated by their responses on the PALS Academic Self-Efficacy scale (Midgley et al., 2000, p. 19).

As noted above, the control variables are the level of Spanish language achievement and student academic self-efficacy at the initiation of the study. Differences in these variables would be controlled for through a pretest and the use of an ANCOVA if the pretest results showed a significant difference between the treatment group and the control group. The potentially confounding variables, sex and socioeconomic status,

were controlled by the use of homogenous groups. The site school has procedures for grouping the students so as to create generally homogenous groups.

Definitions

English L1/Spanish L2 – denotes that English is the native language and Spanish is the second language. This terminology can be used to refer to curriculum, instruction, etc. (Flege, Frieda, & Nozawa, 1997).

Duolingo® – a free language learning software app available for iOS and Android devices, as well as available for computers via a web-based version. *Duolingo*® has gamification incorporated into its design (Vesselinov & Grego, 2012).

Spanish language achievement – the student's ability to translate from Spanish to English and from English to Spanish as indicated by the number of correct responses from multiple-choice questions regarding vocabulary, phrases, and grammar on the Spanish Language Achievement Test that was created for the study.

Gamification – the incorporation of game-like elements into contexts that normally do not have game-like elements for the purpose of creating greater engagement and improving user experience (Deterding et al., 2011; Frey, 2012; Giannetto et al., 2013).

Serious game – a game which is designed for a purpose beyond mere entertainment (Breuer & Bente, 2010).

Self-efficacy - one's belief in how well one can execute courses of action required to deal with prospective situations (Bandura, 1977).

Academic Self-Efficacy – "students' perceptions of their confidence to do their classwork" as indicated by their responses on the PALS Academic Self-Efficacy scale (Midgley et al., 2000, p. 19).

Traditional Spanish class instruction – the instructional methodology normally used by the Spanish language teacher, as distinguished from the gamified instruction used for the experimental group. Further details on the traditional instructional methodology can be found in chapter 3 under "Setting."

Sex – male or female (Education, 2013).

Socioeconomic status – A combination of social and economic factors that are used as an indicator of household income and/or opportunity (Education, 2013).

Summary

In this chapter the significance of the study was discussed along with the theoretical framework for the study, including a review of Vygotsky's zone of proximal development, Csikszentmihalyi's flow theory, and Bandura's social cognitive theory and their relation with gamification, achievement, and self-efficacy. English L1/Spanish L2 instruction in U.S. elementary schools was discussed, along with problems and weaknesses in the current system of instruction in the U.S. The purpose of the study, the significance of the study, research questions, hypotheses, and identification of the variables were reviewed along with the research summary and the assumptions and limitations of the study.

This quantitative study examined the effect of gamification on Spanish language achievement and student academic self-efficacy for elementary students. More specifically, a quasi-experimental, pretest-posttest non-equivalent control group design

was used to compare elementary school students at a private school in South Florida. The treatment group had *Duolingo*® significantly incorporated into their class while the control group continued with a traditional instructional model. Students took pretests to control for prior Spanish language achievement and academic self-efficacy.

This research design is strong among the quasi-experimental studies that can be used when true random sampling is not feasible (Campbell & Stanley, 1963). This research design allows for the control of prior Spanish language achievement and academic self-efficacy since groups cannot be assumed equivalent at the start of the study.

The treatment group significantly incorporated the use of *Duolingo*® into their elementary Spanish program. It was used as their sole curriculum for the duration of each of their once-per-week, 40-minute class sessions for the duration of the 12-week study. Students were given iPads to use during class time and were taught how to log in to *Duolingo*® and work primarily independently through the levels of the program. Students in the treatment group tracked their progress on a physical display board in the classroom.

 The control group continued with traditional Spanish instruction. For the duration of the study, the control group classes focused on the same words and grammar as the *Duolingo*® group. This ensured that the primary difference between the groups was the method of instructional delivery, as opposed to having an additional significant difference in content. Both classes continued to meet once a week for 40 minutes. The study continued for 12 weeks (see Figure 1).

At the conclusion of the 12 weeks, the students took the Spanish Language Achievement Test and the PALS Academic Efficacy subscale (Midgley et al., 2000). Since the analysis of the pretest showed no significant differences between the treatment group and the control group, an independent *t*-test was used to analyze the posttests to determine the effects of gamification on Spanish language achievement and academic self-efficacy.

Research Duolingo Content → Create Spanish Language Achievement Instrument based on Duolingo content → Create Traditional Lessons for Control Group Based on Duolingo Content

Select Instrument to Assess Academic Self-Efficacy → Develop Gamification Instructional Plan → Pretest with Achievement and Self-Efficacy Instruments

Begin Control and Treatment Programs → Run Programs for 12 Weeks → Posttest with Achievement and Self-Efficacy Instruments

Analyze the Data

Figure 1. Research process for this study.

In this chapter the problem statement, purpose statement, significance of the study, research questions, hypotheses and variables were discussed. In chapter two the theoretical framework will be discussed more thoroughly. Gamification and the literature supporting the study will also be examined.

CHAPTER TWO: REVIEW OF THE LITERATURE

Introduction

Some have argued that there is too little theory connected to people using gamification with many seeming to use serious games for educational purposes without having a clear understanding of why the game should be effective (Falloon, 2013). This study is using the app *Duolingo*® as an alternative means of instructing upper elementary students in Spanish as a second language. Principles from Csikszentmihalyi's flow theory and Vygotsky's social development theory suggest that features of gamification, and *Duolingo*® in particular, could be an effective way of increasing Spanish language achievement. Principles from Bandura's (1977) social learning theory suggest that features of gamification could impact student academic self-efficacy. This chapter will explore these theoretical connections and explain why this study was conducted.

This chapter will provide a description of *Duolingo*®, the serious game that is the primary tool used to gamify the foreign language classrooms in this study, and an overview of the current literature on flow theory, zone of proximal development, scaffolding, self-efficacy, and gamification. Foreign language achievement will be discussed including the importance of foreign language achievement and the current state of foreign language study in U.S. schools. Flow theory (Csikszentmihalyi, 1991) will be discussed along with its definition, a discussion of factors that lead to flow, and the results of being in a state of flow. Scaffolding will be discussed, including the definition, the underlying learning theory of the zone of proximal development, and the relationship of scaffolding to the zone of proximal development (Vygotsky, 1978). Social learning theory will be explored, with a focus on academic self-efficacy (Bandura, 1977).

Gamification will be reviewed, with an emphasis on its use in the field of education.

Finally, the literature gap that currently exists and which points to the need for research

on gamification and its effects on foreign language achievement and academic self-

efficacy will be examined.

<div align="center">**Duolingo®**</div>

Duolingo® is an award-winning, free foreign language learning app that can be

used on the iPhone, iPad, and Android devices, as well as on personal computers.

Duolingo® has sixty million users, 20 million who are active (Shapiro, 2015). To put this

into perspective, there are more people actively using *Duolingo*® than there are students

in the entire U.S. public school system (Shapiro, 2015). While *Duolingo*® is free, it is not

a low budget operation. *Duolingo*® has acquired significant capital since its inception so

as to invest in extensive development of the app. In 2015 alone, *Duolingo*® raised $45

million in venture capital and is currently valued at $470 million (Lardinois, 2015).

Duolingo® is gamified adaptive learning technology. It has game-like elements

such as the opportunity for users to move to ever increasing levels of difficulty as they

advance through the program. The opportunity to be on a leaderboard with other users

fosters competition among users, and the opportunity to gain points that users can use to

earn different rewards within the game. It is adaptive learning technology because the

app tracks the user's progress in multiple areas of language proficiency, and

appropriately adjusts difficulty of content for the user. If the user is showing adequate

proficiency, the user is able to move on to a higher level of language challenge. If the

user is not showing adequate proficiency the program will continue to provide instruction

and additional opportunities for the user to achieve and demonstrate adequate proficiency.

While *Duolingo*® has been built using venture capital, there is a funding model in place that Von Ahn and his team hope will allow it to continue to develop, yet remain ad free. The method for generating income is having users translate actual content from the web when the users reach the higher levels in the game. Businesses would pay *Duolingo*® for the service of translating web content. *Duolingo*® compares the translations of multiple users and chooses the best of the translations. Human translation is known to be superior to computer translation in most instances, but traditional human translation is very costly in comparison to computer translation. Von Ahn hopes to provide a third way: crowd-sourced, human translation of web content at a price that will be lower than current human translation models (Garcia, 2013; Giles, 2012; Shapiro, 2015).

As of July 8, 2015 *Duolingo*® provided language instruction for 22 languages. On *Duolingo*® users are guided through progressively challenging lessons. *Duolingo*® users in the version of the app which was used in this study (English as first language and Spanish as target language English L1/Spanish L2) are taught vocabulary and grammar. These exercises require users to provide the English translation of Spanish words, phrases and sentences, and also the Spanish translation of English words, phrases and sentences.

Zone of Proximal Development

Several key theories, previously discussed in chapter 1, provide a foundation for the effectiveness of gamification in general, and the use of the serious game *Duolingo*® as a tool to gamify the elementary Spanish language classroom. Vygotsky's (1978) zone of

proximal development, along with scaffolding; Csikszentmihalyi's (1991) flow theory; and Bandura's (2001) social cognitive theory with a focus on self-efficacy (Bandura, 1982) each indicate that aspects of gamification could positively impact the education experience.

Vygotsky's zone of proximal development has been referenced in gamification research and in research on learning Spanish as a foreign language (Davin, 2013; Feng, 2009). Gamification researchers utilize Vygotsky's theory to help understand how serious games may facilitate learning (AMR, 2012; Boyle et al., 2011; Fang & Strobel, 2011; Huizenga, Admiraal, Akkerman, & Dam, 2009; Peterson, 2010; Piirainen-Marsh & Tainio, 2009; Qing, Lemieux, Vandermeiden, & Nathoo, 2013; Rouse, 2013; Wu et al., 2012). Vygotsky (1978) explained the zone of proximal development (ZPD) as "the distance between actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86).

Diagnostic tests in Vygotsky's day (and most in our day) focused on what the child could do independently (Vygotsky, 1978). These tests fail to give the full picture of the child's developmental level. Vygotsky (1978) explained that there is more to a child's developmental level than what she can do independently. Vygotsky gives the example of two children who both test at the eight year old developmental level on a test that focuses on what they can independently accomplish. He then goes on to explain that these two students may be very different in their zone of proximal development, or in the sense that one may be able to accomplish significantly more than the other student when both receive the same assistance from an adult. For example, some students may be able

to say the majority of the alphabet with some assistance, while another student may demonstrate that even with assistance, they are not able to say any of the alphabet. This distinction between what a student can do independently and what a student can do with assistance is an important one that should be taken into consideration when seeking to understand the developmental level of a child; especially since this is the zone in which the most learning occurs (Vygotsky, 1978).

The assistance from the adult or more capable peers has been referred to as scaffolding, and it is this scaffolding that gives the child the opportunity to perform more complex tasks that they cannot yet do independently. The scaffolding is critical because it is precisely what gives the child the opportunity to practice more complex tasks until they are able to independently complete them (Vygotsky, 1978).

ZPD Connection to Gamification

Gamification researchers utilized Vygotsky's theory to explain how serious games may facilitate learning (AMR, 2012; Boyle et al., 2011; Fang & Strobel, 2011; Huizenga et al., 2009; Peterson, 2010; Piirainen-Marsh & Tainio, 2009; Qing et al., 2013; Rouse, 2013; Wu et al., 2012). In Wu et al. (2012) investigation of the learning theory foundations for game-based learning, Vygotsky's social development theory (including ZPD) and cognitive apprenticeship theory were shown to be two of the major learning theories on which gamification research was based. While Vygotsky's definition of ZPD includes the possibility of adult guidance or collaboration with peers as the scaffolding support for the student, gamification research suggests that the computer game itself can provide scaffolding (Peterson, 2010; Ranathunga et al., 2014). In one sense, this is an

extension of Vygotsky's model. While in another sense, the computer game can be seen as an extension of adult support through the medium of software and hardware.

Robust computer software assesses the student's level of content understanding, while providing ZPD appropriate challenges and scaffolding to give the student the opportunity to practice those skills that he or she has yet to accomplish independently (Peterson, 2010). The software also continues assessing the student until the student is able to accomplish the task independently. The game then moves on to more complex tasks, and continues repeating the cycle of providing scaffolding, assessing, removing scaffolding, assessing, and moving on to a more complex task once there is sufficient evidence of independent mastery.

Duolingo®, the app used as the game platform in this research, attempts to provide a cycle of teaching, supporting and assessing from the lowest level of Spanish language instruction to a very high level of Spanish language instruction. Vygotsky's (1978) ZPD serves as the theoretical framework for this study, because *Duolingo*® provides scaffolding that gives the learner the opportunity to practice skills he or she has not yet mastered, it is also believed that this key factor lead, to *Duolingo*® serving as a powerful tool for students attempting to learn a foreign language.

Flow Theory

Flow is defined as "the experience of complete absorption in the present moment, and the experiential approach to positive psychology that it represents" (Nakamura & Csikszentmihalyi, 2009, p. 195). Csikszentmihalyi's flow theory originated in the field of psychology, but has since been found to be a useful paradigm in other fields including the study of education in general and the study of gamification in general as well as the

study of gamification in education in particular (Boyle et al., 2011; Bressler & Bodzin, 2013; Csikszentmihalyi, 2008; Finneran & Zhang, 2003).

Development of the Theory

Csikszentmihalyi (2008) studied artists, athletes, composers, and others. He noted they were thoroughly engaged in meaningful and enjoyable work, these individuals lost a sense of time, a sense of themselves, and became fully engrossed in the experience at hand. The people described these experiences as times of intense pleasure. In his research, Csikszentmihalyi found that these optimal flow experiences were described similarly by people of different cultures, age groups, genders, nations, occupations, and socio-economic conditions. Csikszentmihalyi (2008) recommended that in order to have the fullest life, one should seek to engage in these optimal experiences more often. This can be done by engaging in meaningful work or play that is challenging but not beyond the person's ability.

Csikszentmihalyi explains some of the different ways that flow is being used:
But flow is not just an academic subject. Only a few years after it was first published, the theory began to be applied to a variety of practical issues. Whenever the goal is to improve the quality of life, the flow theory can point the way. It has inspired the creation of experimental school curricula, the training of business executives, and the design of leisure products and services. Flow is being used to generate ideas and practices in clinical psychotherapy, the rehabilitation of juvenile delinquents, the organization of activities in old people's homes, the design of museum

exhibits, and occupational therapy with the handicapped.

(Csikszentmihalyi, 2008, p. 5)

Flow Elements

Csikszentmihalyi (1990) stated that there are certain elements shared among activities that lead individuals to experience flow. These include (a) a challenging activity that requires skill, (b) the merging of action and awareness, (c) clear goals and feedback, (d) paradox of control, (e) loss of self-consciousness, (f) transformation of time, and (g) an autotelic experience. Nakamura and Csikszentmihalyi (2009) define *autotelic* as doing something for its own sake, rather than to achieve some later goal. The conditions for entering flow include challenges and opportunities for action "that stretch but do not overmatch existing skills…and clear proximal goals and immediate feedback about the progress being made" (Nakamura & Csikszentmihalyi, 2009, p. 195). Both the elements and conditions above are common to video games, and Csikszentmihalyi (1990) points out that sports, games and other flow activities supply the goal and feedback structures that make flow more likely to occur. This leads the video game player to enter a state with the following flow characteristics:

- intense and focused concentration on the present moment;

- merging of action and awareness;

- loss of reflective self-consciousness (i.e., loss of awareness of oneself as a social actor);

- a sense that one can control one's actions; that is, a sense that one can in principle deal with the situation because one knows how to respond to whatever happens next;

- distortion of temporal experience (typically, a sense that time has

    passed faster than normal);

- experience of the activity as intrinsically rewarding, such that

    often the end goal is just an excuse for the process. (Nakamura &

    Csikszentmihalyi, 2009, pp. 195-196)

For those who have become engrossed in a computer game, the above characteristics probably seem in line with the game playing experience. Jane McGonigal (2011) explains how in a good computer game the player is always playing at the very edge of his or her skill level. The player is always on the brink of falling off, and when the player does fall off, she feels compelled to climb back on. McGonigal (2011) explains that this is because practically nothing is as engaging as working at the very limits of your ability. She also pointed out that game designers and psychologists call this *flow*.

Csikszentmihalyi (1990) explained that to continue experiencing flow, one must engage in progressively more complex challenges. Increasingly difficult features have been shown to be important to effective educational apps (Kucirkova, Messer, Sheehy, & Panadero, 2014). Thus, computer games are designed to provide the type of features that are requisite for experiencing flow. Therefore, it is not surprising that flow has provided the theoretical framework for many studies of gamification (Boyle et al., 2011; Bressler & Bodzin, 2013; Finneran & Zhang, 2003).

Nakamura and Csikszentmihalyi's (2009) discussion of the need for progressively more difficult challenges builds on the work of Vygotsky: "To continue experiencing flow, they must engage progressively more complex challenges. The optimal level of

challenge stretches existing skills (cf. Vygotsky, 1978) resulting in more complex capacities for action" (p. 197). They go on to explain that flow activities provide a system of graded challenges that accommodate a person's continuing and deepening enjoyment as skills improve.

Csikszentmihalyi, in a study with D. Shernoff, Schneider and E. Shernoff (2003), noted that in addition to graded, appropriate challenges for the student, it is also important to increase student autonomy and control over their learning experience. Gamification provides these graded, appropriate challenges and student control over the learning experience. An example of this was found in this study. The students used *Duolingo*® individually on their devices, and were able to control the pacing, and the challenge level was modified to the students, accomplishments in the game.

The enjoyable nature of flow fosters a desire to spend more time doing activities that lead to flow (Csikszentmihalyi, 2008). This means that a good educational game can result in a student is desire to spend more time working with the educational game, (Rosas et al., 2003) thus potentially learning more through that additional time spent with the learning software. However, the connection between a learner's affective state, flow state, and learning outcomes has not been investigated in detail in the context of serious games or gamification (Brom et al., 2014).

While the connection between flow theory and gamification has not been studied, educational activities have been studied in relation to flow. Strong correlations between flow and learning outcomes were found in upper grade elementary students. Marginally significant differences were also found for flow experience during training, and for motivational gains on self-efficacy after training (van der Meij, 2013). Empirical

observations and findings from studies, using flow as the theoretical framework, suggested that well designed, well utilized educational games can promote engagement and learning for students including those with special learning needs (Fengfeng & Abras, 2013; van der Meij, 2013).

Other research referenced more modest correlations between flow and learning outcomes (Craig, Graesser, Sullins, & Gholson, 2004; Vollmeyer & Rheinberg, 2006). While Craig et al. (2004) found more modest correlations between flow and learning, they do note their findings, that learning correlates positively with flow, are consistent with Csikszentmihalyi's predictions, based on his analysis of flow experiences. Research exploring the connection between flow theory and gamification in the elementary Spanish classroom is lacking.

Social Cognitive Theory

Bandura's (2001) social cognitive theory, formerly referred to as social learning theory (Bandura & McClelland, 1977), has been used as the theoretical framework in numerous gamification studies (Huber & Hilty, 2015; Jones, Madden, Wengreen, Aguilar, & Desjardins, 2014; Terlutter & Capella, 2013; Wu et al., 2012). Social cognitive theory posits that learning does not take place in isolation, rather learning is social in nature (Bandura, 2001). People do not simply take in new information that is put before them and move from unknowing to knowing. Instead, learning is social, with potential learners taking into account factors such as who is teaching them, what are they seeing others around them do, and how are others relating to them if they act one way rather than another. People also practice self-talk about what they are learning and their

ability to learn it, and they take into account whether or not they are feeling coerced to learn (Bandura, 1977, 2001).

Social cognitive theory provided a significant contribution to the field of education by placing emphasis on the social factors that impact the student's desire and perceived ability to learn (Bandura & McClelland, 1977). In addition, social cognitive theory naturally lends itself to the discussion of gamification, since gamification is often brought into education (Heick, 2013; Johnson et al., 2013; Kapp, 2012; Papastergiou, 2009; Wu et al., 2012), advertising (Terlutter & Capella, 2013), health care (Lin & Zhu, 2011; McCallum, 2012), and other spheres (McGonigal, 2011) for the purpose of motivating the learner to act in a certain way. Education, health care, and advertising desire to influence the thinking of the learner, patient or consumer. They find that gamification can guide users to interact socially around their product. This has an impact on other users and their willingness to engage with, and potentially trust, their product (Bandura, 1977).

One of the key elements of social cognitive theory, and one that has a significant connection to both education and gamification, is self-efficacy. Self-efficacy is a person's belief in his or her ability to accomplish a certain task. Self-efficacy is different from self-concept. Self-concept is a person's assessment of the abilities that they possess, in general, while a person's self-efficacy is a person's sense of what they can accomplish in particular situations (Bong & Skaalvik, 2003). A person's self-concept may be that they are "good at snow skiing," but an individual's self-efficacy is what they believe about their ability to ski a particular ski run at a certain difficulty level (Linnenbrink & Pintrich, 2003). Research has shown that self-efficacy is a more accurate

predictor of a person's ability to accomplish a task than is their self-concept (Pajares & Miller, 1994).

Self-efficacy has been shown to have a positive association to learning in general (Linnenbrink & Pintrich, 2003; Multon & Brown, 1991; Pajares & Miller, 1994; Zimmerman, 2000; Zimmerman, Bandura, & Martinez-Pons, 1992) and to foreign language academic achievement in particular (Mills et al., 2007; Xiao, 2012). The successful distance language learner has high self-efficacy that Xiao (2012) found to potentially be associated with an internal locus of learning and increased motivation.

In a study looking at the relationship between attribution, self-efficacy and performance in a foreign language course, Hsieh and Schallert (2008) found that self-efficacy was the strongest predictor of academic performance. Hsieh and Schallert (2008) also found that students attributing failure to a lack of effort had higher self-efficacy than students who did not make effort attributions. So as with Xiao (2012), Hsieh and Schallert (2008) found higher self-efficacy to be related to other factors that could lead to more successful academic performance.

It has been established that greater self-efficacy leads to greater general academic success (Bandura, 1982; Mills et al., 2007; Pajares, 1996; Pajares & Miller, 1994; Zimmerman et al., 1992), and that greater self-efficacy leads to greater success in the foreign language classroom (Mills et al., 2007; Xiao, 2012). Therefore, it is critical to understand educational methods that lead to improving a student's sense of self-efficacy (Bandura, 1982; Pajares, 1996).

While there have been studies on foreign language study and academic self-efficacy (Mills et al., 2007; Xiao, 2012), to date there are no studies that focus on

gamification's potential effect to influence academic self-efficacy in a foreign language class. A search on Academic Search Complete on January 9, 2016 for the terms *self-efficacy, foreign language* and *game* or *gamification* or *GBL* resulted in zero results.

Self-Efficacy

Self-efficacy, gamification and Duolingo®. Self-efficacy is one's belief in how well one can execute courses of action required to deal with prospective situations (Bandura, 1977). Self-efficacy sits squarely within social cognitive theory because one's belief in one's ability to accomplish something is impacted by one's interactions with the social world around them (Bandura, 1977, 1982, 1995). The four key factors to developing a person's self-efficacy include (1) mastery experiences, (2) vicarious experiences, (3) social persuasion, and (4) physiological and emotional states (Bandura, 1995). This study links these four key self-efficacy factors to gamification in general and to *Duolingo®*, the gamification application used in this study. Thus, in addition to gamification positively influencing foreign language achievement, it is hypothesized that it will likely influence self-efficacy. Bandura's theory leads this author to hypothesize that the effect of gamification on foreign language achievement would be positive since self-efficacy and academic achievement have been shown to be positively associated.

Mastery experiences. When a person performs a task successfully, this is a mastery experience (Bandura, 1995). Mastery experiences enhance self-efficacy because the student finds himself or herself successful at tasks related to the subject (Bandura, 1995). Gamification can provide these experiences in ways that are less costly than real world experiences (Insley & Nunan, 2014; Ker, Hogg, Maran, & Walsh, 2010). This is one reason why the aviation industry uses simulation; it is much less costly trying to learn

to be effective in a simulator than in an actual situation in which one could be seriously injured or lose his or her life (Insley & Nunan, 2014; Ker et al., 2010). *Duolingo*® provides the student with a perpetual series of opportunities for mastery experience as the student interacts with its gamified learning environment. It was anticipated that each student had a much larger number of opportunities for mastery experience than in the traditional classroom environment due to the fact that the *Duolingo*® environment allowed the student to be personally engaged during the entire class period, whereas in the traditional learning environment the teacher tends to call on other students for answers or for speaking practice, leaving other students to wait or do something less engaging than what *Duolingo*® provides.

In addition, while teachers are encouraged to differentiate their lessons and do their best to meet each student at their level, the daily challenges of a classroom often make this less than a reality (Algozzine & Anderson, 2007; Tomlinson, 2012). The teacher is only able to give one set of directions at a time and can only answer one question at a time. However, *Duolingo*® is designed to adapt to each student's level of understanding of the foreign language. The U.S. Department of Education (2015) states that the average elementary teacher to pupil ratio is 1 to 21.2. If a class of 21 students each had an electronic device and used *Duolingo*®, 21 different levels of differentiated instruction would occur because *Duolingo*® uses adaptive learning technology.

Vicarious experiences. Another key factor in the development of self-efficacy is vicarious experiences (Bandura, 1995). Vicarious experiences involve seeing someone else attempt a particular type of task. The more similar the person attempting the task is to oneself, and the more successful the person is at the task, the greater the likelihood an

increase in self-efficacy will result via the vicarious experience (Bandura, 1995).

Duolingo® provides a social component by allowing users to invite others to link to their account so that they can see each other's progress and challenge one another to move forward in their learning on the app. This feature allows users to see how people they know, usually their friends, family or colleagues, are progressing in the app. This provides a solid form of Bandura's (1995) vicarious experience as users have an opportunity to see people like themselves moving forward in the learning experience and can result in an increase in academic self-efficacy as the challenge of moving forward seems more attainable when people like them are having success.

According to Bandura's (1995) explanation of vicarious experiences, the strength of the vicarious experience of the traditional method of using *Duolingo*® would be dependent upon how many friends with whom the user connects, how similar those friends are to the user, and how successful those friends are at moving forward in the app. It is anticipated that school, whole-class usage of *Duolingo*® could provide a high quality vicarious experience because the class would likely consist of students with significant key similarities (e.g.: age, grade level, sex, life experience) to the user. If these connected "friends" perform well on *Duolingo*®, this would lead to a positive vicarious experience and impact on self-efficacy. Similarly, if the connected "friends" perform poorly on *Duolingo*®, this would lead to a negative vicarious experience and impact on self-efficacy.

Social persuasion. Social persuasion can lead to increased self-efficacy through encouraging a person to believe they can be successful at a given task and also setting up situations in which the person can find opportunities for success (Bandura, 1995).

Discouragement, or situations that result in failure, would lead to decreases in self-efficacy. In regards to setting up situations in which the person can find opportunities for success, the *Duolingo*® app assesses the proficiency level of the user and provides training along with situations in line with the user's ZPD making it likely that the user finds success (Vygotsky, 1978). *Duolingo*® also provides encouragement through an avatar uses uplifting speech bubbles. The speech bubbles can praise the success of a user who is getting right answers, or the speech bubbles can give some needed encouragement to a user who is having difficulty selecting the right answer. Encouragement occurs in the traditional classroom setting as well, but the avatar in *Duolingo*® may be able to provide positive feedback in a more regular and data-based manner through adaptive learning technology.

Physiological and emotional states. When people attempt difficult tasks they sometimes encounter physiological and emotional states such as anxiety or fatigue, and the interpretation of these impact a person's sense of self-efficacy (Bandura, 1995). A person who interprets "butterflies in the stomach" as a sign of inability will find their self-efficacy diminished, while someone who interprets it as normal for the situation, and unrelated to ability, will not see their self-efficacy diminished. A high percentage of students find the standard foreign language classroom to be a stressful environment (Elkhafaifi, 2005; Horwitz et al., 1986; Xiao, 2012). The concern of being evaluated by others when speaking in front of the class, and self-perception concerns related to one's inability to fully express oneself to others in the target language (Horwitz et al., 1986) may be mitigated by the use of *Duolingo*® as the students were interacting with their device rather than speaking independently with the rest of the class looking on.

Bandura's (1995) discussion of physiological and emotional states tended significantly towards the possibility for stressful situations to be interpreted negatively so as to reduce self-efficacy. For this reason it is thought that reduction of stressful situations would lead toward greater overall results in academic self-efficacy.

Potential Negative Impact on Academic Self-Efficacy

The above studies show a positive relationship between self-efficacy and performance in the foreign language classroom. Interestingly, Jernigan (2011) provides an example of the opposite, a negative relationship between self-efficacy and performance in the foreign language classroom. These counterintuitive results could be the result of what Garcia (1995) describes as defensive pessimism. Students who have a low self-efficacy can use defensive pessimism to fuel their need to work harder in the foreign language classroom so as to overcome their weaknesses and avoid failure (Garcia, 1995).

Jernigan's (2011) study is not representative of the research on self-efficacy. Meta-analyses of self-efficacy and its relationship to academic performance reveal positive, and statistically significant, relationships between self-efficacy and academic performance (Multon & Brown, 1991; Pajares, 1996). What is not as well understood is the causality and the direction of causality in this relationship (Pajares, 1996). Does a student's level of academic success lead to his or her level of self-efficacy, or does his or her level of self-efficacy lead to his level of academic success? Pajares (1996), an influential researcher in the area of self-efficacy writes that "(b)ecause of the reciprocal nature of human motivation and behavior, it is unlikely that such a question can be resolved" (p. 566). Surely one must not give up hope that future research could be

conducted that could help us to better understand the direction of causality. In fact, Pajares (1996) later expressed that experimental studies in which self-efficacy beliefs are altered, and then performance is measured with longitudinal and repeated measures designs, could lead to a greater understanding.

While much research has shown a positive association between self-efficacy and learning (Bandura, 1982; Mills et al., 2007; Pajares, 1996; Pajares & Miller, 1994; Zimmerman et al., 1992), there is reason to believe that academic self-efficacy in this study could be negatively associated in regards to the treatment group as a whole in comparison to the control group as a whole; despite the fact that the treatment group may actually learn more than the control group. The reason for this counterintuitive possibility is that a large part of academic self-efficacy involves the student's belief that he or she can understand and succeed with the most difficult work in the class (Bandura, 1977; Midgley et al., 2000). In a traditional learning environment, as with the control group, the teacher is generally teaching at a level so that most students are able to keep pace with the material and expectations in the class, and a good portion of the class often finds the work to be less than challenging (Algozzine & Anderson, 2007; Tomlinson, 2012). These higher achievers would normally have a high academic self-efficacy since they are able to show mastery of most of the class material.

In contrast, in this study's gamified treatment group, the material was differentiated down to the individual student according to the level of mastery that they have shown thus far in their work on *Duolingo*®. For this reason, no matter how hard they work or how proficient they are at Spanish, the program is ready to take them further to the point that they are operating in the challenge zone. Therefore, instruments

designed to measure a student's academic self-efficacy may be met with a very different

set of answers for mid to high ability students in the treatment group versus the mid to

high ability students in the control group in this study. For example, Midgely's (2000)

Patterns of Adaptive Learning Scales' (PALS) academic self-efficacy subscale asks that

students agree or disagree, on a Likert scale, with statements such as "I'm certain I can

master the skills taught in class this year", "I'm certain I can figure out how to do the

most difficult classwork" and "I can do even the hardest work in this class if I try" (p.

19). The previous paragraph discussed how a student in the control group would likely

answer such questions. Considering the students in the treatment group, one can see that

students working with adaptive learning software that is immediately moving them on to

higher level work whenever they demonstrated mastery could be much less likely to

agree with statements such as "I'm certain I can master the skills taught in class this

year." Yet, there is reason to expect that students who are receiving differentiated

instruction in the form of adaptive learning software will learn more than students whose

instruction is less differentiated and less able to keep moving them on to higher

challenges whenever they show mastery (Algozzine & Anderson, 2007; Tomlinson,

2012). One possible way to overcome this could be to set a reasonable goal that much of

the class could master. Then, when the students pass that point in their learning with the

adaptive learning software, they would have a greater sense of academic self-efficacy due

to the fact that they know that not only can they learn the most challenging material in

class, but their level in *Duolingo*® shows that they have done so. However, it is unlikely

that reducing expectations for students, through goal reduction, would lead to higher

learning outcomes when the literature points to higher goals leading to higher learning

even to the point of recognizing cognitive disequilibrium or confusion as a precursor for deep learning (Craig et al., 2004). It was expected that gamification would have a positive effect on achievement and a positive effect on self-efficacy. However the direction of the effect on self-efficacy is less predictable in light of the fact that the very questions used to measure self-efficacy may receive significantly different answers from students who are not using traditional material. As described above, adaptive learning software is designed to continue to move the student forward with challenging educational material. This makes it less likely that even the most advanced students would say that they are confident in their ability to learn the hardest material that will be presented in class.

Having reviewed the literature on zone of proximal development, flow theory and academic self-efficacy, and their relation to gamification, the literature on foreign language study and gamification in particular will now be explored. A rationale is given for the choice of Spanish as the foreign language for the current study as well as an explanation of why it is advantageous to learn a foreign language earlier in a student's school career. Gamification will be explored including its educational impact, the challenging nature of designing computer games, and research on gamification. The need for research in elementary foreign language education and the lack of research on *Duolingo*® in particular is also explored.

Foreign Language Study

Spanish as the Foreign Language for the Current Study

While the studies on foreign language mentioned heretofore were focused on foreign language in general, it should be noted that the studies in the U.S. (Garfinkel &

Tabor, 1991; Schuster, 2005; Stewart, 2005; Taylor & Lafayette, 2010) tend to focus on

the study of Spanish as a foreign language. Spanish is the most prevalently taught

foreign language in the U.S. (Pufahl & Rhodes, 2011), and this coincides with the fact

that Spanish ranks second, to only English, as the most used language in the U.S. (Byram,

2008; Lopez & Gonzalez-Barrera, 2013; Ryan, 2013). According to Lopez and

Gonzalez-Barrera (2013), of the 59 million people in the U.S. who speak a language

other than English in their home, 37 million of these speak Spanish in their home.

In addition to being the second most spoken language in the U.S., Spanish has a

dominant place among the languages spoken around the globe (Byram, 2008). The

number of Spanish language speakers surpasses the number of English language speakers

worldwide (Lewis, 2014). There are 470 million Spanish speakers worldwide, making

Spanish second, only to Mandarin, on the world stage of languages (Lewis, 2014). The

study of Spanish, along with other foreign languages, provides academic benefits and

enhanced career opportunities. It also increases an individual's ability to positively

impact many areas of life in our society and world including economic development,

national security, cultural understanding, international relations, and diversity relations

(Lacorte, 2013; Pavlenko, 2003; Pufahl & Rhodes, 2011).

While the belief is that the results of this study have implications for any modern

language, Spanish was selected due to the fact that it is one of the most popular choices

for students desiring to learn another language in both the U.S. and throughout the world

(Lacorte, 2013). Due to its ranking as the second most prevalent language in the U.S., it

is also a natural choice for those looking to expand their opportunities in terms of

employment. While students in elementary school may not yet be thinking of a foreign

language's impact on their future employment, those who lead U.S. schools should be taking this into account as they look to prepare students for the future.

Importance of Learning a Foreign Language in Elementary

Students who start foreign language study before the age of 12 can attain higher levels of foreign language proficiency than students who start later than 12 (Abrahamsson & Hyltenstam, 2009). Research also suggests that speech rate, degree of foreign prosody, the frequency of pitch accents, and the frequency of high boundary tones is positively affected by initiating foreign language study at an earlier age (Huang & Jun, 2011).

Foreign language study leads to increased cognitive skills, is linked to higher achievement in other academic areas, and is associated with higher achievement test scores (Stewart, 2005). While it is common for schools to reduce foreign language study to focus on the areas that are specifically tested on high stakes standardized tests (Jennings & Rentner, 2006; Pufahl & Rhodes, 2011; Rosenbusch, 2005; Taylor & Lafayette, 2010), there is evidence that the scores for reading, math and other areas may be improved by keeping foreign language study in the curriculum (Stewart, 2005). Foreign language study in the early elementary years has been shown to improve cognitive abilities, to increase achievement in other disciplines, to lead to increases in achievement test scores in reading and math (Garfinkel & Tabor, 1991; Peal & Lambert, 1962; Schuster, 2005; Stewart, 2005; Taylor & Lafayette, 2010).

Peal and Lambert's (1962) landmark study provided evidence that elementary students who studied a foreign language scored significantly better on both verbal and nonverbal intelligence tests. Providing a more extended foreign language program in the elementary school has also been shown to provide students with significantly positive

effects (Garfinkel & Tabor, 1991; Taylor & Lafayette, 2010). An examination of English reading scores of students with varying intelligence showed significant improvement among students who had extended a third and fourth grade introduction to Spanish to a full one to two years of Spanish instruction when in grades five and six as compared to students who did not extend the third and fourth grade introduction when in grades five and six (Garfinkel & Tabor, 1991). Significant improvement in an even wider range of academic areas was found by Taylor and Lafayette (2010). When elementary students who extended their foreign language study beyond one year were compared with those who did not, it was found that the students with the greater amount of foreign language study outperformed the one year foreign language peers on every subject (English language arts, mathematics, science and social studies) for which they were assessed (Taylor & Lafayette, 2010). The clear positive impact for learning a foreign language in elementary provides impetus to focus on elementary students in this study.

Elementary Students as the Age Group for this Study

Another impetus for the selection of elementary students for the current study is the lack of research on gamification among elementary students. A literature review by Caponetto et al. (2014) on 120 gamification papers showed elementary school or primary school as the focus population in only 3% of the papers. In addition, their research found that a minority of the papers included quantitative research on gamification (Caponetto et al., 2014).

Another reason for working with elementary students in this study is that in regards to *Duolingo*®, there is only one known study of its effectiveness (Vesselinov & Grego, 2012) and this study was conducted with adults only. It has been shown that the

effects of gamification are significantly impacted by the types of users of the serious game or the gamified classroom (Hamari, 2014). Therefore, the results of *Duolingo*® that were found to occur in the Vesselinov and Grego (2012) study, may be very different than the results one would find with elementary students using the same program.

Gamification

Gamification is a tool being utilized by a diverse range of organizations including The World Bank, the American Heart Association, the National Academy of Sciences, the U.S. Department of Defense, McDonald's, Intel, the Corporation for Public Broadcasting, and the International Olympic Committee (McGonigal, 2011). One of the key ways that gamification occurs in education is by incorporating serious games into the classroom experience (Breuer & Bente, 2010; Connolly et al., 2012; Connolly, Stansfield, & Hainey, 2011; Escudeiro & Carvalho, 2013; Fengfeng & Abras, 2013; Fu-Hsing et al., 2012; Hamari, 2014; Hess & Gunter, 2013; Kapp, 2012; Ke, 2008; Mitchell & Savill-Smith, 2004; Nolan & McBride, 2014; Papastergiou, 2009; Shin, Sutherland, Norris, & Soloway, 2012). Serious games are games that are designed to achieve a change (e.g.: knowledge, attitude, physical ability) in the player (McCallum, 2012). Numerous studies have been conducted to explore the educational benefits of gamification and serious games and have provided evidence of their educational benefits (Connolly et al., 2012; Hamari, 2014; Huizenga et al., 2009; Hwang, Sung, Hung, Huang, & Tsai, 2012; Kelle et al., 2013; Zhi-Hong et al., 2012). There are numerous studies including qualitative (Fengfeng & Abras, 2013), quantitative (Lee, Heeter, Magerko, & Medler, 2012) and mixed methods (Hess & Gunter, 2013) studies related to gamification and learning. Gamification and serious game studies have been used with diverse populations from

students with special needs (Fengfeng & Abras, 2013) to students studying online (Hess & Gunter, 2013).

Challenging Nature of Designing Computer Games

Some games are developed by educators for the purpose of teaching something in particular (Rosas et al., 2003). Researchers have also explored the effects of general-purpose commercial games and found that they could be used to achieve general educational objectives when properly utilized by a teacher (Panoutsopoulos & Sampson, 2012). It is important to note that commercial games can be used effectively for educational purposes because research shows that designing effective serious games from the ground up is a complex and challenging endeavor (Fang & Strobel, 2011; Kelle et al., 2013; Qing et al., 2013).

Designing effective serious games requires knowledge in multiple areas including instruction, pedagogy, computer programming and game development (Carmody, 2012). The effects of gamification can be directly impacted by the nature of the gamification implemented. In other words, teaching is known to be effective, but only when the teaching is done effectively and the same principle can likely be applied to gamification (Hamari, 2014). In addition, it is important to note that not all computer-assisted learning strategies will have the same effect on all students (Chun, 2011).

Inexperienced designers of serious games can create undesirable game characteristics. For example a student's poor game playing ability could lead to poor results in learning. Designers of educational games have to be careful in their game design to avoid scenarios in which players discover ways to be successful in the game without learning (Fang & Strobel, 2011; Fu-Hsing et al., 2012).

Gamification's Educational Impact

Limited study on gamification has emerged across educational content areas and across different student populations; this research is beginning to demonstrate that gamification does have a positive impact on educational outcomes. Primary students taught with a game-based learning approach to math scored higher than those with a traditional learning approach, though not statistically significantly higher (Abdul Razak & Connolly, 2013). Middle school students using an augmented reality (AR) science learning game demonstrated a potential for these types of games to increase science interest and help students learn collaboration skills (Bressler & Bodzin, 2013). Some studies have shown mixed results regarding the educational effectiveness of computer games for learning (Mitchell & Savill-Smith, 2004). One problem was the possibility for game mechanics to distract from the learning objectives. For example, in one study, (Fu-Hsing et al., 2012) students' playing motivation was found to negatively affect their learning motivation in the game, which then affected their learning effectiveness.

Need for Research on Gamification with Foreign Language Study

Much of the research on gamification with foreign language study has been qualitative, and there is a need for more quantitative and experimental research in the area of serious games (Falloon, 2013; Fengfeng & Abras, 2013). While a good number of studies have been conducted on serious games for the PC, there is a need to dedicate more study to the educational apps for iOS devices and other popular mobile devices, considering the sheer number of these devices being used by students and schools (Falloon, 2013; Shuler, 2012) and their potential power to change the learning

atmosphere. In addition, research has shown that game-based-learning is not currently a widely used educational model (Abdul Razak & Connolly, 2013). There is a need for more serious games research that connects a theoretical foundation to gamification (Falloon, 2013). There is a need to research the use of gamification to solve real world instructional problems (Carmody, 2012). This study focuses on the real problem with the state of foreign language achievement among American elementary students (Pufahl & Rhodes, 2011) and seeks to explore a possible role of gamification in strengthening foreign language instruction for elementary students.

As devices are getting more powerful and less expensive, more and more people are purchasing them. In addition to one-to-one device initiatives in which schools purchase and provide devices for their students, there is a growing trend referred to as *Bring Your Own Device* (BYOD) (Sangani, 2013), and this is possible mainly because the devices are becoming so affordable and ubiquitous in developed countries. In addition, initiatives like One Laptop Per Child have helped to get millions of laptops and tablets to children in underdeveloped countries (Baggaley, 2013). The end result of affordability is that these powerful, portable computing devices are becoming a more and more powerful force for change. But the hardware, or the devices themselves, exists to run the software and the apps. All of this points to the importance of understanding what effect these apps can have on learning. While apps can be used to teach or support the teaching of practically any subject, this study focuses on the study of foreign language.

Limited Research on *Duolingo*®

Due to its fairly recent release, it is perhaps not surprising that very little research has been published on *Duolingo*®. A search for "Duolingo" on Academic Search

Complete on July 9, 2014 with the delimiter of peer-reviewed journals resulted in no research articles found. The *Duolingo*® website shares the results of an independent study by Vesselinov and Grego (2012) commissioned by *Duolingo*®, but this study did not appear in the search on Academic Search Complete.

The only known study on *Duolingo*® is an eight week study using a random representative sample selected from *Duolingo*® users who studied Spanish (Vesselinov & Grego, 2012). The participants were 18 years of age and older, native English speakers and not advanced users of Spanish, and all of the participants resided in the U.S. The participants in the study took one college placement Spanish language test at the beginning of the study and another at the end of the study. The results of the test were measured in points with higher points representing greater Spanish language knowledge. The difference between the final and initial language results represented the improvement of language abilities. The study measured the effectiveness of *Duolingo*® as language improvement per one hour of study. The users showed a showed a high level of satisfaction (95.5% agreed that it was easy to use and 92.4% believed it helped them to learn Spanish) with the program (Vesselinov & Grego, 2012).

Research on Gamification

Connolly et al.'s (2012) systematic literature review of empirical evidence on computer games and serious games provides evidence of the extent of research that exists on gamification. Their study focused on 129 of the higher quality papers that they found among the 7392 that appeared in the search results for papers on gamification, serious games, game based learning, and other similar terms (Connolly et al., 2012). Of the 129 higher quality papers the vast majority were quantitative, 121 (84%), with only 8 (6%)

reporting qualitative data. Sixty-five (54%) of the quantitative studies utilized quasi-experimental designs, 43 (36%) used survey designs, 12 (10%) were randomized control trial design, and one study used a correlational design (Connolly et al., 2012). Forty-five (69%) of the quasi-experimental designs used between-group designs with no randomization. The remaining 20 (31%) used within-group designs with no control group. Eight studies reported qualitative data only and these used case study methodologies, protocol analysis, and analysis of perspectives (Connolly et al., 2012). In Connolly et al.'s (2012) review of gamification literature the most frequently occurring outcomes were affective and motivational, knowledge acquisition/content understanding, followed by perceptual and cognitive skills, behavior change, physiological outcomes, and social/soft skills outcomes. The study at hand represents the most utilized type of study, a quantitative, quasi-experimental design, represented in Connolly et al.'s (2012) study; this provides rationale for the appropriateness of the design chosen.

There was a range of curricular areas represented by the 129 high quality papers used in the study. Four of the 129 papers and three of the 70 high quality papers reviewed by Connolly et al. (2012) dealt with language, but none of the papers were identified as having foreign language as the curriculum area. There is a need for research on gamification's impact on foreign language education.

There was also a diverse range of learning outcomes represented in Connolly et al.'s (2012) study including affective and motivational, behavior change, motor skills and numerous others. Thirty-two of the 129 papers dealt with knowledge acquisition/content understanding, the learning outcome of the *Duolingo*® gamification study represented here. Connolly et al.'s (2012) review of the literature did not provide mixed evidence

regarding gamification's correlation to improved learning outcomes. Additional research is needed to improve our understanding of gamification's impact on learning.

Generally positive conclusions about gamification's effect on learning were made by Hamari, Koivisto, and Sarsa (2014) in a recent review of the literature on gamification. From thousands of articles on gamification, Hamari, Koivisto, and Sarsa culled 24 articles, all asking a similar question, *Does gamification work?* (Hamari et al., 2014). While the conclusions were positive about gamification, several shortcomings were identified demonstrating the need for more research. These limitations included: 1) sample sizes that were small (around N=20), 2) validated psychometric instruments were not used, 3) experiments lacked control groups and relied only on user observation, 4) many studies only presented descriptive statistics, 5) timeframes for experiments were in most cases very short, and 6) results lacked in clarity (Hamari et al., 2014). Future studies on gamification are needed and should employ more rigorous research methods (Hamari et al., 2014).

Summary

In the literature review chapter, it has been demonstrated that this study is situated within the theoretical framework of Csikszentmihalyi's (1991) flow theory, Vygotsky's (1978) zone of proximal development with an emphasis on scaffolding, and Bandura's (1977) social cognitive theory with an emphasis on self-efficacy. Additionally, research on gamification, especially within the foreign language classroom, is limited. While there is one study on the effectiveness of *Duolingo*® with users 18 and older in a non-classroom environment, there are no other known studies of *Duolingo's*® effectiveness. Thus this

study provides much needed research on the effectiveness of gamification on foreign

language academic achievement and academic self-efficacy.

CHAPTER THREE: METHODOLOGY

Introduction

This study examined the effects of gamification on elementary students' Spanish language achievement and student academic self-efficacy. Gamification was incorporated into the Spanish language instruction through the use of *Duolingo*®, a free, digital game-based, mobile learning app. The design, the research questions and hypotheses, the participants, and the setting are discussed in this chapter. Following the discussion of these elements is a description of the procedures for the study and an explanation of how the data was analyzed.

Design

This quantitative study examined the effect of gamification through the use of *Duolingo*® on Spanish language achievement and student academic self-efficacy. A quasi-experimental, pretest-posttest non-equivalent control group design was used to compare two groups of students, an experimental and a control group, from a private school in South Florida. This research design is one of the strongest designs for educational research when true random sampling is not feasible (Campbell & Stanley, 1963). It is more appropriate than a correlational design as the aim of the study is not to simply explore the relationship between variables but to attempt to understand cause and effect. This design has also been used in published gamification research with students (Hwang et al., 2012; Kablan, 2010). Reichardt (2009) also explains that relying solely on experimental research will not result in a body of research as credible as that that could be obtained by an accumulation of findings from a variety of designs that included both

experimental and quasi-experimental research. This study added to the current limited accumulation of findings on the topic.

In this study, participants were students already grouped into distinct elementary school classrooms, and it was not feasible to randomly assign students to the experimental and control groups. Students' classes were assigned to the treatment and control groups. Students in the control group received their regularly scheduled English Level 1 (L1)/Spanish Level 2 (L2) class learning activities. Students in the experimental group had *Duolingo*® incorporated into their English/Spanish class. The duration of the study was 12 weeks. At the initiation of the study, students took pretests to assess prior Spanish language achievement and prior academic self-efficacy. The posttests were taken at the conclusion of the twelve-week study to measure Spanish language achievement and academic self-efficacy.

While the quasi-experimental design is rigorous (Campbell & Stanley, 1963; Reichardt, 2009), threats to internal validity inherent in the chosen design have been considered and controls were put in place.

The threat of history is of concern because during the course of the study the students could encounter educational content, teaching or other factors that could influence their Spanish achievement or academic self-efficacy. The threat of history was controlled for by use of a control group and a pretest and posttest (Rovai, Baker, & Ponton, 2013). Since all students are at the same school, and in the same grade level, they are likely to have similar concurrent histories (same school experience). In addition, the length of the study was 12 weeks, and this relatively short amount of time also reduced the likelihood of a history threat while still being a length of time that has been

shown to be sufficient for various gamification studies (Carr, 2012; Kablan, 2010; Zhi-Hong et al., 2012).

Treatment diffusion and the John Henry effect were concerns since the quasi-experiment was conducted at one site thus it was possible for the participants in the treatment group to talk to those in the control group about how they were using Duolingo®. Since the app is free, and many students have devices of some sort, they could potentially acquire the app on their own. This was controlled for by taking steps to not bring attention to the different methods being used in the other classes and by keeping experimenters unaware of the research specifics (Rovai et al., 2013).

Selection was a concern since the use of random selection was not ethically possible due to the fact that the students were already in distinct class groupings that could not be broken up for the sake of the study (Rovai et al., 2013). To control for this, a pretest was conducted to take into account the potential preexisting differences in the groups, the level of foreign language achievement that the students possessed at the onset of the study and the students' academic self-efficacy at the onset of the study. The site school also had measures in place to provide homogenous grouping of students between classes in terms of sex, behavior, and academic achievement which is important as these have been associated with self-efficacy and foreign language achievement (Bacon, 1992; Busch, 1995; Lent, Brown, & Larkin, 1984; Onwuegbuzie, Bailey, & Daley, 2000). A review of the distribution of sex and race showed that the site school's method for grouping students was effective at creating homogenous groups.

While the addition of the pretest helped to control for the selection threat to validity, it introduced the testing threat, which was controlled for by the use of a control

group (Rovai et al., 2013). The control group would experience a similar effect from having been pretested so it is hoped that these effects cancelled each other out (Rovai et al., 2013).

Treatment fidelity and the instrumentation threat to validity were also concerns. Therefore, scripts were provided to the teacher to help ensure that the testing delivery was the same across groups, for both the teacher made test and the self-efficacy instrument (Gall, Gall, & Borg, 2007). Also, the researcher carefully reviewed with the teacher the expectations for the control and treatment group testing and intervention and asked questions to ensure that the teacher understood and followed through on the expectations for how the study was to be conducted (Gall et al., 2007).

Questions and Hypotheses

The research questions for this study are**:**

Research Question 1: Is there a statistically significant difference in the Spanish language achievement of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous Spanish language achievement?

Research Question 2: Is there a statistically significant difference in the academic self-efficacy of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous academic self-efficacy?

The following are the research hypotheses:

H_1: There is statistically significant difference in the Spanish language achievement of elementary students who are taught with gamification (i.e. *Duolingo*®

learning) versus those who are taught with a traditional instructional approach while controlling for previous Spanish language achievement.

H_2: There is a statistically significant difference in the academic self-efficacy of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous academic self-efficacy.

Alternatively, the following are the null hypotheses:

H_{o1}: There is no statistically significant difference in the Spanish language achievement of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous Spanish language achievement.

H_{o2}: There is no statistically significant difference in the academic self-efficacy of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous academic self-efficacy.

Participants

The participants in the study were a convenience sample of third and fourth grade students from a private school in South Florida. The school was chosen due to its proximity to the researcher and the superintendent's willingness for the school to be involved in the research. All students in the third and fourth grade (N=167) at the site school participated in the study. The school has five third grade classes and six fourth grade classes. Two third grade and three fourth grade classes served as the treatment group, and the other three third grade and the other three fourth grade classes served as

the control group. This number of students (N=167) easily surpassed the minimum

number recommended as standard research texts recommend 15 participants in each

group to be compared in this type of study (Gall, Gall & Borg, 2007).

The students were all involved in weekly Spanish as a foreign language classes.

The students ranged in age from seven to ten years old due to the students being in the

third and fourth grade. Seventy-seven of the students in the study were boys, and 90 of

the students were girls. Demographic data will be discussed more fully in chapter four.

Setting

The study was conducted at a regionally accredited, private, religious K-12 school

in South Florida. The site was used for the study because the location allowed for greater

feasibility in conducting the study, training the teacher, and following up on the study.

Another key factor was the superintendent of the school was open to this research being

conducted at the school. The teacher at the site school has four and one-half years of

experience teaching Spanish to elementary students and has taught at this school for four

and one-half years. Prior to her current position she taught English as a Second

Language (ESL) for 10 years. She has a master's degree in education and she holds a

Florida State Certification for Elementary Education K to 6th grade and Social Studies for

6th to 12th grade. She also holds teacher certification from the Association of Christian

Schools International (ACSI).

Site School

The academic standard of admission at the site school requires prospective

students to achieve Florida Comprehensive Assessment Test (FCAT) scores of 3–5 in

Reading, Math, and Language. Also, a minimum achievement of the 40th national

percentile in each of the following areas: Total Reading, Total Math, Total Language, and Complete Battery, as indicated by their most recent achievement tests such as the Terra Nova Achievement Test, the Iowa Achievement Test, or another nationally normed standardized achievement test. Students achieving below the academic standards of admissions may be enrolled at the discretion of the school's administration (Academy, 2015). A number of students with scores below the listed minimums are enrolled under this discretion as administrators see other indicators that give them reason to believe that the student's needs could, in fact, be met by the school. Many students also enter at the preschool and kindergarten level where there is no academic testing for admission and later, as they reach higher elementary grades these students may score below the 40th percentile on one or more of the subscales mentioned above. These students are allowed to continue at the school in most cases unless the school determines that the school is not able to adequately meet the student's needs (P. Walker, personal communication, Oct. 14, 2014).

The site school attempts to develop reasonably homogenous classes by taking into account certain criteria and then assigning students to various classes so as to distribute these criteria fairly evenly. The criteria include: (1) sex, (2) academic level (gifted, high achieving, average achieving, low achieving), (3) behavior, (4) parental make-up (one or two parent home), (5) ESE accommodations (participant in child study, learning enrichment lab participant, tutoring), (6) level of assistance required (full time unique aide, part time unique aide, speech therapy, other assistance), (7) race, (8) reading level, and (9) math level. Teachers are also given the opportunity to share information not captured in the above criteria that they believe could be helpful in placing a child (e.g.:

parent request for a particular teacher or a teacher with certain characteristics, request to not be placed in the same class as another child). See Appendix X: Site School Class Placement Tracking.

Spanish Curriculum

The Foreign Language in Elementary School (FLES) program at the site school consists of a once-per-week Spanish class. Each week the PreK-3 students have a 20-minute class, PreK-4 students have a 30-minute class and kindergarten through fifth grade have a 40-minute class. The FLES teachers at the site school have developed their own curriculum that is built around thematic units. There are 10 units per year on a two-year rotating schedule. The units include themes such as body parts, family, rooms of the house, verbs relating to each room, food, clothing, classroom items, school subjects, telling time, and additional verbs. The students are all taught a Bible verse in Spanish each month as well.

In addition to the vocabulary and grammar of the thematic units, students are also introduced to other elements such as interrogatives, greetings, numbers, colors, weather, days, months, and other common elements as they arise in class discussions and instruction of the thematic units.

The teacher uses conversation practice, choral response and the acting out of skits and simple stories. The teacher explained that intertwined in the units are other vocabulary and conversational structures that she anticipated the students would learn along with the thematic vocabulary. The program includes instruction in historical and cultural elements as well.

What has been heretofore described is the FLES program at the site school, and

this is what students in the school have been receiving each year and what they have

received the year the study was conducted as well. This program was adjusted for the

duration of the study as described in *Procedures*.

Instrumentation

Dependent Variable #1: Spanish Language Achievement

The Spanish Language Achievement Test (see Appendix B) was used to measure

students' Spanish language achievement. A nationally normed standardized Spanish test,

the STAMP was also explored but through discussions with the creators of the tests it

was determined that these tests would likely lack the sensitivity to show significant

differences between elementary students whose Spanish class only occurred once per

week for 40 minutes.

In order to have a test that would have strong content and face validity and ensure

good construct validity in the study, this author worked with the FLES teacher at the site

school to develop a traditional curriculum and a test that was congruent with the

information covered in the first 20 lessons of the *Duolingo*® app. The test was designed

in consultation with several elementary Spanish teachers and specifically created to

assess students who were in a part time, upper elementary, English L1/Spanish L2

program.

The test included vocabulary, phrases, and grammar and all three of these were in

both a Spanish to English as well as an English to Spanish format. The instrument is a

50-question Scantron test, each item was worth one point for a total possible score of 50.

The test covered 20 levels of *Duolingo*® as that is in line with what we predicted would

be the highest level that our higher achieving students would be able to reach during the

course of the study. The test has fifteen low-level questions, twenty middle-level questions, and fifteen high-level questions. Too many low-level questions would likely result in a failure to assess the extent to which some high achievers reach. Too many high-level questions would likely result in many questions missed by all students thus failing to help distinguish the differences between the different learners. The following represent groupings of types of questions and each of these could also serve as a subscale:

- Vocabulary – Spanish to English – 10 questions

- Vocabulary – English to Spanish – 10 questions

- Phrases – Spanish to English – 10 questions

- Phrases – English to Spanish – 10 questions

- Grammar – Spanish to English – 5 questions

- Grammar – English to Spanish – 5 questions

The intent of the test is to determine the students' grasp of the vocabulary, phrases and grammar that were taught during the course of the study. Due to the nature of the research, the vocabulary, phrases and grammar have been built around material covered in the first 60 lessons of *Duolingo*®. Also, due to the adaptive learning software and the purposeful review of material until it is shown to be grasped by the student with a certain level of accuracy, different students advanced at different paces so some students did not review higher-level concepts that appeared on the test. The same goes for students in the control group. The control group did not reach the highest lessons covered by the test. This is not a weakness in design due to the fact that the purpose of the test is two-fold, to determine the level to which students can recall vocabulary, phrases and grammar that

they have reviewed and to see which students learned a greater breadth of material due to being able to move at a faster pace based on the teaching method—traditional classroom environment versus gamified classroom environment.

Students can score between zero and 50, with each question counting one point. The following subscales could be created from this data: vocabulary subscale, phrases subscale, and grammar subscale. Each of those subscales as well as the entire test could be further divided into Spanish to English subscales and English to Spanish subscales.

Reliability. Cronbach's alpha was used to determine internal reliability. The preference was for the score for the Cronbach's alpha to meet or exceed .70, which is considered high reliability (Rovai et al., 2013). A Cronbach's alpha was calculated on these 50 items to examine reliability. The Cronbach's alpha reliability coefficient for the pre-test was .930, and the Cronbach's alpha reliability coefficient for the post-test scale was .919. The results for both the pre-test and the post-test scales suggest that the items have relatively high internal consistency.

Validity. After the development of the test, an expert panel reviewed the test to establish face and content validity. The test and corresponding validation questions used to evaluate the appropriateness of the test (see Appendix A), were shared with three expert reviewers. The validation questions have been adapted from Weir's (2005) Language Testing and Validation: An Evidence-based Approach.

(1) The test proctor script clearly states what the student is required to do.

(2) Questions 1-10 are well written Spanish to English vocabulary questions.

(3) Questions 11-20 are well written English to Spanish vocabulary questions.

(4) Questions 21-30 are well written Spanish to English phrase/sentence questions.

(5) Questions 31-40 are well written English to Spanish phrase/sentence questions.

(6) Questions 41-45 are well-written Spanish grammar questions.

(7) Questions 46-50 are well written English to Spanish grammar questions.

(8) Fifty minutes for the test is a sufficient amount of time for the students to demonstrate their understanding of vocabulary, grammar, and phrases (recognizing the fact that the test does not count for a grade).

(9) The criteria for getting an answer marked as correct is clear to the student.

(10) The order of the questions/sections is appropriate for the test, or the order of questions/sections is not a significant factor, and not in need of adjustment.

(11) Having written instructions to prepare for each section—A, B, C, D, E, and F—is helpful.

(12) The instructions for the tasks only contain words that are suitable for third and fourth grade students' level of language ability.

(13) The instructions for the tasks use simple, easy to understand sentence structures.

An expert panel used these questions to examine the test to ensure that it measures the content it is intended to measure, that the test script is appropriate, that language used on the test is clear and appropriate for third and fourth grade students (Weir, 2005).

Each reviewer was required to meet, at minimum, the following criteria: hold a Master's degree in Spanish and/or education, and have at least 3 years' experience teaching Spanish as a foreign language. Reviewers were given one week to review the test and its contents. Reviewers were encouraged to make comments and annotations about the content and face validity of each question and each section of the test. The expert panel recommended adjustments to 12 of the 30 multiple-choice questions.

Recommended adjustments included slight rewording of the question to make the correct answer more clear; adjusting some of the wrong answer choices to make them grammatically correct; changing a word from being capitalized to not capitalized; adding the article to a group of answer choices; changing two answer choices to agree in sex with the antecedent as did the other answer choices. All of these recommended adjustments were made to the test.

Two other recommendations required further discussion between the researcher and the expert panel. The panel recommended having fewer choices in the word bank and less answer choices for the multiple-choice questions. After receiving these recommendations, the researcher contacted the expert panel to discuss the rationale behind the higher number of answer choices.

Selected response assessments, such as multiple-choice questions and word banks, have the benefit of objectivity and more efficient scoring. They best lend themselves to the understanding of the receptive foreign language skills (Brown & Hudson, 1998). Constructed response assessments, such as fill in the blank questions can better assess the productive foreign language skills of students. However, these questions can be more subjective in scoring due to partially right answers as well as other answers that contextually make sense even though they are not what the test creator intended as the correct answer (Brown, 1980; Brown & Hudson, 1998). In designing test questions it is desirable to reduce the guessing factor, the chance that the test taker can get the answer correct by simply guessing (Brown & Hudson, 1998). It is also desirable to reduce subjectivity in grading. For the test at hand, objectivity in grading was accomplished by the use of word bank and multiple-choice questions. A reduction in the guessing factor

was obtained by providing a 30-answer word bank for a set of 10 questions and by providing six possible answers for each multiple-choice question. Upon consideration of this rationale, the expert panel agreed that it was reasonable to keep the larger number of word bank options and the six possible choices for each multiple-choice question.

Dependent Variable #2: Academic Self-Efficacy

The second covariate and the second dependent variable, academic self-efficacy, was defined as "students' perceptions of their confidence to do their classwork" (Midgley et al., 2000, p. 19). The Pattern of Adaptive Learning Scales' (PALS) Academic Efficacy subscale (Midgley et al., 2000) was used to measure academic self-efficacy. The creators indicate that each of the subscales of PALS can be used independently, and published research has used the Academic Efficacy scale independently (Shin, 2011).

PALS is a five-item instrument, using Likert scale choices. The following are examples of questions: "I'm certain I can master the skills taught in class this year," and, "I'm certain I can figure out how to do the most difficult class work" (Midgley et al., 2000, p. 19). A group of researchers developed, and over time refined, PALS using goal orientation theory to examine the relation between the learning environment and students' motivation, affect, and behavior (Midgley et al., 2000). Students can score between 5 and 25 based on a 5-point Likert-type scale for each question.

Midgley et al. (2000) explain that the scales were designed for use with elementary students and have been used and tested for validity and reliability with elementary students. The instrument has been used in coeducational elementary schools (Midgley et al., 2000) like the site school. The questions of the instrument indicate that it conceptualizes the construct of academic self-efficacy in the same way that I do.

The academic efficacy subscale has been validated through confirmatory factor analysis and has a Cronbach's alpha of .78 (Midgley et al., 2000). This exceeds the minimum standard (.70) for high reliability (Rovai et al., 2013). The test is free to use, the developers of the instrument have been cited (Midgley et al., 2000). The PALS was given as a paper and pencil test. The pretest and posttest used identical questions with the questions put in a different order for the posttest.

Procedures

Before initiating the study, I submitted the dissertation proposal packet and obtained the necessary approvals from the dissertation committee chair and from the Institutional Review Board (IRB). The superintendent of the proposed site school was contacted and gave permission for the study to be conducted at the school.

The researcher met with the Spanish teacher to develop plans for when and how to best deliver the Spanish language achievement pretest and the self-efficacy pretest. The researcher worked with the superintendent's designee to gather relevant demographic data on the participants in the study. For the treatment group, I also worked with the superintendent's designee to determine what devices (e.g.: tablets, PCs) were available for the treatment group to use during the study. It was also determined what steps needed to be taken to ensure that every student in the treatment group had access to a device.

I met with the Spanish language teacher at the site school to collaborate on how best to handle the details of the study including issues such as how to assist students in the treatment group who have questions about how to use the *Duolingo*® software. The teacher at the site school has spent many hours using *Duolingo*® and has used the

program with fifth grade students at the school. She was well-prepared to train the third and fourth grade students in how to use the program.

Due to the fact that most elementary schools in America do not offer a foreign language course (Pufahl & Rhodes, 2011), it is not surprising that there is no standard for what a third and fourth grade student is expected to know relative to Spanish language study. In addition to this lack of grade specific standards, this researcher found through communication with numerous elementary Spanish teachers and state and regional foreign language groups, that elementary Spanish instruction can vary much more widely than reading or math instruction. For example, one fourth grade Spanish teacher may choose to have her students learn the Spanish words for members of the family, places in a neighborhood and colors, while a fourth grade Spanish teacher in the school across the street may choose to have his students learn colors, numbers and parts of the body. This creates difficulties for instrumentation design because a test designed around one group of topics could show one school's Spanish class to be far superior to another, when the difference in scores is actually the result a problem with content validity or the alignment of content on the test with what the students have been taught.

This created a problem for this study. Preliminary plans included having the FLES teacher at the site school to continue with her regular program while the treatment group would begin to solely use *Duolingo*® as their method of study and instruction. This led to a search for a testing instrument that could appropriately and fairly assess the students at the beginning and end of the study. However, the problem mentioned above with content validity arose. Not only were the students in the *Duolingo*® group learning via a different method, they would also be learning different content. This could lead to

an increased likelihood of a false acceptance or a false rejection of the null hypothesis, depending upon whether the testing instrument was more in line with the content of the control group instruction or with that of the treatment group instruction.

In an attempt to resolve this issue, the researcher and the FLES teacher agreed that she would adjust her content for the duration of the study so as to make it best align with the content taught in the *Duolingo*® app. This way the content would be the same, and only the method of instructional delivery would differ. Likewise, the pretest/posttest instrument was made to align with the *Duolingo*® content. The pretest and posttest were given in the Spanish classroom during the students' regularly scheduled weekly Spanish class. The test was a pencil and paper test with 50 multiple choice and matching questions.

Experimental Group Setting

Instruction for the experimental group was through *Duolingo*®, a free app that works on mobile devices and PC's. It was designed by Von Ahn who is a computer science professor from Carnegie Mellon University (Simonite, 2013). The app is designed with gamification elements that users of the software have found to be compelling (Giles, 2012). In their once per week Spanish class, the students in the treatment classes were provided with iPads loaded with *Duolingo*®.

As part of their standard procedure, the site school provided all teachers with an iPad and provided training on how to use it. The researcher guided the Spanish language teacher to set up a *Duolingo*® account (see Figure 1) on her school provided iPad. The teacher spent many hours using the app and completed each lesson tracking the vocabulary and grammar that were taught at each level of the app through lesson 60.

Students in the experimental group were each given an iPad that they were able to use for the full duration of their weekly Spanish class. Students were introduced to the iPads in the weeks prior to the initiation of the study so that lack of proficiency with the device would not hinder the students' use of the *Duolingo*® app. The Spanish language teacher guided the students through the setting up of a *Duolingo*® account.

Students were guided to begin at *Basics 1*, the introductory level (see Figure 2). *Duolingo*® uses adaptive learning technology to make more advanced students quickly to the point of Spanish that they have already mastered. At that point, they encounter new material and be appropriately challenged. Fully bilingual students were guided to select *Placement Test* from the *Duolingo*® home screen. Here they were given a test that allowed them to totally bypass the introductory training levels of *Duolingo*® and to advance to a challenge level that is appropriate to their level of Spanish language knowledge.
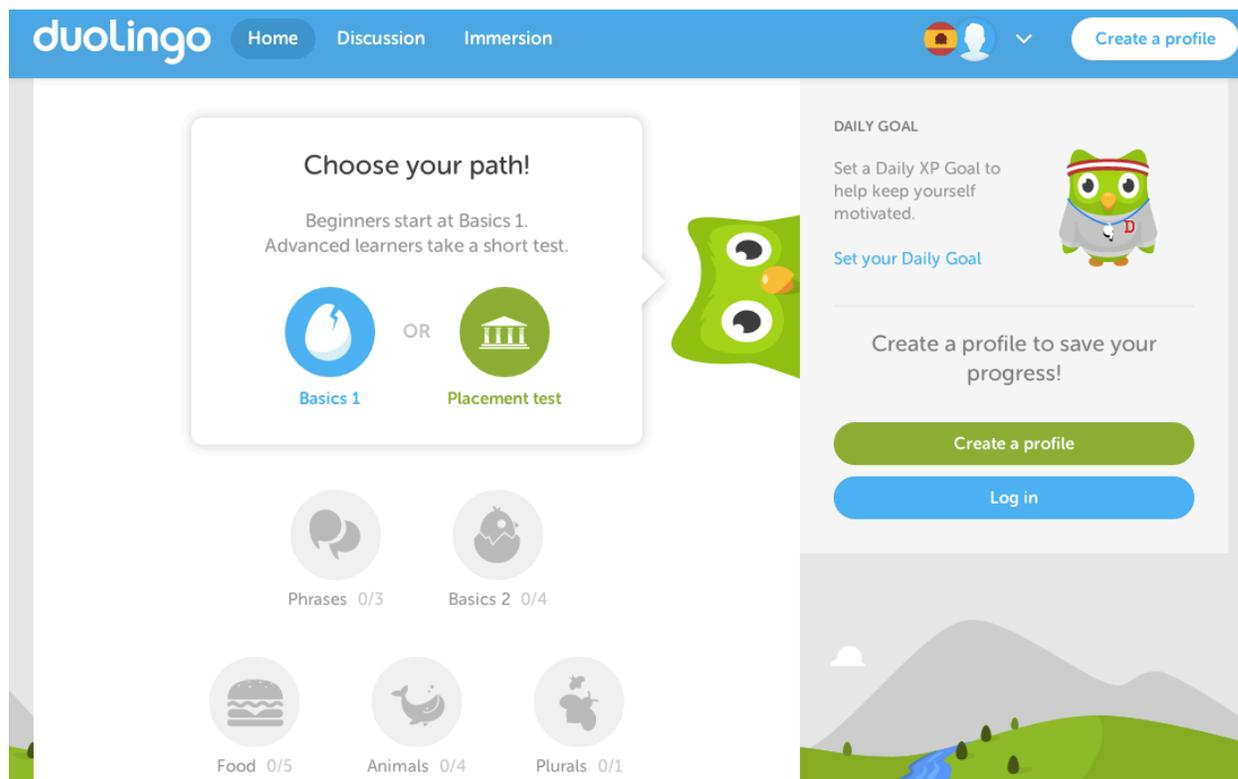
Figure 2. *Duolingo*® welcome page.

Students were allowed to connect with the teacher and other student *Duolingo*®

users by utilizing the "friends" feature (see Figure 3). This feature allows users to see

each other's progress in the app and can be useful for challenging each other forward.
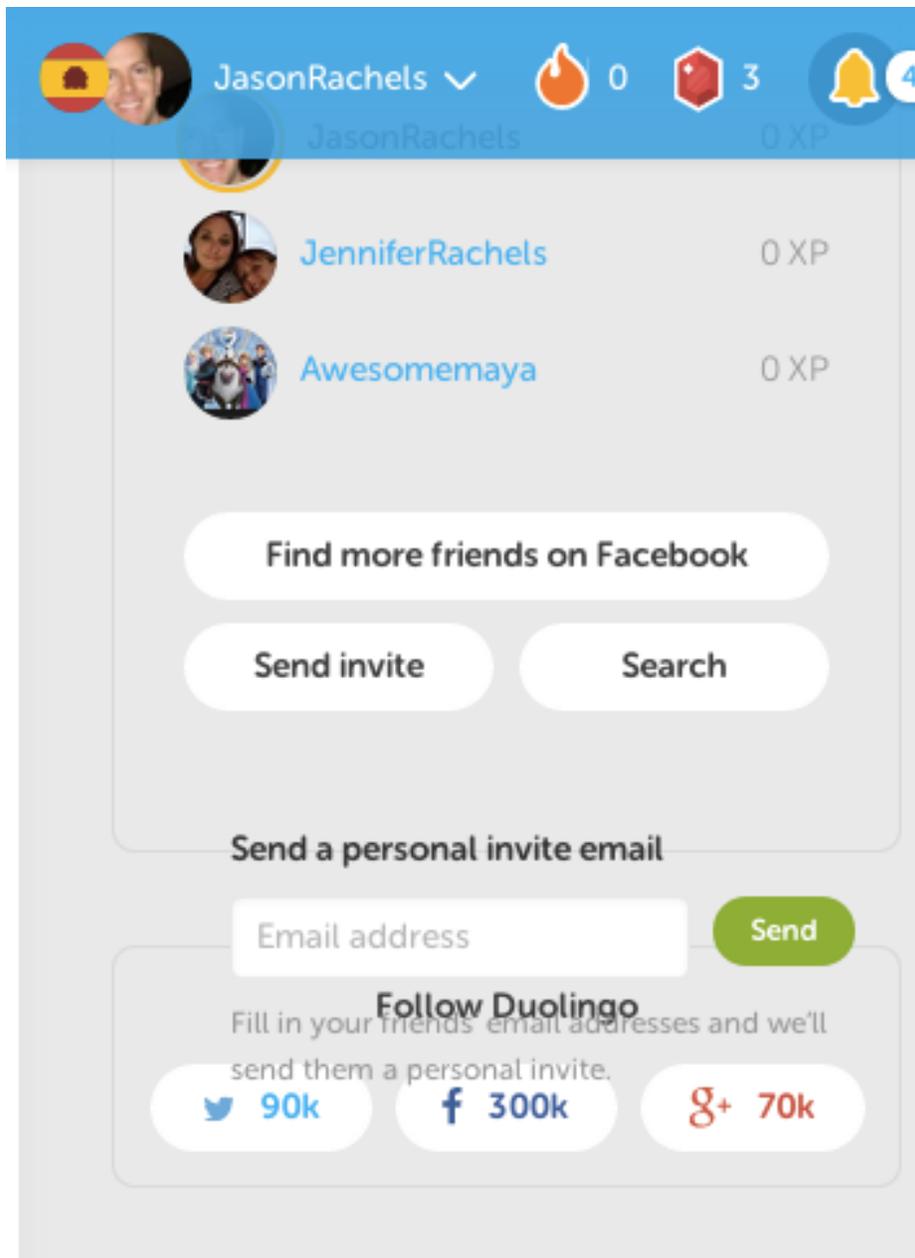
Figure 3. Zoom in of screenshot showing how to add "friends" to the learning experience.

   The teacher guided the students to use their once a week, 40-minute class period to independently progress as far as they were able in the *Duolingo*® app for the 12 week period. Students worked through lessons (see Figure 4) translating from English to Spanish and from Spanish to English (see Figure 5). The teacher monitored the students to ensure that they worked independently.

Figure 4. Screenshot showing an overview of a unit of *Duolingo*®.
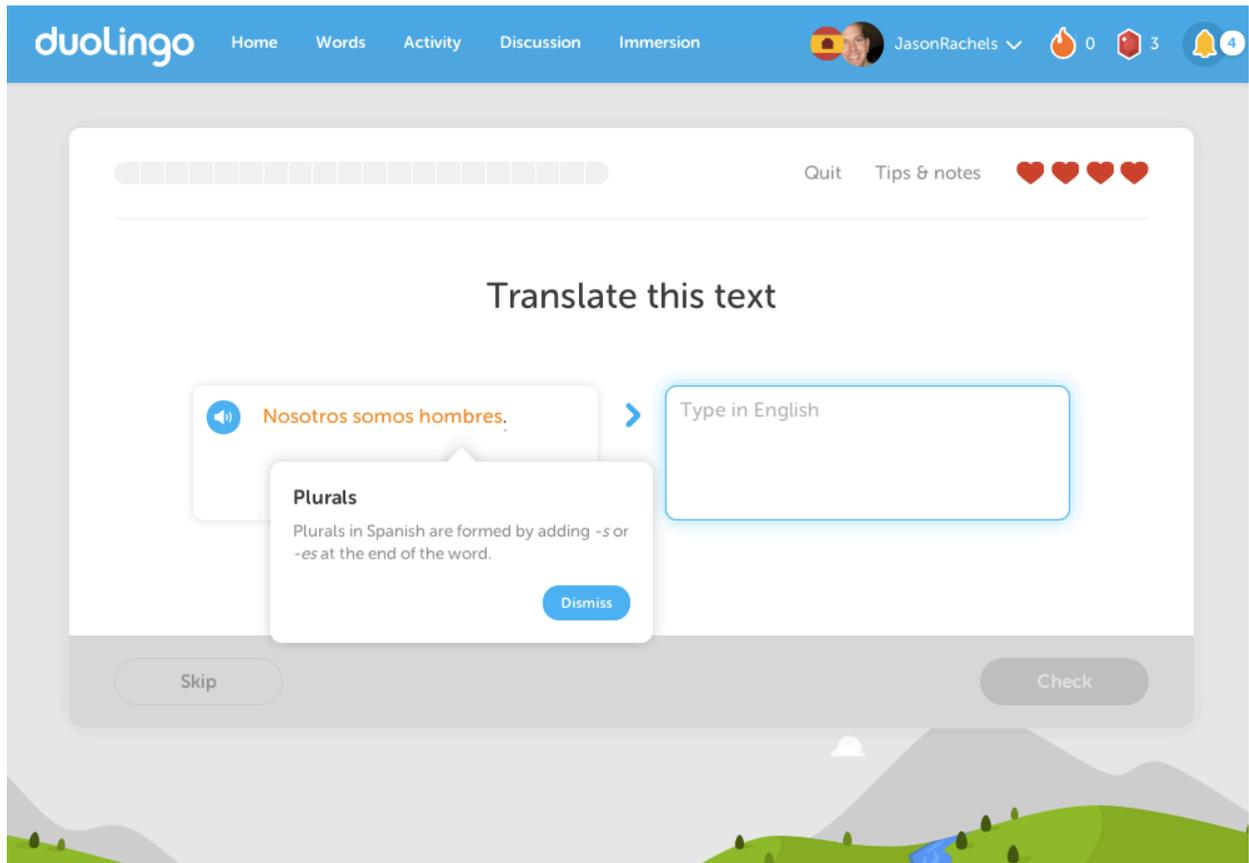
Figure 5. Screenshot of part of an exercise in *Duolingo*®.

Instruction embedded in the exercises (see Figure 6) as well as *Duolingo*'s ®

displaying of the correct answer when a student makes an error (see Figure 7) is intended

to facilitate students' ability to work independently.

Figure 6. Screenshot showing how instruction is embedded within the exercises.
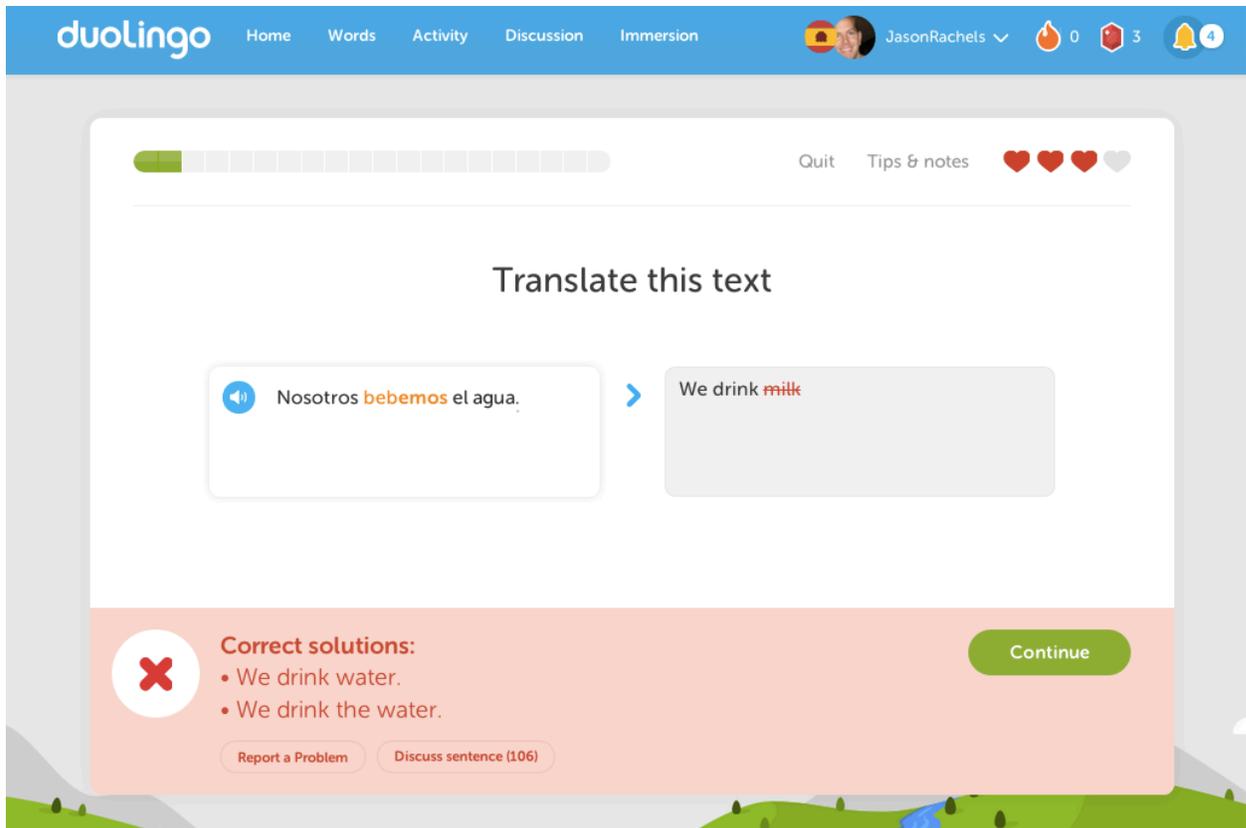
Figure 7. Screenshot showing *Duolingo*® response when the student makes an error.

Navigation through *Duolingo*® is not strictly linear. The user has some ability to choose what they want to do next; options such as redo a lesson, begin a new lesson, attempt to test out of lesson are featured in the program (see Figure 8).
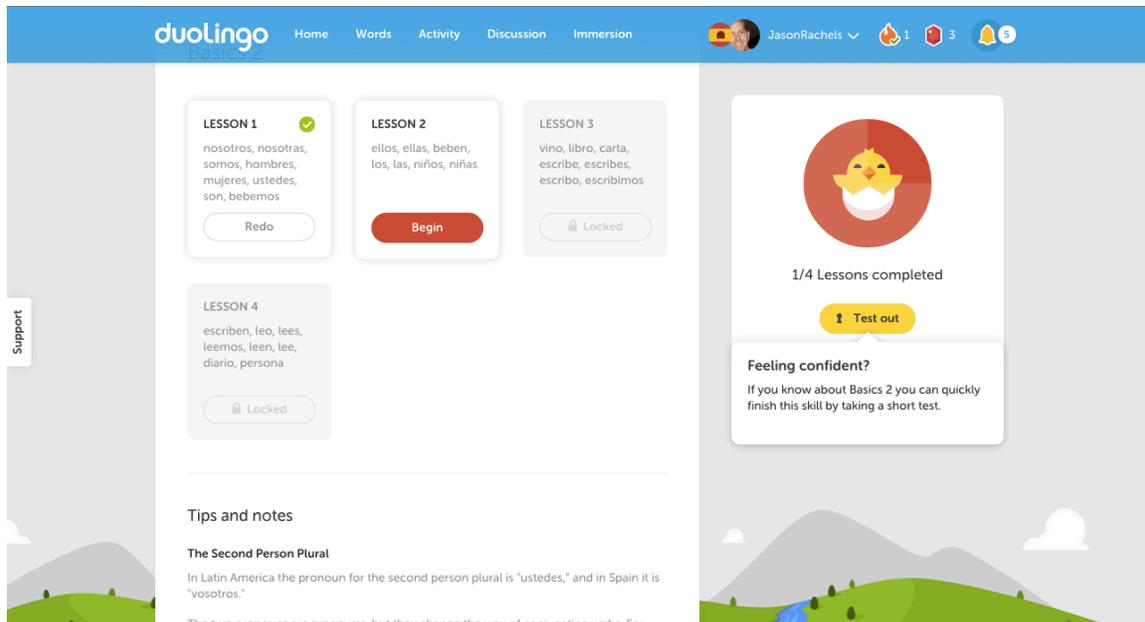
Figure 8. Showing lessons in *Duolingo*®.

After being taught various vocabulary and grammar concepts, users are asked to translate

from the L2 to the L1 (see Figure 9).
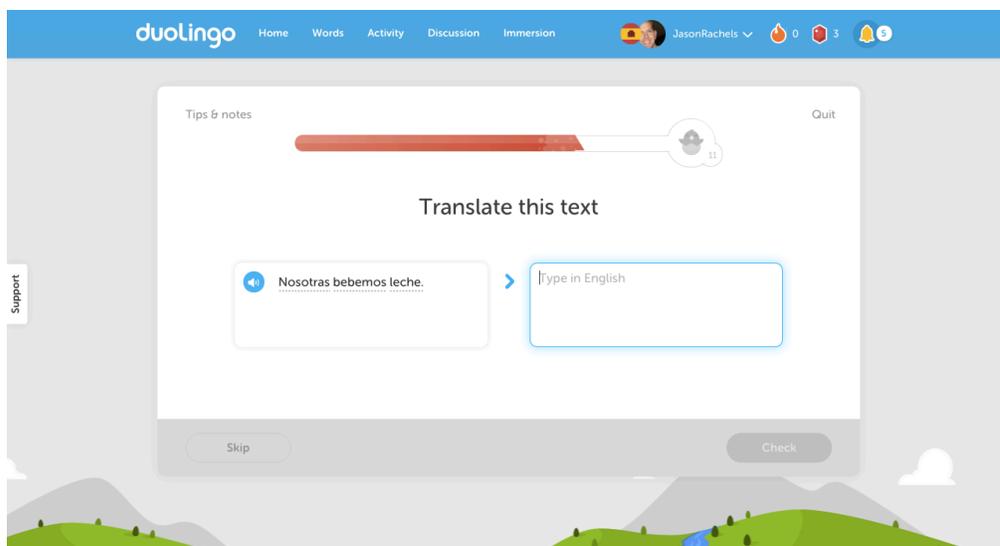
Figure 9. User being asked to translate from L2 to L1.

If the user clicks on a word that he or she is being asked to translate, additional

information about that word is provided. When the user is first learning the word, the

actual meaning of the word may be given (see Figure 10).
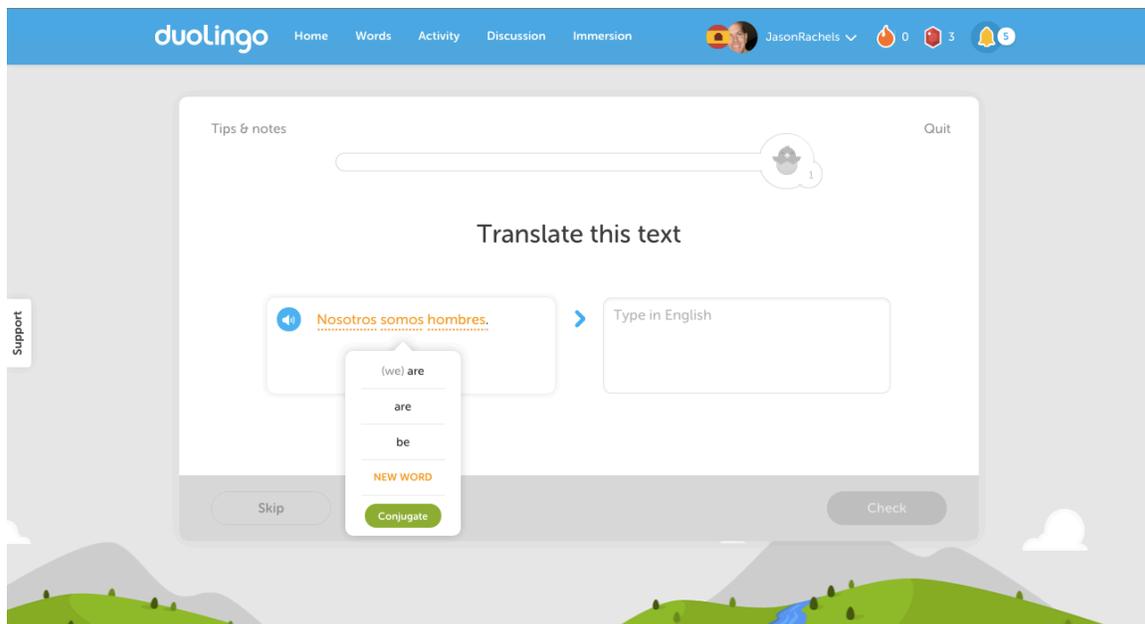
Figure 10. Meaning of a word being displayed when the user selects the word.

At higher levels, less information or different information is provided to the user

regarding the word he or she selects (see Figures 11 and 12).
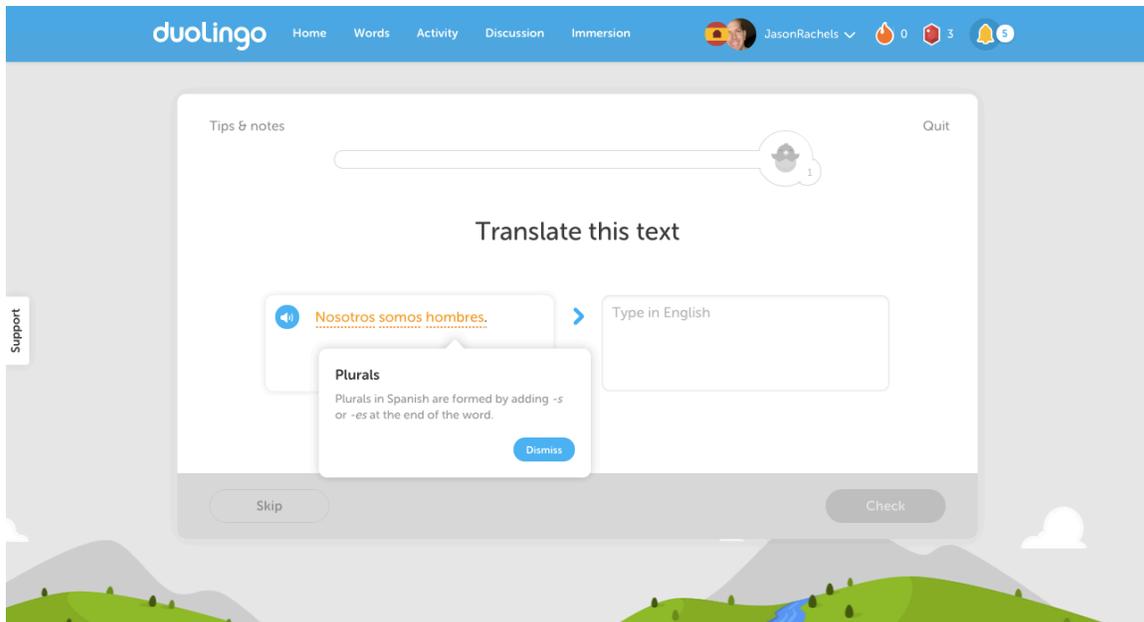
Figure 11. User selecting a word he is being asked to translate – plurals example.
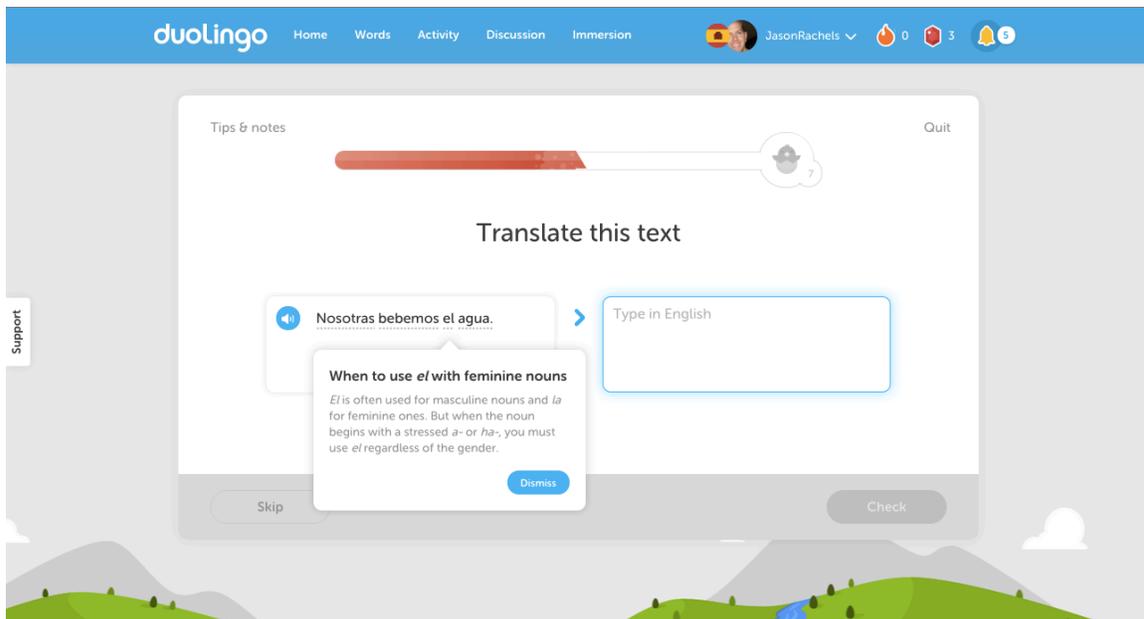
Figure 12. User selecting a word he is asked to translate - article example.

If the user gets the correct answer, the program notifies user that the answer is correct.

Then the progress bar at the top of the page progresses, so the user is able to continue to

another challenge (see Figure 13).
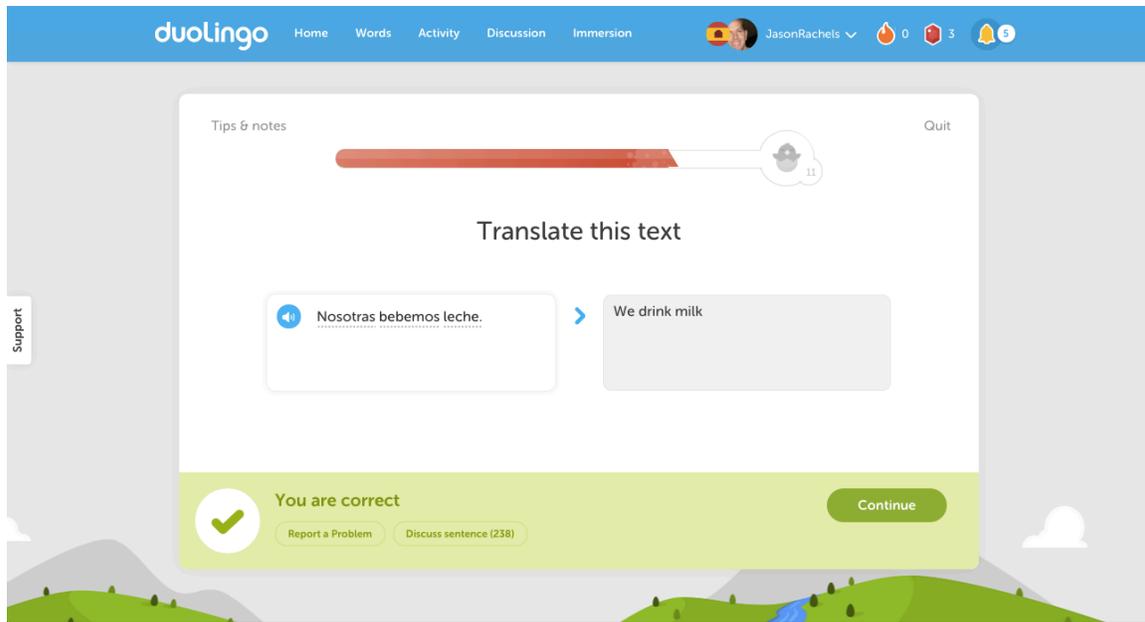
Figure 13. Correct answer display on *Duolingo*®.

Users are given a phrase in the L2 and asked to type it out. Clicking on a speaker icon causes *Duolingo*® to repeat the phrase at regular speed while clicking on the turtle icon causes the phrase to be read at a slower speed (see Figure 14).
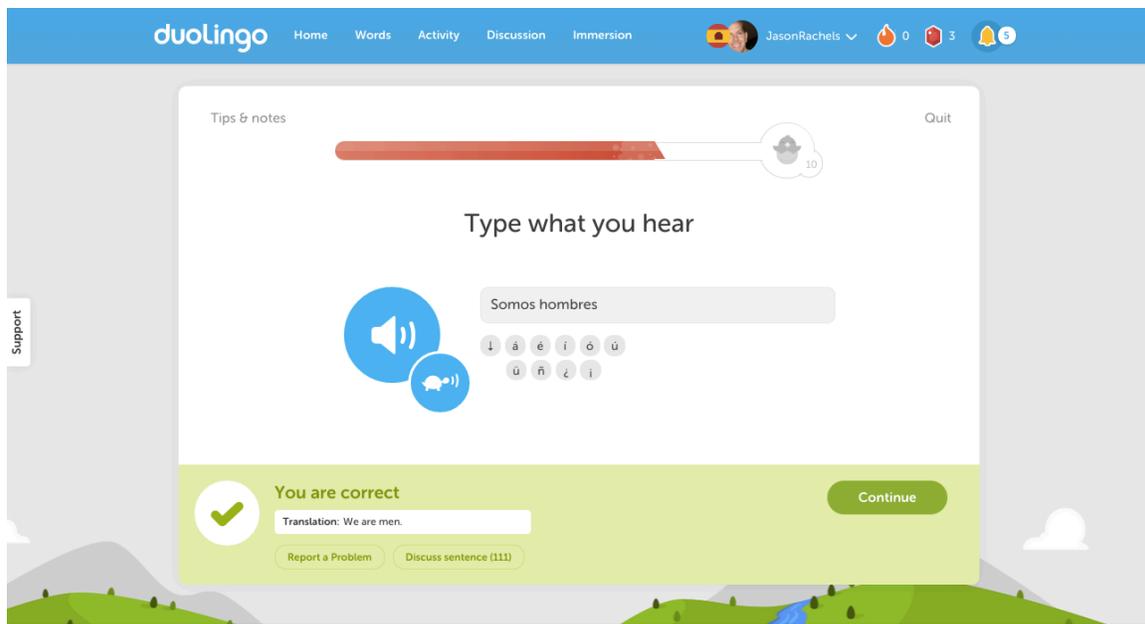
Figure 14. Speaker and turtle icons on *Duolingo*®.

Sometimes users are asked to select the most appropriate word missing from an L2

sentence (see Figures 15 and 16).
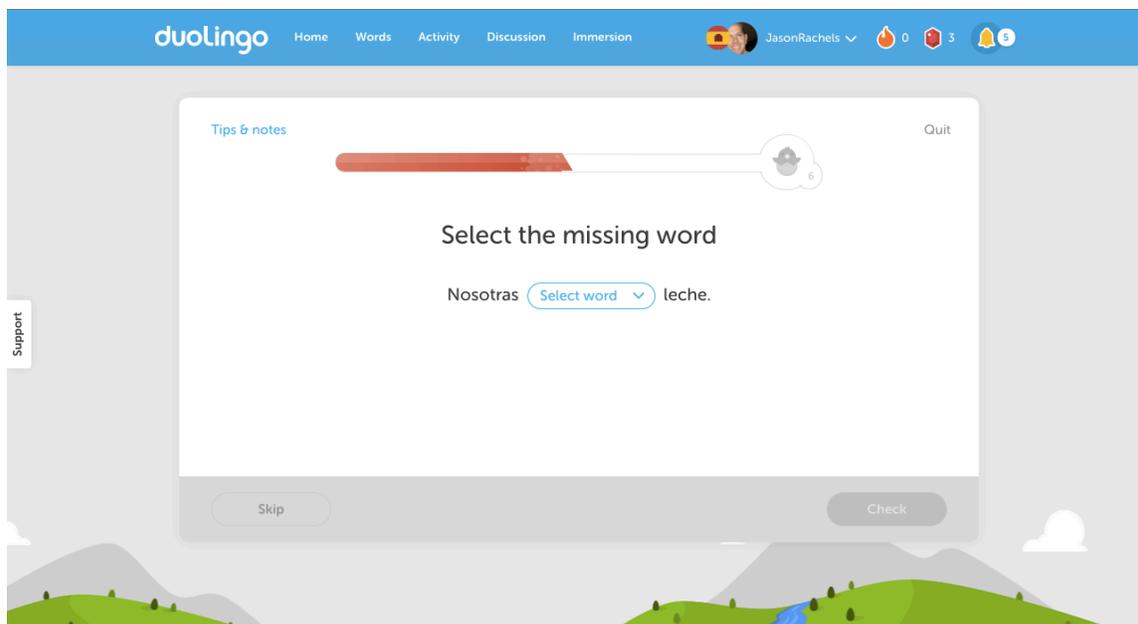
Figure 15. *Duolingo*® user asked to select the missing word.
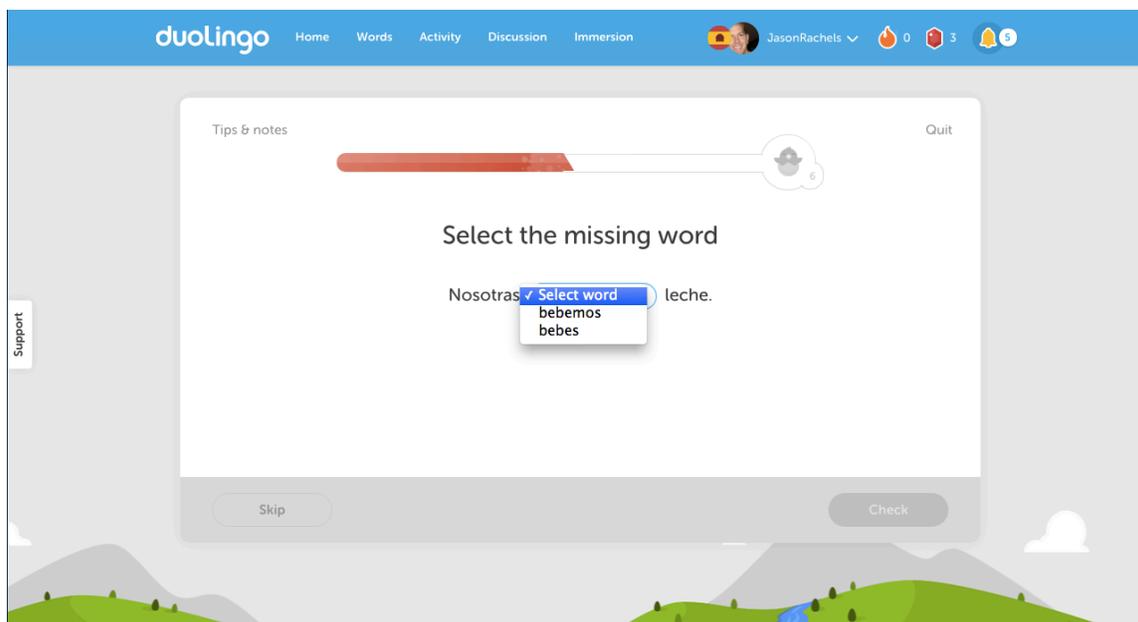
Figure 16. Possible missing word choices for user to select.

Users also need to speak the correct translation of a given phrase into the microphone of their device (see Figure 17).
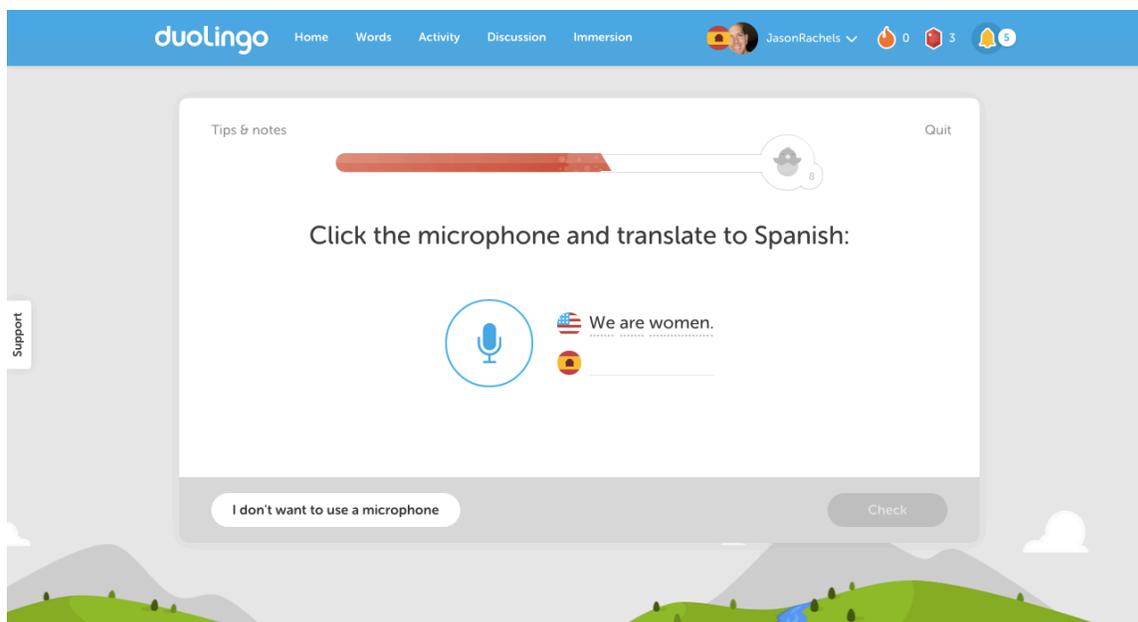
Figure 17. *Duolingo*® user asked to speak the correct translation of a phrase.

If the user is correct, the translation is then written out on the screen (see Figure 13).
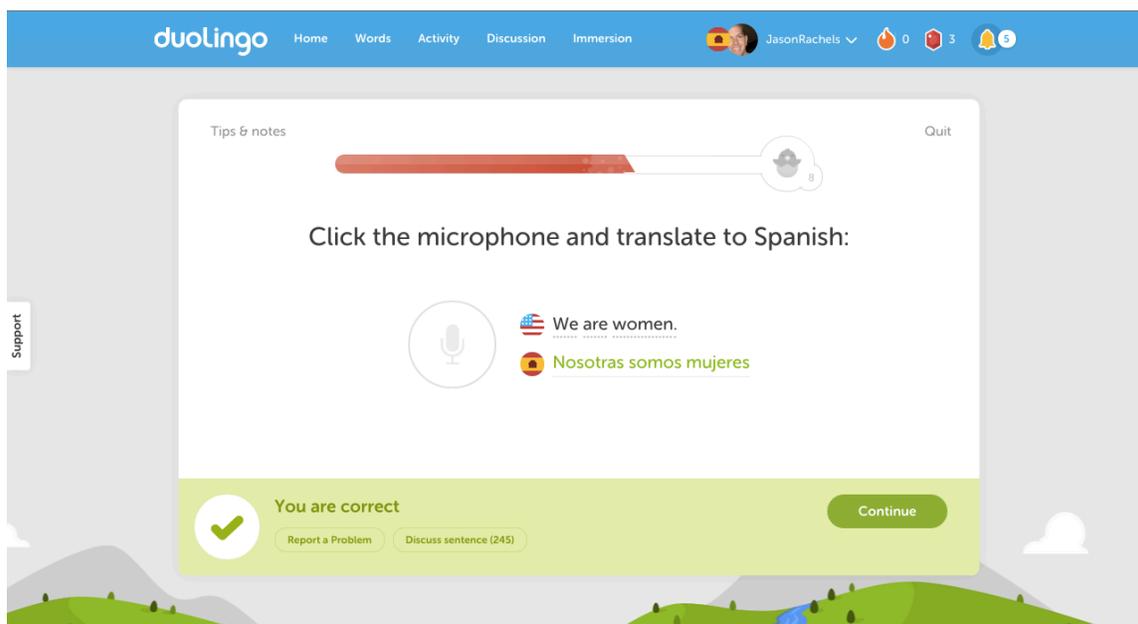
Figure 18. Correct translation shown on screen in *Duolingo*®.

Users may also be asked to choose the correct answer from multiple translation choices

(see Figure 14).
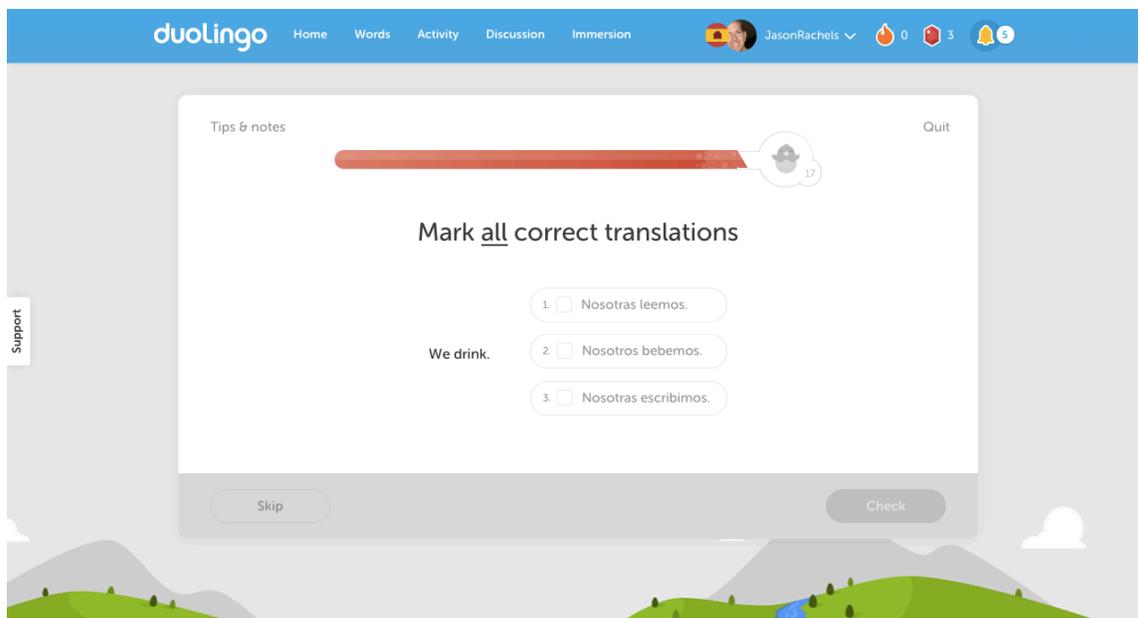
Figure 19. *Duolingo*® user asked to choose correct answer from multiple translations.

Users receive XP (experience points) for completing lessons (see Figure 15). Achieving various levels of XP moves the user to a higher level in the program.
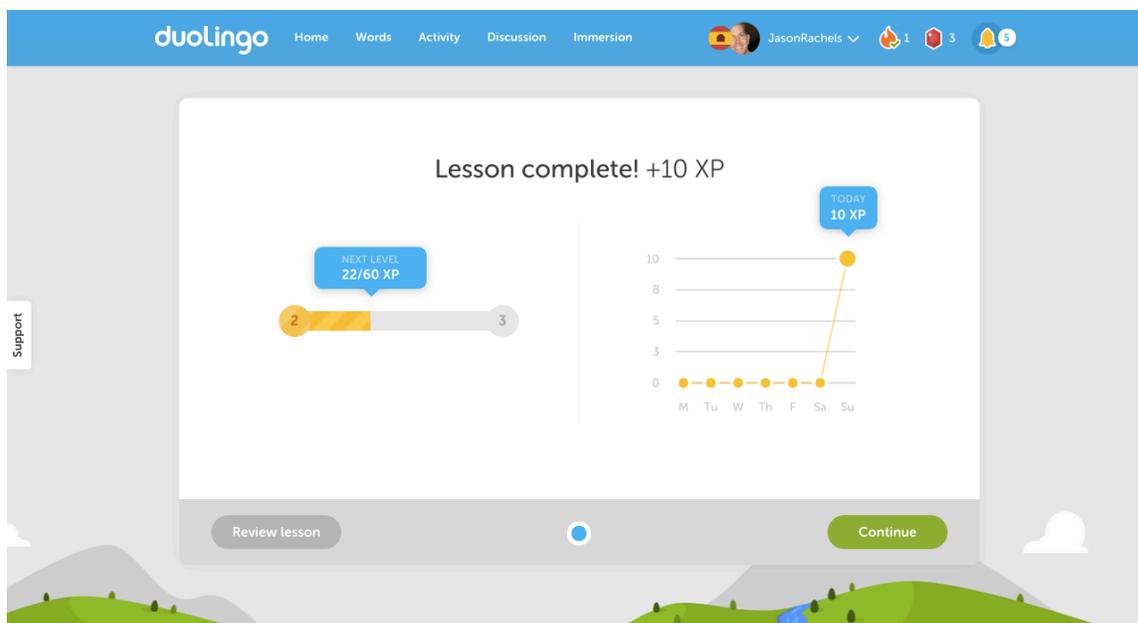
Figure 20. Screenshot showing a *Duolingo*® user's experience points.

Users can receive emails from *Duolingo*® encouraging the them to keep moving forward to reach the next target or level in *Duolingo*® (see Figure 16).
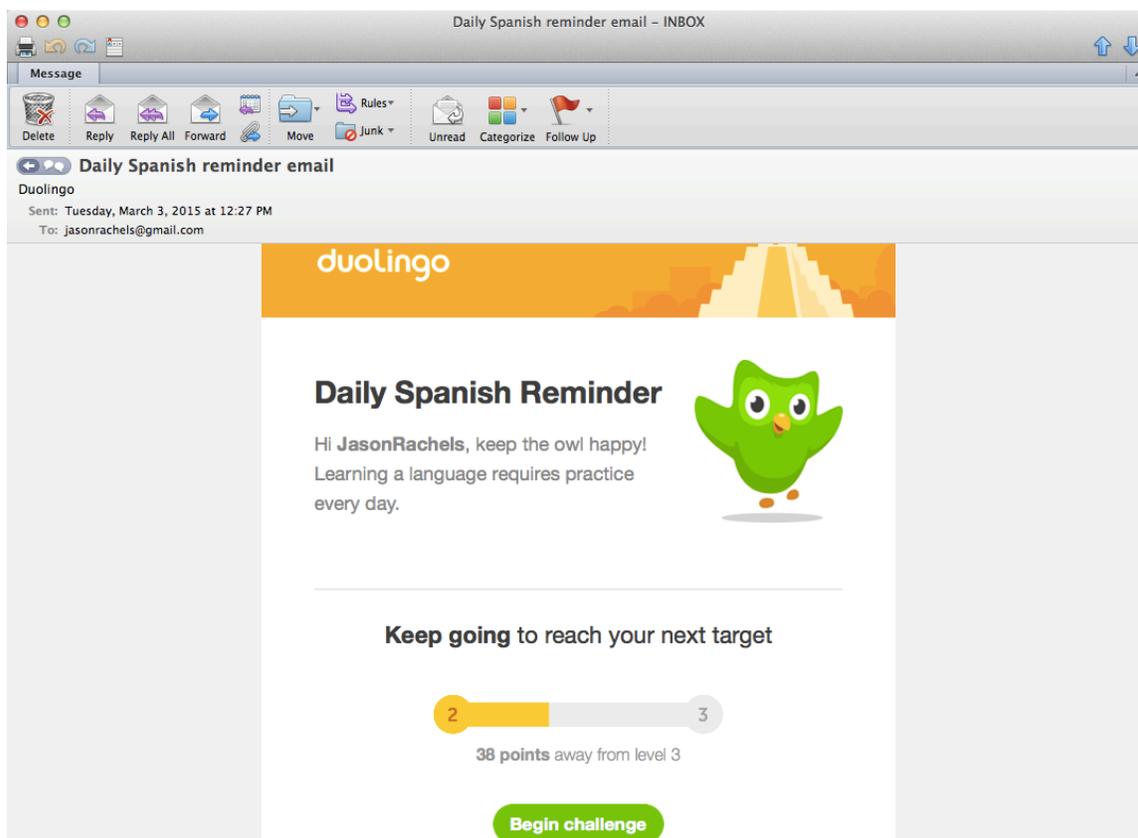
Figure 21. *Duolingo*® email encouraging user to progress.

Acquiring XP allows users to advance to higher levels in the program. The user also receives Lingots that allow them to buy different outfits for their encouraging owl avatar.

The teacher spaced students out in the class and guided them to speak to the app at a volume level high enough for the app to recognize but low enough so as to not to disrupt other students. The researcher guided the teacher to develop a progress tracking display board for each treatment class. This board was similar to what many teachers across the nation create to track Accelerated Reader points for their students. The boards were only displayed to the treatment classes. The original plan was for the teacher to update the progress of each student on the board on a weekly basis. As the study began, it became apparent that it was more advantageous for students to be allowed to walk up to the board and check off levels in real time as they completed them.

I made myself available by phone, text, email and in person so that if any questions arose for the teacher or school faculty or superintendent, they would be able to reach me as immediately as possible. At first, I checked in with the Spanish language teacher daily to establish fidelity of treatment, to answer questions, offer support and verify that procedures were being followed. Later, I was able to reduce contact frequency as indicated by discussions with the Spanish language teacher in which we determined together what frequency would best meet her needs and at the same time help me to be appropriately informed of the progress of the study.

Control Group Setting

The control and treatment group needed to be learning the same content. In order to accomplish this, the Spanish teacher worked through the first 60 lessons of *Duolingo*®, and documented the content taught in those lessons. The teacher gathered the content and grouped it according to themes (e.g.: food, clothing, members of the family) to facilitate the methods of instruction that she uses in the traditional Spanish language classroom. Many instructional strategies were used throughout the 12 week study. One example of an instructional strategy implemented was the teacher brought in clothing for the students to put on so that they could have conversations in pairs in front of the class or in multiple groups. In these conversations the students discussed what they were wearing as well as what other people in the group were wearing. This gave them the opportunity to use vocabulary about clothing as well as grammar elements such as "I am wearing…," "You are wearing…," and "He or she is wearing…". The teacher also incorporated multiple songs and stories as a means of helping the students to learn vocabulary and grammar. The teacher provided printed lists of vocabulary words and

grammar elements so that the students could see the text of what they were learning. The teacher would often have the students work in partners and groups to allow for more opportunities for each student to practice speaking and understanding Spanish through peer conversations.

The pretests and posttests were taken in the Spanish language classroom during the students' regularly scheduled Spanish language class. The tests were completed with pencil and paper and were graded by a Spanish language expert. The teacher was provided a script (see Appendix B) for the instructions that were to be given to students to control for the instrumentation threat to validity.

At the conclusion of the treatment time, the Spanish language teacher assessed the students using the Spanish Language Achievement Test and the PALS.

<div align="center">**Data Analysis**</div>

Research Question One

To examine research question one, Is there a statistically significant difference in the Spanish language achievement of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous Spanish language achievement?, and to examine whether the means of groups are statistically different from one another while controlling for the effects of one or more control variables (Rovai et al., 2013) an analysis of covariance (ANCOVA) was planned.

Prior to conducting the ANCOVA, an independent *t*-test was conducted to evaluate whether the gamification group and the traditional instructional group significantly differed in Spanish language achievement prior to the treatment as measured

by the means of these groups' scores on the pretest of the Spanish Language

Achievement Test (Rovai et al., 2013).

A significance level of .05 was used to determine whether or not the null

hypothesis would be rejected (Rovai et al., 2013). This significance level of .05 is the

generally accepted level for most social science research (Rovai et al., 2013; Warner,

2008). The effect size was calculated as partial eta squared, and was interpreted using

Cohen's conventions (Rovai et al., 2013; Warner, 2008).

The results of the independent *t*-test indicated no significant statistical difference in

Spanish Achievement between the treatment group and the control group for the pretest.

This indicated that both groups were considered to have generally the same foreign

language achievement level at the beginning of the study. ANCOVA is to be preferred

over the *t*-test when there is a need to control for differences in relevant participant

characteristics (Warner, 2013). As there was no statistically significant difference in the

mean pretest scores of the treatment and control group, and demographics between the

groups were homogenous, an independent *t*-test was used to analyze the post-test scores.

Prior to conducting the independent *t*-test, assumption testing was completed.

Normality was examined through the construction of histograms. Histograms showed a

normal distribution for the posttest for research question one, thus criteria were met for

normality. A Kolmogorov-Smirnov test also confirmed normality of the treatment group

and the control group. The Levene's test for equality of variance was used to evaluate

the assumption of homogeneity of variance (Warner, 2008). An independent *t*-test was

used to compare the means of the treatment and the control group.

Research Question Two

To examine research question two, Is there a statistically significant difference in the academic self-efficacy of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous academic self-efficacy? and to examine whether the means of groups were statistically different from one another while controlling for the effects of one or more control variables (Rovai et al., 2013), an analysis of covariance (ANCOVA) was planned. Similar to question one, prior to conducting the ANCOVA, an independent *t*-test was conducted to evaluate whether the gamification group and the traditional instructional group significantly differed in academic self-efficacy prior to treatment. Academic self-efficacy was measured using the Patterns of Adaptive Learning Scales (PALS) (Rovai et al., 2013). An independent *t*-test was the most appropriate analysis procedure for comparing the mean scores of two different groups (i.e.: gamification and traditional instruction; Warner, 2013). An independent *t*-test identified no significant statistical difference in self-efficacy between the treatment group and the control group for the pretest. As stated with research question one, an ANCOVA is to be preferred over the *t*-test when there is a need to control for differences in relevant participant characteristics (Warner, 2013). An independent *t*-test was also used to analyze the post-test scores for research question two because there was no statistically significant difference in the mean pretest scores of the treatment and control group, and demographics were homogenous.

Assumption testing was completed prior to conducting the analysis. Normality was examined through the construction of histograms.

Levene's test for equality of variance was used to evaluate the assumption of homogeneity of variance (Warner, 2008). An independent t-test was used to compare the means of the treatment and the control group.

Summary

In this chapter, the research design for this study was presented. The participants were defined as well as an explanation of the setting, the site school and the Spanish curriculum in use at the site school. The instruments for the study, which include the Spanish Language Achievement Test and the PALS academic self-efficacy survey, were described and defined. The procedures for both the experimental group and the control group were explained. Data analysis procedures were also described.

CHAPTER FOUR: FINDINGS

Restatement of the Purpose

The purpose of this pretest-posttest, non-equivalent control group study (Campbell & Stanley, 1963) was to examine the effect of gamification on elementary students' Spanish language achievement and academic self-efficacy. Given the growing importance of Spanish language knowledge in America (Byram, 2008; Lopez & Gonzalez-Barrera, 2013; Ryan, 2013) and the need to understand best practices in the foreign language classroom, this study was timely. In addition this study was timely in light of current efforts to increase technology implementation in the classroom and the move towards one-to-one device implementation in K-12 schools (Falloon, 2013; Maninger & Holden, 2009). This study also contributed to the body of knowledge in regards to the effect gamification may have on student Spanish knowledge and academic self-efficacy.

Research Questions and Hypotheses

The research questions that guided the study are:

Research question 1: Is there a statistically significant difference in the Spanish language achievement of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous Spanish language achievement?

Research question 2: Is there a statistically significant difference in the academic self-efficacy of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous academic self-efficacy? Moreover, the corresponding null

hypotheses were tested using independent t-tests and the results are discussed in this chapter.

H$_1$: There is a statistically significant difference in the Spanish language achievement of elementary students who are taught with gamification (i.e. *Duolingo*®️ learning) versus those who are taught with a traditional instructional approach while controlling for previous Spanish language achievement.

H$_2$: There is a statistically significant difference in the academic self-efficacy of elementary students who are taught with gamification (i.e. *Duolingo*®️ learning) versus those who are taught with a traditional instructional approach while controlling for previous academic self-efficacy.

Alternatively, the following are the null hypotheses:

H$_{o1}$: There is no statistically significant difference in the Spanish language achievement of elementary students who are taught with gamification (i.e. *Duolingo*®️ learning) versus those who are taught with a traditional instructional approach while controlling for previous Spanish language achievement.

H$_{o2}$: There is no statistically significant difference in the academic self-efficacy of elementary students who are taught with gamification (i.e. *Duolingo*®️ learning) versus those who are taught with a traditional instructional approach while controlling for previous academic self-efficacy.

In this chapter, findings related to these questions and corresponding hypotheses will be presented. This includes a discussion of demographics, the reliability of the assumption testing, an analysis for question one and question two.

Demographics

A total of 187 students, 100% of the sample population, elected to take part in this study, all of whom were third and fourth grade students enrolled in an accredited private K-12 school in South Florida. All students were existing members of the pre-existing once per week, Spanish language class. The regular classroom teacher provided classroom instruction. Of the 187 students, 97 were female and 90 were male. Based on the teacher's knowledge of her students as well as the students' results on the Spanish Language Achievement pretest, 12 students were identified as bilingual and thus their data was removed. Eight students failed to complete both the pretest and the posttest so their data was not used in the study. This resulted in having 167 cases of data analyzed, with 79 cases in the experimental group and 88 cases in the control group. PALS surveys for three students could not be located, resulting in a reduced data set ($N = 164$) for research question two.

Demographic Data

Demographic data was collected and included information about sex and ethnicity was collected. Due to the age of the students involved in the study and the likelihood of false self-reporting, data on socioeconomic status was not collected as part of this study. An analysis was performed to determine whether or not sex was reasonably equivalently distributed among the treatment and the control groups. A chi-square analysis of independence yielded no statistically significant difference in sex distribution within the treatment group and control group, $\chi^2 (1, N = 167) = .24, p = .62$, indicating that male students ($n=38$ in treatment group and $n=39$ in control group) and female students ($n=41$ in treatment group and $n=49$ in control group) were equally distributed in the two groups.

Ethnicity was controlled for through the use of homogenous groups. The site school has a system to intentionally distribute sex, race, achievement and other factors as evenly as possible across the classes at each grade level. This has led to a fairly uniform distribution of race among the treatment and control group (see Figure 22).
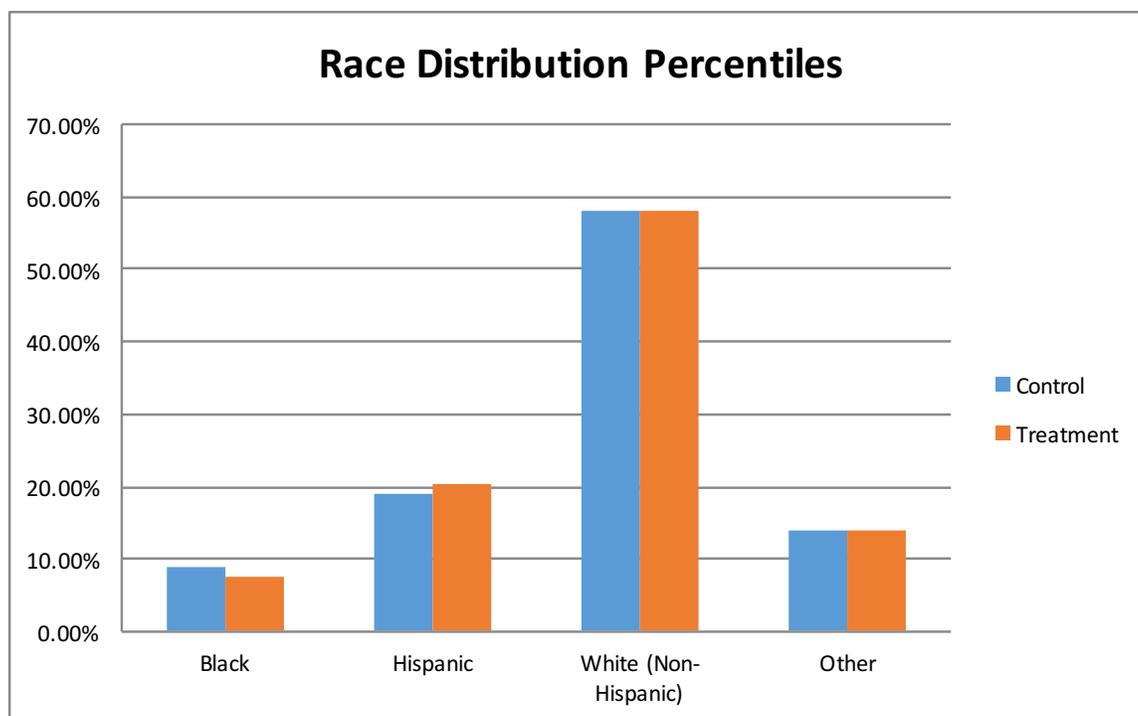
Figure 22: Race distribution between treatment and control groups

Reliability of Measurement

Prior to beginning the treatment, a multi-item scale was developed and given to the students (N=167) to measure their Spanish achievement. The 50-item questionnaire was presented to each student, and then this same questionnaire was presented to the students 13 weeks later after the completion of 12 weeks of Spanish language instruction. A Cronbach's alpha was calculated on these 50 items to examine reliability. The Cronbach's alpha reliability coefficient for the pre-test was .930 and the Cronbach's

alpha reliability coefficient for the post-test scale was .919. The results for both the pre-test and the post-test scales suggest that the items have relatively high internal consistency; thus, the researcher proceeded with the analysis for the first research question as the instrument to measure achievement was deemed reliable.

Analysis

Research Question One

Research question one was, Is there a statistically significant difference in the Spanish language achievement of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous Spanish language achievement? To examine whether the means of groups were statistically different from one another while controlling for the effects of one or more control variables (Rovai et al., 2013) an analysis of covariance (ANCOVA) was conducted.

Prior to conducting the ANCOVA, an independent *t*-test was conducted to evaluate whether the gamification group and the traditional instructional group significantly differed in Spanish language achievement prior to the treatment as measured by the means of these groups' scores on the pretest of the Spanish Language Achievement Test (Rovai et al., 2013). The results of the independent *t*-test indicated no significant statistical difference in Spanish Achievement ($p =1.00$) between the treatment group ($M=11.78$, $SD=9.94$, $n= 79$) and the control group ($M=11.78$, $SD=8.88$, $n = 88$) for the pretest ($N=167$), which indicates that both groups were considered to have generally the same foreign language achievement level at the beginning of the study. ANCOVA is to be preferred over the *t*-test when there is a need to control for differences in relevant

participant characteristics (Warner, 2013). As there was no statistically significant difference in the mean pretest scores of the treatment and control group and demographics between the groups were homogenous, an independent t-test was used to analyze the post-test scores.

Prior to conducting the independent t-test, assumption testing was completed. Normality was examined through the Kolmogorov-Smirnov test, which confirmed normality of the treatment group ($p = 0.07$) and the control group ($p = 0.07$). The results of Levene's test, $F(1, 165) = .75$, $p = .74$ indicated that the variance of the two groups could be assumed equal. Thus, t-test results in which equal equivalence are assumed were used (Warner, 2008). The results of the independent t-test identified no significant statistical difference, ($p=.74$) between the treatment group (M=20.94, SD=9.93, n=79) and the control group (M=21.47, SD=10.20, n=88) on the Spanish Achievement posttest (N=167).

As there was no statistically significant difference in Spanish achievement found between students who were taught with $Duolingo$® learning and those who were taught in the traditional class environment, the null hypothesis was not rejected. Both groups demonstrated an increase in achievement with the treatment group growing from a mean score of 11.78 out of 50 on the Spanish Achievement test to a mean score of 20.94 out of 50. The control group grew from a mean score of 11.78 out of 50 to a mean score of 21.47 out of 50 (see Figure 24).

Spanish Achievement
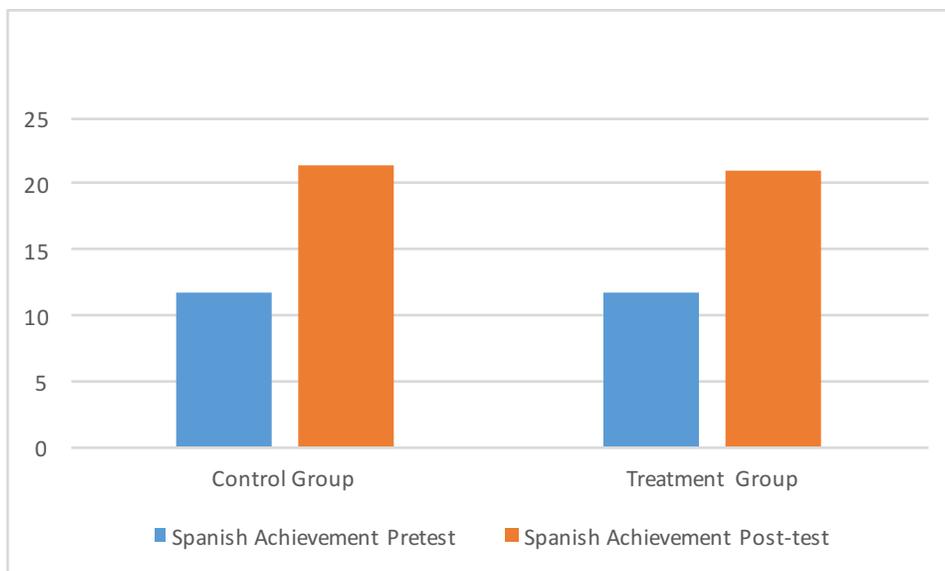
Figure 23: Graph showing pretest and post-test scores for Spanish Achievement

Research Question Two

To examine research question two, Is there a statistically significant difference in the academic self-efficacy of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous academic self-efficacy? and whether the means of groups were statistically different from one another while controlling for the effects of one or more control variables (Rovai et al., 2013), an analysis of covariance (ANCOVA) was planned. Similar to question one, prior to conducting the ANCOVA, an independent *t*-test was conducted to evaluate whether the gamification group and the traditional instructional group significantly differed in academic self-efficacy prior to treatment. Academic self-efficacy was measured using the Patterns of Adaptive Learning Scales (PALS) (Rovai et al., 2013). An independent *t*-test was the most appropriate analysis procedure for comparing the mean scores of two different groups (i.e.: gamification and traditional instruction; Warner, 2013). An independent *t*-test identified no significant

statistical difference in self-efficacy ($p =.94$) between the treatment group ($M=19.21$, $SD=4.03$, $n= 77$) and the control group ($M=19.38$, $SD=4.55$, $n=87$) for the pretest ($N=164$). As stated with research question one, an ANCOVA is to be preferred over the t-test when there is a need to control for differences in relevant participant characteristics (Warner, 2013). An independent t-test was also used to analyze the post-test scores for research question two because there was no statistically significant difference in the mean pretest scores of the treatment and control group, and demographics were homogenous.

Assumption testing was completed prior to conducting the analysis. Normality was examined through the construction of histograms. Histograms showed a skewed distribution for the posttest for research question two (see Figure 24); however, normality was examined through the Kolmogorov-Smirnov test, which confirmed normality of the treatment group and the control group.

Control Group

Mean = 19.14
Std. Dev. = 4.475
N = 87

Treatment Group

Mean = 19.1
Std. Dev. = 4.435
N = 77
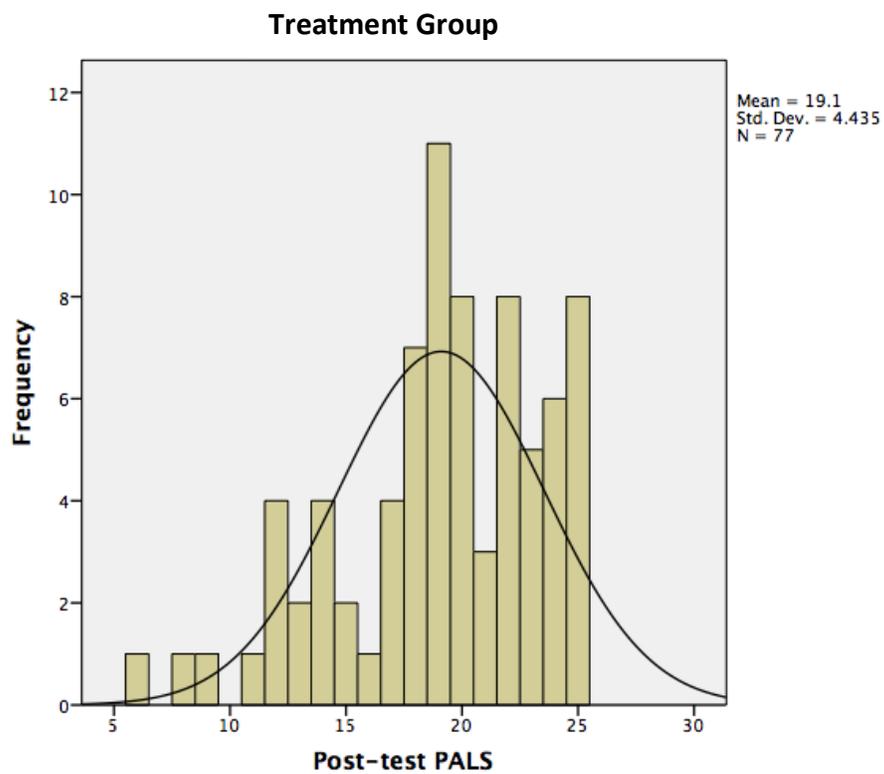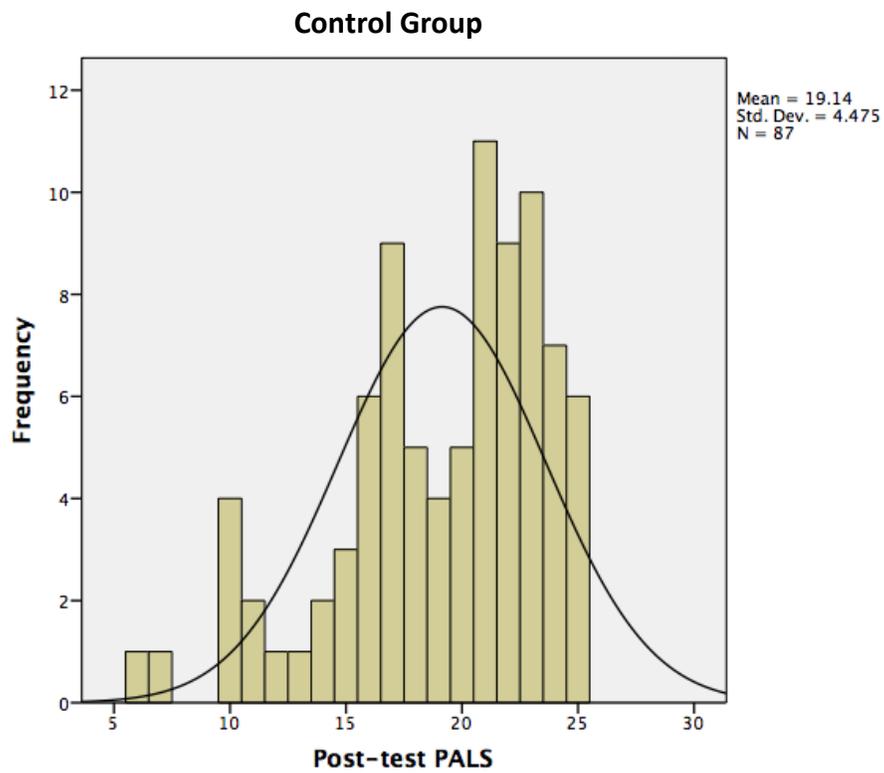
Figure 24: Histograms for PALS post-test for control group and treatment group

The results of Levene's test, $F(1, 162) = 2.36$, $p = .13$ indicated that the variance of the two groups could be assumed to be equal. Thus, a t-test in which equal equivalence is assumed was used (Warner, 2008). An independent t-test on the PALS survey post-test ($N=164$) identified no significant statistical difference ($p=.96$ for $\alpha = .05$) between the treatment group ($M=19.10$, $SD=4.44$, $n=77$) and the control group ($M=19.14$, $SD=4.48$, $n=87$). There was a slight decrease in self-efficacy scores for both the treatment and the control group (see Figure 26), with the treatment group decreasing from a mean pretest score of 19.21 out of a possible 25 to a mean post-test score of 19.10 out of a possible 25, and the control group decreasing from a mean pretest score of 19.38 to a post-test of 19.14 out of a possible 25.
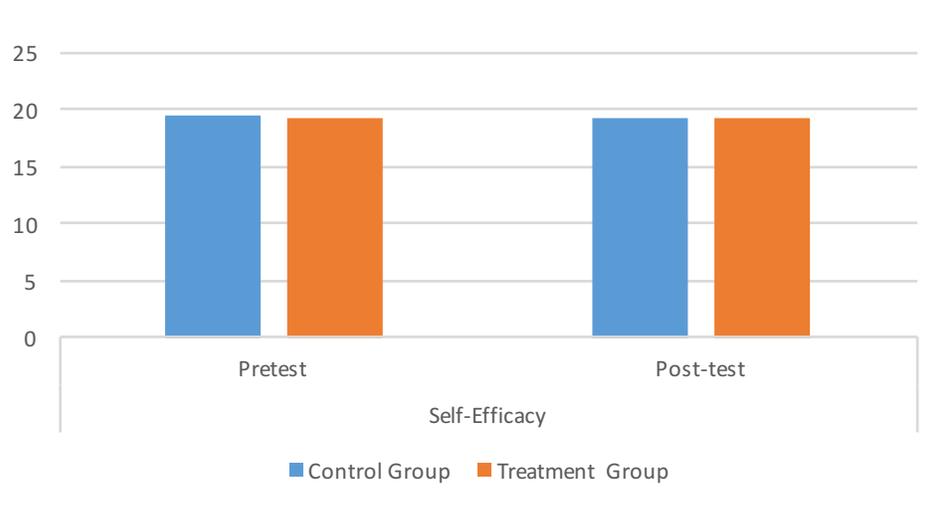
Figure 25: Graph showing pretest and post-test scores for academic self-efficacy

Due to missing pretest and post-test scores for research question two, the number of participants for research question two ($N=164$) was three less than the number of participants for research question one ($N=167$).

CHAPTER FIVE: DISCUSSION

Introduction

This chapter provides a summary and discussion of the findings of this study, including a statement of the problem and the purpose of the study. A summary of the results of each of the research questions is provided and discussed. Theoretical implications, impact on practice, methodological considerations, and implications for future research are explained. Limitations are discussed, and a conclusion is made based on the research findings of this study.

Statement of the Problem

The vast majority of U.S. elementary schools give one day, or less, each week to foreign language study due to budgetary issues and the sense that there is not enough academic time to give foreign language study a greater focus (Jennings & Rentner, 2006; Pufahl & Rhodes, 2011; Rosenbusch, 2005). The foreign language in elementary school (FLES) programs that have been implemented result in little increase in foreign language achievement in the U.S. (Pufahl & Rhodes, 2011). Past research has suggested that gamification could be a way to address these challenges (Garcia, 2013; Giles, 2012; Simonite, 2013; Vesselinov & Grego, 2012).

Gamification's convincing connection to leading educational and psychological theory including Vygotsky, Csikszentmihalyi, and Bandura (Boyle et al., 2011; Bressler & Bodzin, 2013; Brom et al., 2014; Chen, 2007; Fu-Hsing et al., 2012; Wu et al., 2012) present another compelling reason for exploring its potential implications in the elementary classroom.

Utilizing the conceptual frameworks of social development theory, flow theory and social learning theory, this quasi-experimental study sought to first determine the effects of gamification on elementary students' Spanish language achievement as measured by a Spanish achievement test designed for the study. Second, it sought to determine the effects of gamification on elementary students' academic self-efficacy as measured by the Pattern of Adaptive Learning Scales (PALS) Academic Self-Efficacy scale (Midgley et al., 2000).

The independent variable was the type of learning (traditional face-to-face instruction or *Duolingo*® learning). Traditional face-to-face instruction was defined as learning that occurs face-to-face in the classroom. *Duolingo*® learning was defined as learning in which each student worked on an iPad, using the app *Duolingo*®, as their primary means of instruction.

The dependent variables were Spanish language achievement and academic self-efficacy. Spanish language achievement was defined as the student's ability to translate from Spanish to English and from English to Spanish as indicated by the number of correct responses on multiple-choice questions regarding vocabulary, phrases, and grammar on the Spanish Language Achievement Test. Academic self-efficacy was defined as "students' perceptions of their confidence to do their classwork" as indicated by their responses on the PALS Academic Self-Efficacy scale (Midgley et al., 2000, p. 19).

Review of Methodology

This study was a quantitative study and used a quasi-experimental pretest/post-test control group design. This design was most suitable as the independent variable was

manipulated, and a control group was utilized. Randomization of the sample was not

feasible as students were part of pre-existing classes (Warner, 2008). A convenience

sample of third and fourth grade class groups (overall student $N = 167$) at a private K- 12

school in South Florida were assigned randomly (as intact class groups) to a treatment or

a control group. Each group received equivalent instructional time covering equivalent

Spanish language content. Students in the treatment group were each provided with an

iPad and the app *Duolingo*® with the teacher simply facilitating their logging onto the

devices and encouraging their engagement for the course of each of the 40 minute class

periods. The control group received traditional face-to-face instruction. The Spanish

Achievement Test and the PALS Academic Self-Efficacy Scale (Midgley et al., 2000, p.

19) were administered prior to the treatment and at the conclusion of the treatment.

Results were statistically analyzed and reported.

Summary of the Findings

Research Question One

Research question one was: Is there a statistically significant difference in the

Spanish language achievement of elementary students who are taught with gamification

(i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional

approach while controlling for previous Spanish language achievement? Prior to the

primary analysis, an independent *t*-test was used. It determined there was not a

statistically significant difference in pre-test scores across groups. This, coupled with the

fact that the groups had homogenous demographics, indicates there was not a need to

control for the covariate. Thus, an independent *t*-test was then used to determine if there

was a statistically significant difference in the post-test scores. No significant difference

was found between the post-test scores of the treatment and the control group. This indicated that the students working independently on iPads with *Duolingo*® was equivalent in effectiveness as traditional FTF instruction in regards to helping students to learn Spanish.

Research Question Two

Research Question two was as follows: Is there a statistically significant difference in the academic self-efficacy of elementary students who are taught with gamification (i.e. *Duolingo*® learning) versus those who are taught with a traditional instructional approach while controlling for previous academic self-efficacy? An independent *t*-test was used to determine if there was a statistically significant difference in pretest scores across groups. The need to control for the covariate was not present. An independent *t*-test was then used to determine if there was a statistically significant difference in the post-test scores across groups. Results indicated that a statistically significant difference did not exist in students' academic self-efficacy who are taught with gamification (i.e. *Duolingo*® learning) and those who are taught with a traditional instructional approach. Thus, students learning Spanish with *Duolingo*® on iPads for 12 weeks had the same impact on academic self-efficacy as an equivalent amount of time receiving traditional FTF instruction.

<div align="center">

Discussion of Results

</div>

Research Question One

Results showed no statistically significant difference in Spanish achievement between students who were taught with gamification (i.e. *Duolingo*® learning) and those who are taught with a traditional face-to-face approach. This indicates that independent

learning with the *Duolingo*® app is as effective as traditional FTF instruction. The results

of this study are consistent with those of Petersen (2010) in his work with 56 high school

students using an e-tutor, software, like *Duolingo*®, that allows a student to practice

independently, unaided by a teacher. The results are also consistent with a meta-analysis

of e-tutors (Cerezo, Baralt, Suh, & Leow, 2014) that was conducted in an attempt to

determine if the medium, face-to-face (FTF) versus Computer Assisted Language

Learning (CALL), mattered in terms of learning outcomes. Cerezo et al. (2014)

concluded that the medium does not matter in that CALL and FTF produced generally

equivalent results. Similar findings were made by Grgurović, Chapelle, and Shelley

(2013) in their meta-analysis of effectiveness studies on computer technology-supported

language learning.

Vesselinov and Grego (2012) found that adults using *Duolingo*® actually showed

greater gains than college students who spent an equivalent amount of time on traditional

face-to-face Spanish instruction. Thus the current research supports the work of

Vesselinov and Grego (2012) in showing the effectiveness of *Duolingo*®, but the current

research differs in that it showed *Duolingo*® to be equivalently as effective as traditional

FTF instruction, whereas Vesselinov and Grego (2012) showed *Duolingo*® to be

significantly more effective than traditional FTF learning. Differences in the results of

the studies can be accounted for given the differences in the study: age of participants,

study setting, and demographics.

Research Question Two

Results showed no statistically significant difference in academic self-efficacy

between students who were taught with gamification (i.e. *Duolingo*® learning) and those

who are taught with a traditional, face-to-face instructional approach. This absence of a statistically significant difference in the academic achievement of the treatment group and the control group is consistent with the work of Bandura (1982), Mills, Pajares, and Herron (2007), Pajares (1996), Pajares and Miller (1994) and Zimmerman, Bandura, and Martinez-Pons (1992). This research discovered a positive association between self-efficacy and learning. The treatment and control group showed no statistically significant difference in academic achievement or in academic self-efficacy, and that is what might be expected to follow since academic achievement and academic self-efficacy have been shown to have a positive association.

Theoretical Implications

Results showed no statistically significant difference in Spanish language achievement scores and no difference in academic self-efficacy based on the type of instruction employed. The treatment group did not add gamification to traditional face-to-face instruction; rather the treatment group used gamification instead of traditional face-to-face instruction. Thus, the lack of a statistically significant difference indicates that gamified instruction, or *Duolingo*® instruction, was shown to be as effective as traditional face-to-face classroom instruction for these elementary students.

This study supported the social learning theory of Vygotzky (1978) and the importance of the zone of proximal development. With the gamified instruction, it was critical that the adaptive learning system (the *Duolingo*® app) effectively adapt the level of instruction and support so that the students could work independently of the teacher but with support of the software. This balance of challenge and support needed to be such that the student was challenged and making significant forward progress in Spanish

achievement while at the same time offering the support needed to keep the students from giving up as they would likely otherwise do if they had been asked to learn Spanish independently of the teacher or the app.

This study also supported Csikszentmihalyi's flow theory. Multiple elements that Csikszentmihalyi notes as the elements that lead to flow were critical elements to the functioning of the *Duolingo*® app. The exercises in *Duolingo*® exhibited two key elements of flow through challenging activities that required skill and providing clear goals and feedback, two key elements of flow. In addition, students using *Duolingo*® were required to exercise control in difficult situations (another element of flow) due to the nature of the adaptive learning technology that is requiring the user to operate at a level in which they are stretched to the limits of their current Spanish knowledge.

The results for research question two support Bandura's social cognitive theory and its focus on self-efficacy (Bandura, 1982). Bandura found a positive correlation between the level of self-efficacy and the level of performance. In this study, the self-efficacy of the treatment group and the control group had no significant difference and similarly there was no significant difference found between the academic self-efficacy levels of the two groups.

Implications for Practice

The results of the current study indicate that learning with this free language app on devices that are accessible to an ever-increasing percentage of our students at school, at home and even on their person is as effective as face-to-face instruction in a classroom. Thus, schools who seek to infuse FL instruction into their elementary curriculum need to consider the use of *Duolingo*® as an affordable, cost-effective option. While school

administrators may be concerned about the cost of hardware to support the use of the app,

schools need not to have achieved one-to-one device to student ratios in order to utilize

Duolingo® with their FLES programs. The site school for the current research was done

at a school that has not achieved that ratio. It is only necessary that a number of devices

be available for a class or a group to use at particular points during the week. This could

be a computer lab or a class set of tablets. Even less devices could work if the *Duolingo*®

time were to be utilized as one of multiple "centers" set up to engage the students for a

portion of the class day or week in the elementary classroom. Since the app is free,

schools could also choose to bolster their ratio of devices to students by asking students

who have a smartphone or device to install the app and use it in class as is commonly

done with the Bring Your Own Device (BYOD) model (Sangani, 2013).

One of the greatest hurdles to establishing an effective FLES is the need to

overcome administrators' reluctance to allocate academic time to foreign language study

(Jennings & Rentner, 2006; Pufahl & Rhodes, 2011; Rosenbusch, 2005). If an

elementary school were unwilling or unable to allocate regular class time for FLES,

Duolingo® could be utilized in a manner similar to the popular Accelerated Reader®

(AR) program. AR has been used in over 75,000 schools since 1980 (Cox, 2012) and has

been shown to have significantly positive effects on student reading outcomes (Clark,

2013). The power of the program is that it takes very little time and effort from teachers

to set students up to work independently (checking out AR books, reading them, taking

tests to assess that they read and comprehended the books) for hours in a manner that

produces educational gains (Clark, 2013). What AR has done for reading

comprehension, *Duolingo*® could potentially do for foreign language instruction. As with

AR, students could be guided to reach appropriate, individually based achievement goals and then sent to work as independently with *Duolingo*® as elementary students currently work with AR.

Schools that are willing to allocate class time, but not willing or able to allocate the funds for a foreign language teacher, could potentially use *Duolingo*® with the children's regular classroom teacher or with a class proctor who spoke the language of study. *Duolingo's*® ability to keep a student independently engaged could be capitalized upon by FLES teachers who could use the program to engage the majority of the class, thus providing the teacher the opportunity to provide more one on one or small group help to struggling students or students needing greater challenge.

Limitations

While this study has a number of implications for educational practice, caution should be taken in their application, as several limitations did exist in the study. This study used a population that was not randomly selected and not randomly assigned (Rovai et al., 2013). Due to the students being a part of intact groups (classes) randomization was not possible, and a quasi-experimental design was used. This lack of randomization provides a weaker design and is an internal threat to validity (Rovai et al., 2013). While measures were taken to minimize these threats to validity, the threats still existed. For example, to assist in controlling for the lack of randomization, a pretest was used (Campbell & Stanley, 1963). The use of a pretest addressed the internal threats of selection, participant history, maturation, and regression (Rovai et al., 2013). However, the use of the pretest introduced the testing threat to validity. So, similar results may be hard to achieve without a pretest.

Non-generalizability is a limitation of the study since the study was only conducted on third and fourth grade students in a private school in South Florida. The results of this study may not be generalizable to populations that differ significantly from the sample. These results may not be fully applicable to students with different demographics.

Implications for Future Research and Methodological Implications

Despite the limitations, this study was intended to add to the lack of empirical data in the field. While research has been conducted comparing the effects of different media on the teaching of foreign language, little has been done on free applications available to mobile device users, and very little has been conducted on gamification's use in the elementary classroom (Caponetto et al., 2014). Even less research has been conducted on the foreign language elementary classroom. The following recommendations are made to further increase the quality of the empirical data available on this topic and the broader topic of gamification in foreign language education.

This study focused on the study of foreign language in the mid to upper elementary classroom. It is recommended that this study be reproduced at other educational levels including lower elementary, middle school, high school and the college level. This study was conducted in a school with a once-per-week, 40 minute FLES class. Additional research with different time frames such as a daily FLES program would also strengthen the body of research.

This study focused on Spanish L2 acquisition. The field of research would benefit from additional individual studies focused on different foreign languages, since

languages differ in grammatical complexity, vocabulary and in other ways that make one language more difficult to learn than another (Trudgill, 2011).

Moreover, this research focused on *Duolingo*® in comparison to FTF traditional classroom instruction. There are other apps that teach foreign languages (e.g.: *Memrise*®, *Babbel*® and *Mango*®) and comparison studies need to be conducted. Special care must be taken in comparison studies to ensure that the Spanish achievement testing instrument does not provide an unfair advantage to either the traditional instruction or the gamified instruction. This can happen due to a lack of a clear scope and sequence for Spanish being embraced in a significant way. This leads to different curriculums, textbooks, teachers, programs and apps, covering different content at different times in a manner very different from the more uniform, sequential way that content is covered in a math class, for example. However, there would be challenges to this type of research because the way to increase the validity of the study in the research at hand was to have the FTF teacher line up her teaching with the *Duolingo*® content so as to not give an unfair advantage to the treatment or the control group simply because their content was more in line with a particular testing instrument. Then an instrument had to be created around this similar content. This naturally did create a challenge for the teacher who had to adjust her content to line up with *Duolingo*®, but a better alternative was not envisioned. Perhaps future researchers can conceive a better way to resolve the problem of ensuring that no group in the study has an advantage over the other in terms of content alignment with the testing instrument, while at the same time not requiring one group to adjust their content to line up with the other. The teacher being required to line up her content with the *Duolingo*® content was also a limitation in this study.

This study utilized 167 participants. A replication of the study with a larger sample size would increase statistical strength and reliability. In regards to research design, future methodology could include a truly random sample as this study employed a convenience sample of students who were already grouped in classes. A truly random sample would strengthen the design of the study (Rovai et al., 2013; Warner, 2008). A true experimental design would be stronger than the quasi-experimental design used in this study, and could increase the internal validity of the results (Rovai et al., 2013; Warner, 2008). Use of a more thoroughly validated Spanish achievement instrument could also strengthen the validity of the study.

Conclusion

The purpose of this study was to examine the effect of gamification on third and fourth grade students' Spanish language achievement and student academic self-efficacy. Results indicated that there was no statistically significant difference in Spanish language achievement and student academic self-efficacy based on the medium of instruction. These results provide evidence to indicate that students being taught with gamification via *Duolingo*® on a device will learn as much as students being taught in a traditional, face-to-face learning environment. The results also indicate that students being taught with gamification via *Duolingo*® on a device will not differ in overall academic self-efficacy when compared to students being taught in a traditional, face-to-face learning environment. This research extended the current knowledge base on gamification and foreign language instruction. In a world in which smartphones and tablets are becoming more and more ubiquitous, a free app with research indicating equivalent results to traditional, FTF instruction can truly change foreign language learning.

REFERENCES

Abdul Razak, A., & Connolly, T. (2013). Using games-based learning: How it influences the learning experience and outcomes of primary school children. *International Journal of Emerging Technologies in Learning (iJET), 8*(2013).

Abrahamsson, N., & Hyltenstam, K. (2009). Age of onset and nativelikeness in a second language: Listener perception versus linguistic scrutiny. *Language Learning, 59*(2), 249-306. doi: 10.1111/j.1467-9922.2009.00507.x

Academy, C.C. (2015). Academic standard of admission. Retrieved October 14, 2014, from http://www.ccaeagles.org/admissions

Algozzine, B., & Anderson, K.M. (2007). Tips for teaching: Differentiating instruction to include all students. *Preventing School Failure: Alternative Education for Children and Youth, 51*(3), 49-54.

AMR, K. (2012). Learning through games: Essential features of an educational game. *(Order No. 3509954, Syracuse University). ProQuest Dissertations and Theses, , 227. Retrieved from http://search.proquest.com/docview/1021370975?accountid=12085. (1021370975).*

Bacon, S.M. (1992). The relationship between gender, comprehension, processing strategies, and cognitive and affective response in foreign language listening. *The Modern Language Journal, 76*(2), 160-178.

Baggaley, J. (2013). When prophecy fails. *Distance Education, 34*(1), 119-128. doi: 10.1080/01587919.2013.770426

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological review, 84*(2), 191.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American psychologist, 37*(2), 122.

Bandura, A. (1995). *Self-efficacy in changing societies*: Cambridge University Press.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual review of psychology, 52*(1), 1-26.

Bandura, A., & McClelland, D.C. (1977). Social learning theory.

Bestwick, A., & Campbell, J.R. (2010). Mobile learning for all. *Exceptional Parent, 40*(9), 18-20.

Bong, M., & Skaalvik, E.M. (2003). Academic self-concept and self-efficacy: How different are they really? *Educational Psychology Review, 15*(1), 1-40.

Boyle, E., Connolly, T.M., & Hainey, T. (2011). The role of psychology in understanding the impact of computer games. *Entertainment Computing, 2*(2), 69-74. doi: http://dx.doi.org/10.1016/j.entcom.2010.12.002

Bressler, D.M., & Bodzin, A.M. (2013). A mixed methods assessment of students' flow experiences during a mobile augmented reality science game. *Journal of Computer Assisted Learning, 29*(6), 505-517. doi: 10.1111/jcal.12008

Breuer, J.S., & Bente, G. (2010). Why so serious? On the relation of serious games and learning. *Eludamos. Journal for Computer Game Culture, 4*(1), 7-24.

Brom, C., Buchtová, M., Šisler, V., Děchtěrenko, F., Palme, R., & Glenk, L.M. (2014). Flow, social interaction anxiety and salivary cortisol responses in serious games:

A quasi-experimental study. *Computers & Education, 79*(0), 69-100. doi: http://dx.doi.org/10.1016/j.compedu.2014.07.001

Brown, J.D. (1980). Relative merits of four methods for scoring cloze tests. *The Modern Language Journal, 64*(3), 311-317.

Brown, J.D., & Hudson, T. (1998). The alternatives in language assessment. *Tesol Quarterly, 32*(4), 653-675.

Busch, T. (1995). Gender differences in self-efficacy and attitudes toward computers. *Journal of Educational Computing Research, 12*(2), 147-158.

Byram, M. (2008). *From foreign language education to education for intercultural citizenship: Essays and reflections* (Vol. 17): Multilingual matters.

Campbell, D.T., & Stanley, J.C. (1963). *Experimental and quasi-experimental designs for research*. Boston,: Houghton Mifflin.

Caponetto, I., Earp, J., & Ott, M. (2014). Gamification and education: A literature review.

Carmody, K.W. (2012). *Exploring serious game design heuristics: A delphi study.* (3554098 Ed.D.), Northeastern University, Ann Arbor. Retrieved from http://www.liberty.edu:2048/login?url=http://search.proquest.com/docview/1316620090?accountid=12085

Carr, J.M. (2012). Does math achievement "h'app'en" when ipads and game-based learning are incorporated into fifth-grade mathematics instruction? *Journal of Information Technology Education: Research, 11*, 269-286.

Cerezo, L., Baralt, M., Suh, B.-R., & Leow, R.P. (2014). Does the medium really matter in l2 development? The validity of call research designs. *Computer Assisted Language Learning, 27*(4), 294-310.

Chen, J. (2007). Flow in games (and everything else). *Commun. ACM, 50*(4), 31-34. doi: 10.1145/1232743.1232769

Chun, D. (2011). Computer-assisted language learning. In E. Hinkel (Ed.), *Handbook of research in second language teaching and learning. Volume 2 volume 2* (pp. 663-680). New York: Routledge.

Clark, C. (2013). Accelerated reader and young people's reading. *London: National LiteracyTrust*.

Connolly, T.M., Boyle, E.A., MacArthur, E., Hainey, T., & Boyle, J.M. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education, 59*(2), 661-686. doi: http://dx.doi.org/10.1016/j.compedu.2012.03.004

Connolly, T.M., Stansfield, M., & Hainey, T. (2011). An alternate reality game for language learning: Arguing for multilingual motivation. *Computers & Education, 57*(1), 1389-1415. doi: http://dx.doi.org/10.1016/j.compedu.2011.01.009

Cox, D. (2012). Is accelerated reader best practice for all? *California Reader, 46*(2).

Craig, S., Graesser, A., Sullins, J., & Gholson, B. (2004). Affect and learning: An exploratory look into the role of affect in learning with autotutor. *Journal of educational media, 29*(3), 241-250.

Csikszentmihalyi, M. (1991). *Flow: The psychology of optimal experience* (Vol. 41): HarperPerennial New York.

Csikszentmihalyi, M. (2008). *Flow : The psychology of optimal experience*. New York: Harper Perennial.

Davin, K.J. (2013). Integration of dynamic assessment and instructional conversations to promote development and improve assessment in the language classroom. *Language Teaching Research, 17*(3), 303-322. doi: 10.1177/1362168813482934

Deterding, S. (2013). Gameful design for learning. *T+D, 67*(7), 60-63.

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). *From game design elements to gamefulness: Defining gamification.* Paper presented at the Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments.

Education, U.S.D.o. (2013). Naep glossary of terms. Retrieved from National Center for Education Statistics website: http://nces.ed.gov/nationsreportcard/glossary.asp

Elkhafaifi, H. (2005). Listening comprehension and anxiety in the arabic language classroom. *Modern Language Journal, 89*(2), 206-220. doi: 10.1111/j.1540-4781.2005.00275.x

Escudeiro, P., & Carvalho, C.V.d. (2013). Game-based language learning. *International Journal of Information and Education Technology, 3*(6), 643-n/a. doi: http://dx.doi.org/10.7763/IJIET.2013.V3.353

Falloon, G. (2013). Young students using ipads: App design and content influences on their learning pathways. *Computers & Education, 68*, 505-521. doi: 10.1016/j.compedu.2013.06.006

Fang, J., & Strobel, J. (2011). How id models help with game-based learning: An examination of the gentry model in a participatory design project. *Educational Media International, 48*(4), 287-306. doi: 10.1080/09523987.2011.632277

Feng, L. (2009). *How do adult foreign language learners experience the opportunities presented by computer games as a self-study tool?* (3357576 Ed.D.), University of Massachusetts Lowell, Ann Arbor. Retrieved from http://www.liberty.edu:2048/login?url=http://search.proquest.com/docview/30491 7033?accountid=12085

Fengfeng, K., & Abras, T. (2013). Games for engaged learning of middle school children with special learning needs. *British Journal of Educational Technology, 44*(2), 225-242. doi: 10.1111/j.1467-8535.2012.01326.x

Finneran, C.M., & Zhang, P. (2003). A person–artefact–task (pat) model of flow antecedents in computer-mediated environments. *International Journal of Human-Computer Studies, 59*(4), 475. doi: 10.1016/S1071-5819(03)00112-5

Flege, J.E., Frieda, E.M., & Nozawa, T. (1997). Amount of native-language (l1) use affects the pronunciation of an l2. *Journal of Phonetics, 25*(2), 169-186.

Frey, T. (2012). 28 major trends for 2012 and beyond: Part 2. *Journal of Environmental Health, 74*(9), 40-43.

Fu-Hsing, T., Kuang-Chao, Y., & Hsien-Sheng, H. (2012). Exploring the factors influencing learning effectiveness in digital game-based learning. *Journal of Educational Technology & Society, 15*(3), 240-250.

Gall, M.D., Gall, J.P., & Borg, W.R. (2007). *Educational research : An introduction* (8th ed.). Boston: Pearson/Allyn & Bacon.

Garcia, I. (2013). Learning a language for free while translating the web. Does duolingo work? *International Journal of English Linguistics, 3*(1), 19-25.

Garcia, T. (1995). The role of motivational strategies in self−regulated learning. *New directions for teaching and learning, 1995*(63), 29-42.

Garfinkel, A., & Tabor, K.E. (1991). Elementary school foreign languages and english reading achievement: A new view of the relationship. *Foreign Language Annals, 24*(5), 375-382.

Ghani, J.A., & Deshpande, S.P. (1994). Task characteristics and the experience of optimal flow in human-computer interaction. *Journal of Psychology, 128*(4), 381.

Giannetto, D., Chao, J., & Fontana, A. (2013). Gamification in a social learning environment. *Issues in Informing Science & Information Technology, 10*, 195-207.

Giles, J. (2012). Learn a language, translate the web. *New Scientist, 213*(2847), 18-19.

Grant, S., & Shawgo, K. (2013). Digital badges: An annotated research bibliography. *HASTAC*.

Grgurović, M., Chapelle, C.A., & Shelley, M.C. (2013). A meta-analysis of effectiveness studies on computer technology-supported language learning. *ReCALL, 25*(02), 165-198.

Hamari, J., Koivisto, J., & Sarsa, H. (2014). *Does gamification work?--a literature review of empirical studies on gamification.* Paper presented at the System Sciences (HICSS), 2014 47th Hawaii International Conference on.

Heick, T. (2013). Design your class like a video game.   Retrieved December 30, 2013, from http://www.teachthought.com/learning/design-your-class-like-a-video-game/

Hess, T., & Gunter, G. (2013). Serious game-based and nongame-based online courses: Learning experiences and outcomes. *British Journal of Educational Technology, 44*(3), 372-385. doi: 10.1111/bjet.12024

Hoffman, B., & Nadelson, L. (2010). Motivational engagement and video gaming: A mixed methods study. *Educational Technology Research & Development, 58*(3), 245-270. doi: 10.1007/s11423-009-9134-9

Horwitz, E.K., Horwitz, M.B., & Cope, J. (1986). Foreign language classroom anxiety. *Modern Language Journal, 70*(2), 125.

Hsieh, P.-H.P., & Schallert, D.L. (2008). Implications from self-efficacy and attribution theories for an understanding of undergraduates' motivation in a foreign language course. *Contemporary Educational Psychology, 33*(4), 513-532.

Huang, B.H., & Jun, S.-A. (2011). The effect of age on the acquisition of second language prosody. *Language & Speech, 54*(3), 387-414. doi: 10.1177/0023830911402599

Huber, M.Z., & Hilty, L.M. (2015). Gamification and sustainable consumption: Overcoming the limitations of persuasive technologies *Ict innovations for sustainability* (pp. 367-385): Springer.

Huizenga, J., Admiraal, W., Akkerman, S., & Dam, G.t. (2009). Mobile game-based learning in secondary education: Engagement, motivation and learning in a mobile city game. *Journal of Computer Assisted Learning, 25*(4), 332-344. doi: 10.1111/j.1365-2729.2009.00316.x

Hwang, G.-J., Sung, H.-Y., Hung, C.-M., Huang, I., & Tsai, C.-C. (2012). Development of a personalized educational computer game based on students' learning styles.

Educational Technology Research & Development, 60(4), 623-638. doi:

10.1007/s11423-012-9241-x

Insley, V., & Nunan, D. (2014). Gamification and the online retail experience.

International Journal of Retail & Distribution Management, 42(5), 340-351.

Jennings, J., & Rentner, D.S. (2006). Ten big effects of the no child left behind act on

public schools. *Phi Delta Kappan, 88*(2), 110.

Jernigan, C.G. (2011). What do students expect to learn? The role of learner

expectancies, beliefs, and attributions for success and failure in student

motivation. *Current Issues in Education, 7*(4).

Johnson, L., Adams, S., Cummins, M., Estrada, V., Freeman, A., & Ludgate, H. (2013).

The nmc horizon report: 2013 higher education edition.

Jones, B.A., Madden, G.J., Wengreen, H.J., Aguilar, S.S., & Desjardins, E.A. (2014).

Gamification of dietary decision-making in an elementary-school cafeteria. *PloS

one, 9*(4), e93872.

Kablan, Z. (2010). The effect of using exercise-based computer games during the process

of learning on academic achievement among education majors. *Educational

Sciences: Theory & Practice, 10*(1), 351-364.

Kapp, K.M. (2012). *The gamification of learning and instruction: Game-based methods

and strategies for training and education*: John Wiley & Sons.

Ke, F. (2008). Computer games application within alternative classroom goal structures:

Cognitive, metacognitive, and affective evaluation. *Educational Technology

Research & Development, 56*(5/6), 539-556. doi: 10.1007/s11423-008-9086-5

Kelle, S., Klemke, R., & Specht, M. (2013). Effects of game design patterns on basic life support training content. *Journal of Educational Technology & Society, 16*(1), 275-285.

Ker, J., Hogg, G., Maran, N., & Walsh, K. (2010). Cost-effective simulation. *Cost effectiveness in medical education*, 61-71.

Kucirkova, N., Messer, D., Sheehy, K., & Panadero, C.F. (2014). Children's engagement with educational ipad apps: Insights from a spanish classroom. *Computers & Education, 71*, 175-184.

Kuh, G., Kinzie, J., Buckley, J., Bridges, B., & Hayek, J. (2006). What matters to student success: A review of the literature: National Postsecondary Education Cooperative.

Lacorte, M. (2013). Sociopolitical and institutional conditions for teaching spanish as a l2 in us universities. *Spanish in Context, 10*(3), 331-349. doi: 10.1075/sic.10.3.01lac

Lardinois, F. (2015). Duolingo raises $45 million series d round led by google capital, now valued at $470m. from http://techcrunch.com/2015/06/10/duolingo-raises-45-million-series-d-round-led-by-google-ventures-now-valued-at-470m/#.lx7tky:dSmj

Lee, Y.-H., Heeter, C., Magerko, B., & Medler, B. (2012). Gaming mindsets: Implicit theories in serious game learning. *CyberPsychology, Behavior & Social Networking, 15*(4), 190-194. doi: 10.1089/cyber.2011.0328

Lent, R.W., Brown, S.D., & Larkin, K.C. (1984). Relation of self-efficacy expectations to academic achievement and persistence. *Journal of counseling psychology, 31*(3), 356.

Lewis, M., Simons, G., & Fennig, C. (2014). *Ethnologue: Languages of the world, seventeenth edition*   Retrieved from http://www.ethnologue.com

Lin, R.J., & Zhu, X. (2011). Leveraging social media for preventive care-a gamification system and insights. *Studies in health technology and informatics, 180*, 838-842.

Linnenbrink, E.A., & Pintrich, P.R. (2003). The role of self-efficacy beliefs instudent engagement and learning intheclassroom. *Reading & Writing Quarterly, 19*(2), 119-137. doi: 10.1080/10573560308223

Lopez, M.H., & Gonzalez-Barrera, A. (2013). What is the future of spanish in the united states? *Washington DC: Pew Research Center*.

Maninger, R.M., & Holden, M.E. (2009). Put the textbooks away: Preparation and support for a middle school one-to-one laptop initiative. *American Secondary Education, 38*(1), 5-33.

McCallum, S. (2012). Gamification and serious games for personalized health. *Studies in health technology and informatics, 177*, 85-96.

McGonigal, J. (2011). *Reality is broken: Why games make us better and how they can change the world*: Penguin.

Midgley, C., Maehr, M.L., Hruda, L.Z., Anderman, E., Anderman, L., Freeman, K.E., & Urdan, T. (2000). Manual for the patterns of adaptive learning scales. *Ann Arbor, 1001*, 48109-41259.

Mills, N., Pajares, F., & Herron, C. (2007). Self-efficacy of college intermediate french students: Relation to achievement and motivation. *Language Learning, 57*(3), 417-442. doi: 10.1111/j.1467-9922.2007.00421.x

Mitchell, A., & Savill-Smith, C. (2004). The use of computer and video games for learning. *A review of the literature*.

Multon, K.D., & Brown, S.D. (1991). Relation of self-efficacy beliefs to academic outcomes: A meta-analytic investigation. *Journal of counseling psychology, 38*(1), 30.

Nakamura, J., & Csikszentmihalyi, M. (2009). In C. R. Snyder & S. J. E. Lopez (Eds.), Oxford handbook of positive psychology (pp. pp. 195-206). New York, NY: Oxford.

Nolan, J., & McBride, M. (2014). Beyond gamification: Reconceptualizing game-based learning in early childhood environments. *Information, Communication & Society, 17*(5), 594-608. doi: 10.1080/1369118X.2013.808365

Onwuegbuzie, A.J., Bailey, P., & Daley, C.E. (2000). Cognitive, affective, personality, and demographic predictors of foreign-language achievement. *The Journal of Educational Research, 94*(1), 3-15.

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of educational research, 66*(4), 543-578.

Pajares, F., & Miller, M.D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem solving: A path analysis. *Journal of Educational Psychology, 86*(2), 193.

Panoutsopoulos, H., & Sampson, D.G. (2012). A study on exploiting commercial digital games into school context. *Journal of Educational Technology & Society, 15*(1), 15-27.

Papastergiou, M. (2009). Digital game-based learning in high school computer science education: Impact on educational effectiveness and student motivation. *Computers & Education, 52*(1), 1-12.

Pavlenko, A. (2003). 'Language of the enemy': Foreign language education and national identity. *International Journal of Bilingual Education and Bilingualism, 6*(5), 313-331.

Peal, E., & Lambert, W.E. (1962). The relation of bilingualism to intelligence. *Psychological Monographs: general and applied, 76*(27), 1-23.

Petersen, K.A. (2010). *Implicit corrective feedback in computer-guided interaction: Does mode matter?* : ERIC.

Peterson, M. (2010). Computerized games and simulations in computer-assisted language learning: A meta-analysis of research. *Simulation & Gaming, 41*(1), 72-93. doi: 10.1177/1046878109355684

Piirainen-Marsh, A., & Tainio, L. (2009). Collaborative game-play as a site for participation and situated learning of a second language. *Scandinavian Journal of Educational Research, 53*(2), 167-183. doi: 10.1080/00313830902757584

Pomerantz, E.M., Altermatt, E.R., & Saxon, J.L. (2002). Making the grade but feeling distressed: Gender differences in academic performance and internal distress. *Journal of Educational Psychology, 94*(2), 396.

Pufahl, I., & Rhodes, N.C. (2011). Foreign language instruction in u.S. Schools: Results of a national survey of elementary and secondary schools. *Foreign Language Annals, 44*(2), 258-288.

Qing, L., Lemieux, C., Vandermeiden, E., & Nathoo, S. (2013). Are you ready to teach secondary mathematics in the 21st century? A study of preservice teachers' digital game design experience. *Journal of Research on Technology in Education, 45*(4), 309-337.

Ranathunga, R., Rajakaruna, L., Karunarathna, S., Abeywardena, L., Nawinna, D., & Halloluwa, T. (2014). A gamified learning tool for sri lankan primary schools.

Reichardt, C.S. (2009). Quasi-experimental design. *The SAGE handbook of quantitative methods in psychology*, 46-71.

Rosas, R., Nussbaum, M., Cumsille, P., Marianov, V., Correa, M., Flores, P., . . . Salinas, M. (2003). Beyond nintendo: Design and assessment of educational video games for first and second grade students. *Computers & Education, 40*(1), 71-94. doi: http://dx.doi.org/10.1016/S0360-1315(02)00099-4

Rosenbusch, M.H. (2005). The no child left behind act and teaching and learning languages in us schools. *Modern Language Journal*, 250-261.

Rouse, K.E. (2013). *Gamification in science education: The relationship of educational games to motivation and achievement.* (3569748 Ph.D.), The University of Southern Mississippi, Ann Arbor. Retrieved from http://www.liberty.edu:2048/login?url=http://search.proquest.com/docview/13708 00410?accountid=12085

Rovai, A.P., Baker, J.D., & Ponton, M.K. (2013). *Social science research design and statistics : A practitioner's guide to research methods and spss analysis*. Chesapeake, VA: Watertree Press.

Ryan, C. (2013). Language use in the united states: 2011. *Washington, DC: US Census Bureau, August.*

Sangani, K. (2013). Byod to the classroom. *Engineering & Technology (17509637), 8*(3), 42-45.

Schuster, B.G. (2005). Did a foreign language in the elementary schools (fles) program in a kansas school district affect students' academic achievement in english? *Foreign Language Annals, 38*(3), 344-356.

Shapiro, J. (2015). Duolingo for schools is free, and it may change the edtech market. *Forbes*. http://www.forbes.com/sites/jordanshapiro/2015/01/08/duolingo-for-schools-may-change-the-edtech-market/

Shin, N., Sutherland, L.M., Norris, C.A., & Soloway, E. (2012). Effects of game technology on elementary student learning in mathematics. *British Journal of Educational Technology, 43*(4), 540-560. doi: 10.1111/j.1467-8535.2011.01197.x

Shin, R.Q. (2011). The influence of africentric values and neighborhood satisfaction on the academic self-efficacy of african american elementary school children. *Journal of Multicultural Counseling and Development, 39*(4), 218-228.

Shuler, C. (2012). *Ilearn ii: An analysis of the education category on apple's app store.* Paper presented at the Joan Ganz Cooney Center at Sesame Workshop. www. j oanganzcooneycenter. org/Reports-33. html (retrieved January 29, 2012).

Simonite, T. (2013). The cleverest business model in online education. *Technology Review, 116*(1), 66-67.

Sirin, S.R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. *Review of educational research, 75*(3), 417-453.

Stewart, J.H. (2005). Foreign language study in elementary schools: Benefits and implications for achievement in reading and math. *Early Childhood Education Journal, 33*(1), 11-16.

Stone, C.A. (1998). The metaphor of scaffolding: Its utility for the field of learning disabilities. *Journal Of Learning Disabilities, 31*(4), 344-364.

Taylor, C., & Lafayette, R. (2010). Academic achievement through fles: A case for promoting greater access to foreign language study among young learners. *The Modern Language Journal, 94*(1), 22-42.

Terlutter, R., & Capella, M.L. (2013). The gamification of advertising: Analysis and research directions of in-game advertising, advergames, and advertising in social network games. *Journal of Advertising, 42*(2-3), 95-112.

Tomlinson, C.A. (2012). *How to differentiate instruction in mixed-ability classrooms*: ASCD.

Trudgill, P. (2011). *Sociolinguistic typology: Social determinants of linguistic complexity*: Oxford University Press.

Urban, B., Tiefenbeck, V., & Roth, K. (2011). Energy consumption of consumer electronics in us homes in 2010. *Fraunhofer Center for Sustainable Energy Systems*.

USDOE. (2015). Fast facts.   Retrieved June 16, 2015, from http://nces.ed.gov/fastfacts/display.asp?id=28

van der Meij, H. (2013). Motivating agents in software tutorials. *Computers in human behavior, 29*(3), 845-857.

Vesselinov, R., & Grego, J. (2012). *Duolingo effectiveness study*. Retrieved from

http://static.duolingo.com/s3/DuolingoReport_Final.pdf

Vollmeyer, R., & Rheinberg, F. (2006). Motivational effects on self-regulated learning

with different tasks. *Educational Psychology Review, 18*(3), 239-253.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological*

processes. Cambridge: Harvard University Press.

Warner, R.M. (2008). *Applied statistics: From bivariate through multivariate techniques*.

Los Angeles: Sage Publications.

Watson, W.R., Mong, C.J., & Harris, C.A. (2011). A case study of the in-class use of a

video game for teaching high school history. *56*, 466-474. doi:

10.1016/j.compedu.2010.09.007

Weir, C.J. (2005). Language testing and validation. *Hampshire: Palgrave McMillan*.

Wood, R.T., Griffiths, M.D., & Parke, A. (2007). Experiences of time loss among

videogame players: An empirical study. *CyberPsychology & Behavior, 10*(1), 38-

44.

Wu, W.H., Hsiao, H.C., Wu, P.L., Lin, C.H., & Huang, S.H. (2012). Investigating the

learning-theory foundations of game-based learning: A meta-analysis. *Journal of*

Computer Assisted Learning, 28(3), 265-279. doi: 10.1111/j.1365-

2729.2011.00437.x

Wu, X., Lowyck, J., Sercu, L., & Elen, J. (2013). Task complexity, student perceptions of

vocabulary learning in efl, and task performance. *British Journal of Educational*

Psychology, 83(1), 160-181. doi: 10.1111/j.2044-8279.2011.02061.x

Xiao, J. (2012). Successful and unsuccessful distance language learners: An 'affective' perspective. *Open Learning, 27*(2), 121-136. doi: 10.1080/02680513.2012.678611

Zhi-Hong, C., Liao, C.C.Y., Cheng, H.N.H., Yeh, C.Y.C., & Tak-Wai, C. (2012). Influence of game quests on pupils' enjoyment and goal-pursuing in math learning. *Journal of Educational Technology & Society, 15*(2), 317-327.

Zimmerman, B.J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology, 25*(1), 82-91.

Zimmerman, B.J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American educational research journal, 29*(3), 663-676.

Appendix A

Site School's Class Placement Tally Sheet

Class Placement Tally Sheet - TEACHER NAME HERE

Class Placement Tally Sheet Class D — Student Name Last name, First name Alphabetical Order	RM	Gender		Academic Level				Behavior			Families		ESE			Assistance			Race	Reading Level				Math Level				Comments: Please do not leave blank; Provide as much information as you can in this space or attach a separate sheet if necessary.
		M	F	Academically Gifted	High Achieving	Average Achieving	Low Achieving	1	2	3	Two Parent	One Parent	Accommodation/Child Study	Lab	Tutoring	1	2	3	See Key	Academically Gifted	High Achieving	Average Achieving	Low Achieving	Academically Gifted	High Achieving	Average Achieving	Low Achieving	
1																													
2																													
3																													
4																													
5																													
6																													
7																													
8																													
9																													
10																													
11																													
12																													
13																													
14																													
15																													
16																													
17																													
18																													
19																													
20																													
21																													
22																													
23																													
24																													
25																													
Totals	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	

Administrative use only:

A = Asian   H=Hispanic
B=Black   I = American Indian
BI = Biracial   W = White

Appendix B

Instrument Analysis Questions

Adapted from Language Testing and Validation: An Evidence-based Approach (Weir, 2005)

For each of the items below, circle the number that REFLECTS YOUR VIEWPOINT on a five-point scale where:

1 = Strongly disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly agree

The test proctor script clearly states what the student is required to do.	**1**	**2**	**3**	**4**	**5**
Questions 1-10 are well written Spanish to English vocabulary questions.	**1**	**2**	**3**	**4**	**5**
Questions 11-20 are well written English to Spanish vocabulary questions.	**1**	**2**	**3**	**4**	**5**
Questions 21-30 are well written Spanish to English phrase/sentence questions.	**1**	**2**	**3**	**4**	**5**
Questions 31-40 are well written English to Spanish phrase/sentence questions.	**1**	**2**	**3**	**4**	**5**
Questions 41-45 are well-written Spanish grammar questions.	**1**	**2**	**3**	**4**	**5**

Questions 46-50 are well written English to Spanish grammar questions.	1	2	3	4	5
Fifty minutes for the test is a sufficient amount of time for the students to demonstrate their understanding of vocabulary, grammar, and phrases (recognizing the fact that some students will not complete the test, and that the test does not count for a grade).	1	2	3	4	5
The criteria for getting an answer marked as correct is clear to the student.	1	2	3	4	5
The order of the questions/sections is appropriate for the test, or the order of questions/sections is not a significant factor, and not in need of adjustment?	1	2	3	4	5
Having written instructions to prepare for each section—A, B, C, D, E, and F— is helpful.	1	2	3	4	5
The instructions for the tasks only contain words that are suitable for third and fourth grade students' level of language ability.	1	2	3	4	5
The instructions for the tasks use simple, easy to understand sentence structures.	1	2	3	4	5

Appendix C

Spanish Language Achievement Instrument for Pilot Test

A) Circle the letter of the best answer to the following questions.

1. <u>La niña</u> means:
a. the mom
b. the girl
c. the cat
d. the boy

2. 2. <u>Hola</u> means:
a. Goodbye
b. Thank you
c. I don't know
d. Hello

3. <u>El hombre</u> means:
a. the boy
b. the dog
c. the man
d. the plate

4. <u>Pan</u> means:
a. bread
b. coffee
c. cheese
d. eggs

5. <u>Hablar</u> means:
a. to run
b. to jump
c. to cry
d. to talk

6. <u>El libro</u> means:
a. the book
b. the pencil
c. the paper
d. the table

7. <u>Gracias</u> means:
a. Goodbye

b. Hello
c. Thank you
d. I'm fine

8. <u>Zapato</u> means:
a. Shoe
b. Tie
c. Pants
d. Skirt

9. <u>Qué</u> means:
a. When
b. Where
c. How
d. What

10. <u>Hermano</u> means:
a. Mother
b. Brother
c. Uncle
d. Sister

B) Circle the letter of the best answer to the following questions.

11. How do you say <u>Please</u> in Spanish?
   a. Por favor
   b. Gracias
   c. Buenos Dîas
   d. Adíos

12. How do you say <u>rice</u> in Spanish?
a. pollo
b. cebolla
c. tomate
d. arroz
   13. How do you say <u>apple</u> in Spanish?
a. uva
b. manzana
c. cereza
d. plátano

14. How do you say <u>dress</u> in Spanish?
a. falda
b. camisa

c. vestido
d. gorra

15. How do you say <u>chicken</u> in Spanish?
a. huevo
b. pollo
c. pescado
d. uva

16. How do you say <u>sugar</u> in Spanish?
a. sal
b. cebolla
c. azúcar
d. sopa

17. How do you say <u>cousin</u> in Spanish?
a. tío
b. primo
c. abuela
d. padre

18. How do you say <u>son</u> in Spanish?
a. hijo
b. hermana
c. madre
d. abuela

19. How do you say <u>horse</u> in Spanish?
a. perro
b. pato
c. gato
d. caballo

20. How do you say <u>bedroom</u> in Spanish?
a. baño
b. cocina
c. dormitorio
d. sala

C) What do the underlined Spanish sentences below mean? Circle the letter of the answer you choose.

21. <u>Yo soy un hombre.</u>
a. I am a dog.
b. I am a woman.

c. I am a grandfather.
d. I am a man.

22. <u>Yo hablo.</u>
a. I jump.
b. I speak.
c. You speak.
d. You dance.

23. <u>La mujer bebe la leche</u>.
a. The woman drinks the milk.
b. The woman drinks the juice.
c. The man drinks the milk.
d. The man drinks the juice.

24. <u>El gato bebe el agua.</u>
a. The dog drinks the water.
b. The man drinks the water.
c. The cat drinks the water.
d. The cat drinks the milk.

25. <u>La niña come manzanas.</u>
a. The girl eats apples.
b. The girl eats bananas.
c. The boy eats apples.
d. The boy eats bananas.

26. <u>El vestido es mío.</u>
a. The skirt is mine.
b. The belt is mine.
c. The sweater is mine.
d. The dress is mine.

27. <u>La camisa es azul.</u>
a. The dress is blue.
b. The skirt is green.
c. The pants are red.
d. The shirt is blue.

28. <u>Ella es mi madre.</u>
a. She is my mother.
b. He is my father.
c. She is my sister.

d. He is my brother.

29. <u>Tengo una familia.</u>
a. My family is big.
b. I have a family.
c. I have a grandmother.
d. My family is small.

30. <u>Hoy es lunes</u>.
    a. Today is Saturday.
    b. Today is Monday.
    c. Yesterday was Sunday.
    d. Yesterday was Monday.

D) Translate the underlined English sentences to Spanish. Circle the letter of the answer you chose.

31. How do you say <u>My birthday is in June.</u>
a. Mi cumpleaños es en junio.
b. Mi cumpleaños es en abril.
c. Mi cumpleaños es en noviembre.
d. Mi cumpleaños es en julio.

32. How do you say <u>The bedroom is white.</u>
a. La cocina es blanca.
b. El baño es blanco.
c. El dormitorio es blanco.
d. El dormitorio es negro.

33. How do you say <u>The apple is small.</u>
a. La pera es pequeña.
b. La uva es grande.
c. La cereza es grande.
d. La manzana es pequeña.

34. How do you say <u>I am a girl.</u>

    a. Yo soy un niño.
    b. Yo soy una mujer.
    c. Yo soy una niña.
    d. Yo soy una esposa.

35. How do you say <u>I speak Spanish</u>.
a. Yo hablo español.
b. Yo leo español.
c. Yo escribo español.
d. Yo no hablo español.

36. How do you say <u>The girl eats bread.</u>
a. El niño come pan.
b. La niña come manzanas.
c. La niña bebe pan.
d. La niña come pan.

37. How do you say <u>January is a month of the year.</u>
a. Julio es un mes de año.
b. Febrero es un mes de año.
c. Enero es un día de la semana.
d. Enero es un mes del año.

38. How do you say <u>I run in June.</u>
a. Yo corro en agosto.
b. Yo bebo en octubre.
c. Yo corro en junio.
d. Yo salto en febrero.

39. How do you say <u>Winter is a season.</u>
a. La primavera es una estación.
b. El otoño es una estación.
c. El verano es una estación.
d. El invierno es una estación.

40. How do you say <u>My chair is green</u>.
a. Mi escritorio es azul.
b. Mi silla es verde.
c. Mi sofa es verde.
d. Mi ventana es amarilla.

E) What word is missing? Circle the letter of the answer that makes sense.

41. Ella _____ mi hermana.
a. son
b. eres

c. es
d. soy

42. _____ tengo dos hermanos.
a. Él
b. Ella
c. Nosotros
d. Yo

43. _____ zapatos son negros.
a. Los
b. Las
c. EL
d. La

44. Los guantes son _____.
a. rojo
b. verde
c. amarillo
d. blancos

45. Nosotros _____ muy rápido.
a. corro
b. corremos
c. corren
d. corres

F) Choose the best answer. Circle the letter of the answer you choose.

46. How do you say I eat.

a. Ella come.
b. Nosotros comemos.
c. Yo como.
d. Usted come.

47. How do you say She writes a letter.

a. Ella escribo una carta.

b. Ella escribe una carta.

c. Ella escribimos una carta.

d. Ella escriben una carta

48. How do you say <u>We drink water.</u>

   a. Nosotros bebemos agua.

   b. Ellos beben agua.

   c. Yo bebo agua.

   d. Tú bebes agua.

49.How do you say <u>I cook the chicken.</u>

   a. Yo hablo el pollo.

   b. Ella cocina el pollo.

   c. Yo cocino el pollo.

   d. Tú cocinas el pollo.

50. How do you say <u>The shoes are green.</u>

   a. El zapato es verde.

   b. Los zapatos son verdes.

   c. Los zapatos son morados.

   d. El zapato es rojo.

Appendix D

Spanish Language Achievement Proctor Script

Directions for Administering Test

The test proctor says: "Good Morning/Afternoon boys and girls."

Part A:

The test proctor will say one of the following phrases depending upon when the test is being given.

At the start of the 12-week study the test proctor will say, "I am going to give you a test to see how much Spanish you already know."

At the close of the 12-week study the test proctor will say, "I am going to give you a test to see how much Spanish you have learned over the past 12 weeks."

Part B:

The test proctor then continues with the following information for the students:

"This test will NOT count as a grade. Do not worry if you do not know some of the answers, you are not expected to know all of them. Please answer every question the best you can by circling the LETTER that is next to the answer that you think is correct. If you have a question or something is not clear, please raise your hand, and I will try to help you. I cannot help you with the answers. I can only help you understand what the question is asking. Are there any questions before we begin?"

Appendix E

Spanish Achievement Instrument

NOMBRE _____

Student Number _____   **MAESTRA** _____

A. Write the correct English word from the word bank for each Spanish word given. Please write neatly.

1.   manzana means _____   6. huevo means_____

2.   fresa means _____   7. mujer means _____

3.   desayuno means _____   8. cuando means _____

4.   llave means _____   9. qué means _____

5.   corbata means _____   10. quién means _____

WORD BANK

shoe	plate	girl
tall	chair	strawberry
man	breakfast	lunch
rice	woman	folder
grape	brother	what
when	peanut	tie
who	peach	yellow
down	where	egg
apple	key	table
pig	bird	mine

B. Write the correct Spanish word from the word bank for each English word given. Please write neatly.

11. dress _____

12. sugar _____

13. lunch _____

14. dog _____

15. chicken _____

16. bear _____

17. without _____

18. which _____

19. brother _____

20. night _____

WORD BANK

enero	horno	largo
noche	artista	vestido
pez	pollo	grande
piso	comida	azúcar
nosotros	inglés	disculpe
almuerzo	primo	sin
hermano	cuál	oso
escribo	libro	carta
perro	arroz	tomate
naranja	camisa	caballo

C. Circle the letter by the word that would best complete the sentence.

21. Yo tengo_____para escribir
    a. el azul
    b. el lápiz
    c. el libro
    d. el lunes
    e. la mañana

22. Hay _____ días en la semana.
    a. diez
    b. dos
    c. cuatro
    d. nueve
    e. siete

23. Yo hablo_____.
    a. español
    b. ocho
    c. conejo
    d. baile
    e. pelo

24. El invierno es una_____.
    a. día
    b. mañana
    c. semana
    e. estacíon
    f. vacación

25. Me gusta comer _____.
    a. el amarillo
    b. el papel
    c. el pollo
    d. la mañana
    e. el domingo

26. Yo cocino en _____.
    a. el baño
    b. la sala
    c. el dormitorio
    d. el cuarto
    e. la cocina

27. El _____ es alto.
    a. señora
    b. ratón
    c. niña
    d. mujer
    e. hombre

28. La camisa es_____.
    a. abuela
    b. negra
    c. entera
    d. rota
    e. sala

29. Él es mi _____ mayor.
    a. hermano
    b. hermana
    c. abuela
    d. prima
    e. papá

30. El _____ es un animal grande.
    a. cangrejo
    b. ráton
    c. caballo
    d. araña
    e. niño

D. Circle the letter by the word that would best complete the sentence.

31. Yo como _____ en la mañana.
    a. el almuerzo
    b. la cena
    c. el otoño
    d. el desayuno
    e. la merienda

32. Hoy es lunes. Mañana será _____.
    a. sábado
    b. jueves
    c. viernes
    d. martes
    e. domingo

33. Ayer fue viernes. Hoy es_____.
    a. lunes
    b. mañana
    c. miércoles
    d. martes
    e. sábado

34. En el invierno hace_____.
    a. calor
    b. frío
    c. lluvia
    d. negro
    e. feo

35. El gato bebe_____.
    a. leche
    b. jugo
    c. galletas
    d. carne
    e. comida

36. La _____es para dormir.
    a. cama
    b. mesa
    c. cuchara
    d. lavadora
    e. sofá

37. La piscina es para _____.
    a. comer
    b. nadar
    c. beber
    d. soñar
    e. vivir

38. La niña come _____.
    a. jugo
    b. leche
    c. agua
    d. pan
    e. medicina

39. Ella es mi _____.
    a. tío
    b. abuelo
    c. primo
    d. abuela
    e. hermano

40. La _____ trabaja en la escuela.
    a. maestra
    b. policía
    c. doctora
    d. artista
    e. camarera

E. Circle the letter by the word that would best complete the sentence.

41. Ella _____ mi hermana.
    a. son
    b. eres
    c. es
    d. si
    e. soy

42. Los guantes son _____.
    a. rojo
    b. verde
    c. amarillo
    d. verdes
    e. azul

43. Nosotros _____ muy rápido.
    a. corro
    b. corremos
    c. corren
    d. corres
    e. corre

44. _____ tiene dos gatos.
    a. Ella
    b. Nosotros
    c. Yo
    d. Tú
    e. Ellos

45. Yo _____ mucho.
    a. caminamos
    b. caminan
    c. camino
    d. caminaís
    e. caminas

46. Yo _____ a la escuela.
    a. voy
    b. vas
    c. vamos
    d. va
    e. ves

47. El _____ con dinero.
    a. pagan
    b. pagaron
    c. pagamos
    d. pago
    e. paga

48. Mis _____ son azules.
    a. vestido
    b. zapatos
    c. camiseta
    d. sombrero
    e. blusa

49. Hay doce meses en _____ .
    a. una semana
    b. un día
    c. una estacíon
    d. un año
    e. un mes

50. ¿Cuántos niños hay en la clase? ____
    a. primavera
    b. veinte
    c. sueño
    d. veo
    e. domingo

Appendix F

Academic Self-Efficacy Survey

STUDENT SURVEY

The first question is an example.

I like strawberry ice cream.

| **1** | **2** | **3** | **4** | **5** | | NOT AT |
| ALL TRUE | SOMEWHAT TRUE | | VERY TRUE | | | |

HERE ARE SOME QUESTIONS ABOUT YOURSELF AS A STUDENT IN THIS CLASS. PLEASE CIRCLE THE NUMBER THAT BEST DESCRIBES WHAT YOU THINK.

1. I'm certain I can master the skills taught in class this year.

| **1** | **2** | **3** | **4** | **5** | | NOT AT |
| ALL TRUE | SOMEWHAT TRUE | | VERY TRUE | | | |

2. I'm certain I can figure out how to do the most difficult class work.

| **1** | **2** | **3** | **4** | **5** | | NOT AT |
| ALL TRUE | SOMEWHAT TRUE | | VERY TRUE | | | |

3. I can do almost all the work in class if I don't give up.

| **1** | **2** | **3** | **4** | **5** | | NOT AT |
| ALL TRUE | SOMEWHAT TRUE | | VERY TRUE | | | |

4. Even if the work is hard, I can learn it.

| **1** | **2** | **3** | **4** | **5** | | NOT AT |
| ALL TRUE | SOMEWHAT TRUE | | VERY TRUE | | | |

5. I can do even the hardest work in this class if I try.

| **1** | **2** | **3** | **4** | **5** | | NOT AT |
| ALL TRUE | SOMEWHAT TRUE | | VERY TRUE | | | |

Appendix G

Permission to Use Academic Self-Efficacy Survey

License Agreement #6983-umich

This license agreement is *completed*.

Pricing Information

Unit Price
$0.00

Quantity
1

Net Price
$0.00

Sales Tax
$0.00

Shipping
$0.00 None Selected

Total Price
$0.00

Licensee Information

First Name
Jason

Last Name
Rachels

Email Address
jasonrachels@gmail.com

Organization
Liberty University

Title
Doctoral Student

Phone Number
9542144973

Address
Jason Rachels7627 Sunflower Drive

City
  Margate

State
  FL

Zip Code
  33063

Country
  US

Digital Downloads

This agreement includes 1 digital file, each available to the licensee for download.

- **Manual for the Patterns of Adaptive Learning Scales** - PDF - 421 KB

  No expiration date or download limit set.

  # Full License Agreement

  Following is the full and final license agreement text.

  IMPORTANT – READ CAREFULLY: This Agreement is a legal agreement between "LICENSEE" (defined below) and The Regents of The University of Michigan, a constitutional corporation of the state of Michigan ("MICHIGAN").

  The parties agree as follows:

  A. By copying, downloading, accessing or otherwise using the MANUAL, LICENSEE agrees to be bound by the terms of this Agreement. If LICENSEE does not agree with the terms of this Agreement, it shall not download, access or use the MANUAL.

  B. The Regents of the University of Michigan hereby grants to LICENSEE permission to copy and distribute, or otherwise make available via public display, content from the MANUAL for the Patterns of Adaptive Learning Scales ("MANUAL") only through the Licensors' doctoral or educational non-commercial research. This grant does not include the right to make any other modifications or create derivative works of the MANUAL.

  C. This permission is granted on the condition that LICENSEE properly attributes the MANUAL to the University of Michigan and includes the following copyright notice "Copyright © 2000 The Regents of the University of Michigan."

  D. All right and interest in the MANUAL, including, without limitation, the right to copy and distribute the MANUAL, shall remain with the University of Michigan.

E. The term "LICENSEE" shall mean the person downloading the MANUAL if the use hereunder is solely for personal use by that person on the personal equipment of that person. If the MANUAL is being downloaded to equipment for use by a juristic or legal entity, such as a corporation, limited liability company or partnership, then by proceeding with the installation, (a) the person downloading the MANUAL certifies that he or she has legal authority to bind that legal entity to this Agreement and (b) that legal entity shall be considered to be the LICENSEE.

F. MICHIGAN hereby grants to LICENSEE a non-exclusive, non-transferable, license right to use the MANUAL solely for non-commercial, education, or research purposes, in source form, and subject to the terms and conditions of this Agreement. LICENSEE shall not and does not have the right to distribute the MANUAL or create derivative works (as defined under the U.S. Copyright Act or otherwise).

Appendix H

Permission to Publish Academic Self-Efficacy Survey

From: Tim Urdan <turdan@scu.edu>
Date: Friday, June 3, 2016 at 6:02 PM
To: Jason Rachels <jasonrachels@gmail.com>
Subject: Re: Jason Rachels - Request to post 5 PALS questions in my dissertation online

Hello. As long as you cite the source (the one you listed looks good) and mention that the items originally came from the Patterns of Adaptive Learning Survey you are free to use and adapt the items.

Best of luck with your dissertation.

On Wed, Jun 1, 2016 at 3:34 PM, <jasonrachels@gmail.com> wrote:
The following message was sent from the e-mail form in the SCU Online Phonebook:

A message from: Jason Rachels
Greetings!

I am contacting you because I would like to ask permission to reproduce 5 questions from your survey in my dissertation, The Effect of Gamification on Elementary Students' Foreign Language Achievement and Academic Self-Efficacy. After defending my dissertation, my program requires me to submit it for publication in the Liberty University open-access institutional repository, the Digital Commons, and in the Proquest thesis and dissertation subscription research database. If you allow this, I will provide a citation of your work as follows:

Midgley, C., Maehr, M.L., Hruda, L.Z., Anderman, E., Anderman, L., Freeman, K.E., & Urdan, T. (2000). Manual for the patterns of adaptive learning scales. Ann Arbor, 1001, 48109-41259.

Thank you for your consideration in this matter!

FYI: I first contacted techtransfer@umich.edu and received this response:
Jason, this request should typically go to the faculty members. From a quick search, I believe that Professor Urdan, the senior author, is now at Santa Clara University.
Rick

Jason Rachels
Liberty University Student

Appendix I

Permission to use *Duolingo*® Screenshot Images
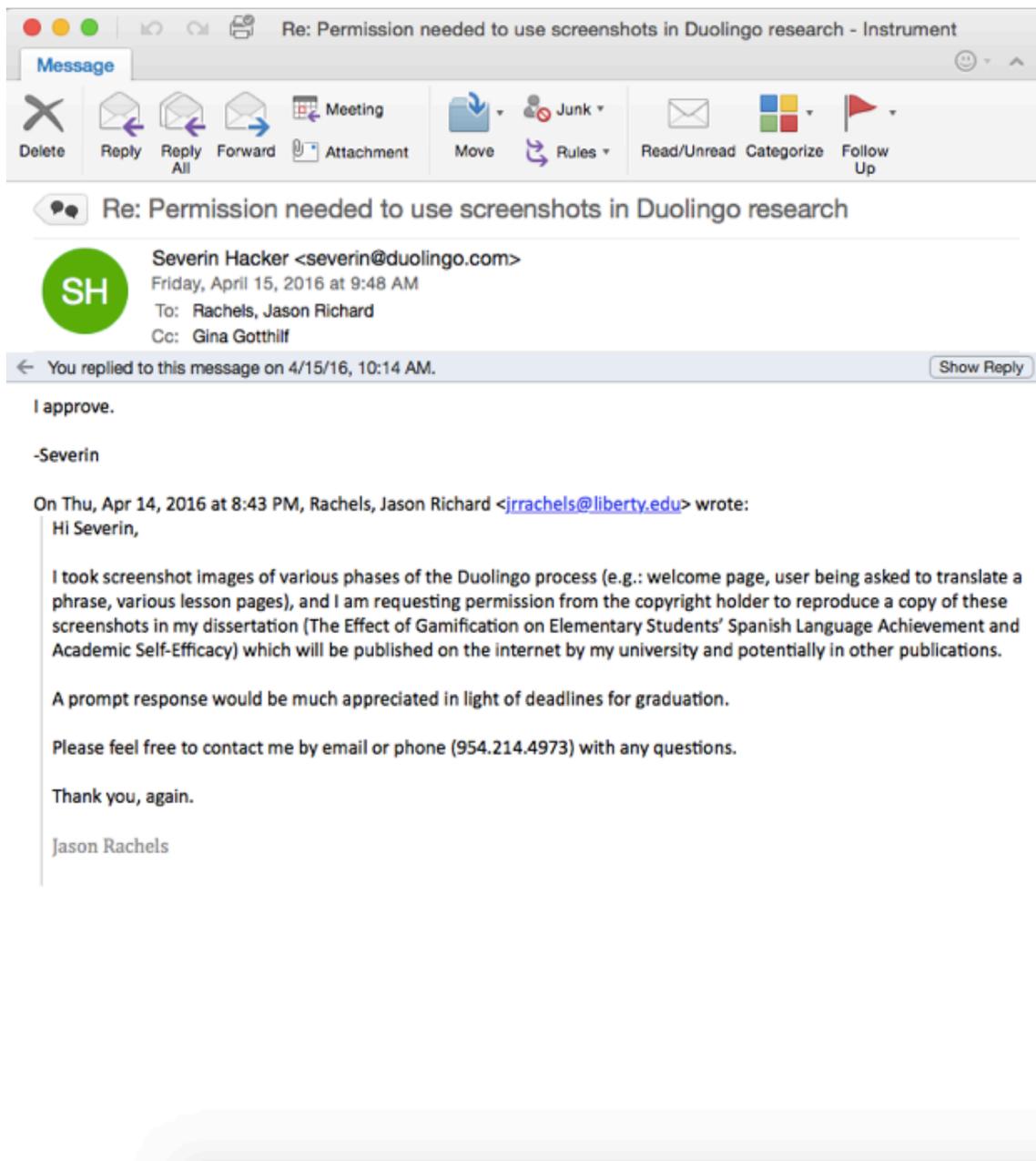
Appendix J

Example Lesson Plans for Control Group

Elementary Spanish 4th Grade
Lesson Plan Week of 2-16-2015

Biblical Integration: God made us part of a family. Exodo 20:12 Honra a tu padre y a tu madre…

Objective:
Students will:
- learn the names of family members (6 this week)
- tell how many siblings they have & their names

New Vocabulary: madre, padre, hermano, hermana. abuelo, abuela
                           mayor, menor
Sentence structure: Tengo _____ hermanos/hermamas.
                           Mi hermano (or hermana) se llama _____.

Methods/Activities:

Pray, Praise Song (Grande Para Salvar), Verse of Month (1 Juan 4:8 Dios es Amor)
Sing Juan 3:16, Newscast (2 student anchors)

Practice greeting conversation (in their folders) up to #5.

Circle area- Read book La Familia - stopping to point out family members & feminine/masculine nouns. Read second time with students reading words this time.

Introduce family pictures with labels on board. Ask "¿Cómo se dice? (How do you say?) and (¿Qué quiere decir?) with new family vocab.
Students tell about their siblings using "Yo tengo _____ hermanos."

Play Family song (CD)

Student volunteers to add family names to pink (feminine) or blue (masculine) balloon posters on wall.

Materials:
Book "La Familia", pictures of family & labels, CD for song

Assessment: Students will know 6 names of family & be able to tell what siblings they have using proper sentence structure.

Appendix J – Continued

Elementary Spanish 4th grade
Lesson Plan Week of 3/16/2015

 Biblical Integration: God provides for all of our needs.
     Salmo 23:1   El Señor es mi pastor, nada me faltará

Objective:
-Review family member names
-Learn the names of rooms of the house.

New Vocabulary: el dormitorio, la cocina, la sala, el baño, el sótano, las escaleras

New Sentence Structure: (Family member) **está en** (room of house.)

Method/Activities:

Pray, Praise Song (Grande Para Salvar), Verse of Month (Salmos 23:1)
Sing Juan 3:16, Newscast (2 student anchors)

Practice greeting conversation in folder up to #5.

Play Family Rap Video to review family names. (3 min) Students ask each other down rows
¿Cómo se dice? (How do you say?) & ¿Qué quiere decir?(What does it mean?) for each family
member vocab

Rapid fire bell game for family.

Put up pictures of rooms and labels on board.
Students repeat for each. Ask ¿Cómo se dice? & ¿Qué quiere decir? for each then students ask
each other.

Put up poster of house and 2 or 3 velcro family members in some of the rooms. Ask ¿Dónde está
(the family member)? (Where is (the family member?) Model a few sentences with new structure
– ex: La abuela está en la sala. Or El hermano está en la cocina. Take them down. Have students
come to board in partners and do the same. One puts the velcro family in a room and askes
"¿Dónde está _____?" and the other partner answers in full sentence with new structure.

Sts will fill in their own houses with room names.

Materials:
Computer for rap video.   Pictures & labels of family for ¿Cómo se dice ? questions.
Pictures & labels of rooms of house and poster of house, Velcro family members. House layout
pictures for each student

Assessment:
Students will be able to say in what room family member is in complete sentence using new
structure.

Appendix J – Continued

Elementary Spanish 4th Grade
Lesson Plan Week of 4-13-2015

Biblical Integration: God provides for all of our needs.
    Salmo 23:1   El Señor es mi pastor, nada me faltará

Objective:
Students will:
-    Review names of classroom items
-    Learn a song about classroom items
Vocabulary to review from this unit: mochila, papel, lápiz, pegamento, tijeras, crayones, regla, carpeta, libro, cuaderno
Sentence structure: Tengo (whatever they have.)
                          Él/Ella tiene _____. (He/She has
_____.)

Methods/Activities:
Pray, Praise Song (Grande Para Salvar), Verse of Month, Sing Juan 3:16, Newscast (2 student anchors)

Practice greeting conversation (in their folders) up to #5.

Review classroom items and colors with bell game.
Remind students that adjectives come before nouns (lápiz amarillo= yellow pencil) and colors match nouns in number and gender unlike English.

Give out various school supplies- 2-3 for each student. Ask each student what he/she has- student replies by holding up what they have Yo tengo_____ y _____ y _____. (Ex: I have a pencil and a book and a ruler.) Encourage students to use colors to describe as well. Then they tell us what their partner has using "Él/Ella tiene _____. (He/She has
_____.)

Play reggae video song about things in a red backpack "En Mi Mochila Roja" – students sing along and hold up their items when the song gets to them. (It's a cumulative reggae kind of song about all these items in a backpack and it moves fast so students have to be paying attention.)

Student volunteers to add school supply names to pink (feminine nouns) or blue (masculine nouns) balloon posters on wall.

Circle- Students will read Weekly Reader magazine- school supply edition.

Materials:
pictures of school supplies, 2 bells, computer for song, weekly reader magazine

Assessment: Students will know the names of school supplies and be able to tell class what they have and what their partner has using proper sentences.

Appendix K

Duolingo® Class Leaderboard Example

Appendix L

U.S. Census Bureau information on Broward County, FL

People QuickFacts	Broward County	Florida
Population, 2013 estimate	1,838,844	19,552,860
Population, 2012 estimate	1,814,813	19,320,749
Population, 2010 (April 1) estimates base	1,748,066	18,802,690
Population, percent change, April 1, 2010 to July 1, 2013	5.2%	4.0%
Population, percent change, April 1, 2010 to July 1, 2012	3.8%	2.8%
Population, 2010	1,748,066	18,801,310
Persons under 5 years, percent, 2012	5.8%	5.5%
Persons under 18 years, percent, 2012	21.6%	20.7%
Persons 65 years and over, percent, 2012	14.7%	18.2%
Female persons, percent, 2012	51.4%	51.1%
White alone, percent, 2012 (a)	66.1%	78.3%
Black or African American alone, percent, 2012 (a)	27.9%	16.6%
American Indian and Alaska Native alone, percent, 2012 (a)	0.4%	0.5%
Asian alone, percent, 2012 (a)	3.5%	2.7%
Native Hawaiian and Other Pacific Islander alone, percent, 2012 (a)	0.1%	0.1%
Two or More Races, percent, 2012	2.0%	1.9%
Hispanic or Latino, percent, 2012 (b)	26.5%	23.2%
White alone, not Hispanic or Latino, percent, 2012	41.9%	57.0%
Living in same house 1 year & over, percent, 2008-2012	83.7%	83.7%
Foreign born persons, percent, 2008-2012	31.4%	19.3%
Language other than English spoken at home, pct age 5+, 2008-2012	37.5%	27.3%
High school graduate or higher, percent of persons age 25+, 2008-2012	87.6%	85.8%
Bachelor's degree or higher, percent of persons age 25+, 2008-2012	29.9%	26.2%
Veterans, 2008-2012	96,528	1,606,758
Mean travel time to work (minutes), workers age 16+, 2008-2012	27.1	25.8
Housing units, 2013	812,565	9,047,612

Appendix L - Continued

People QuickFacts	Broward County	Florida
Housing units in multi-unit structures, percent, 2008-2012	48.1%	30.1%
Median value of owner-occupied housing units, 2008-2012	$199,900	$170,800
Households, 2008-2012	665,913	7,147,013
Persons per household, 2008-2012	2.62	2.58
Per capita money income in past 12 months (2012 dollars), 2008-2012	$28,547	$26,451
Median household income, 2008-2012	$51,603	$47,309
Persons below poverty level, percent, 2008-2012	13.5%	15.6%

Business QuickFacts	Broward County	Florida
Private nonfarm establishments, 2012	56,600	502,414[1]
Private nonfarm employment, 2012	619,069	6,932,382[1]
Private nonfarm employment, percent change, 2011-2012	3.7%	3.0%[1]
Nonemployer establishments, 2012	215,377	1,775,605
Total number of firms, 2007	237,524	2,009,589
Black-owned firms, percent, 2007	16.4%	9.0%
American Indian- and Alaska Native-owned firms, percent, 2007	0.5%	0.5%
Asian-owned firms, percent, 2007	3.7%	3.2%
Native Hawaiian and Other Pacific Islander-owned firms, percent, 2007	0.1%	0.1%
Hispanic-owned firms, percent, 2007	22.1%	22.4%
Women-owned firms, percent, 2007	29.8%	28.9%
Manufacturers shipments, 2007 ($1000)	7,160,772	104,832,907
Merchant wholesaler sales, 2007 ($1000)	31,411,627	221,641,518
Retail sales, 2007 ($1000)	30,886,257	262,341,127
Retail sales per capita, 2007	$17,680	$14,353
Accommodation and food services sales, 2007 ($1000)	4,209,090	41,922,059
Building permits, 2012	3,556	64,810

<center>**Appendix M**</center>

<center>**School Study Approval Letter**</center>

December 15, 2014

Dear Mr. Rachels:

RE: Research Study Approval – The Effect of Gamification on Elementary Students' Spanish Language Achievement and Academic Self-Efficacy

This letter provides written approval for your quasi-experimental research study which seeks to determine the ability of the foreign language app *Duolingo*® to support instructional strategies and affect Spanish language achievement and academic self-efficacy within XXXX XXXX XXXX.

Your study sounds very interesting, and I applaud your efforts of continued education. If I can provide additional information to support this approval, please be encouraged to contact me at XXX-XXX-XXXX or by email.

Respectfully Submitted,

XXXX XXXX
Superintendent

Appendix N

Liberty University IRB Approval Letter

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

January 19, 2015

Jason Rachels
IRB Exemption 2077.011915: The Effect of Gamification on Elementary Students' Spanish Language
Achievement and Academic Self-Efficacy

Dear Jason,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application and no further IRB oversight is required.

Your study falls under exemption category 46.101(b)(2), which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:101(b):

> (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
> (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Please note that this exemption only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued exemption status. You may report these changes by submitting a change in protocol form or a new application to the IRB and referencing the above IRB Exemption number.

If you have any questions about this exemption or need assistance in determining whether possible changes to your protocol would change your exemption status, please email us at irb@liberty.edu.

Fernando Garzon, Psy.D.
Professor, IRB Chair
Counseling

(434) 592-4054

LIBERTY
UNIVERSITY.

Liberty University | Training Champions for Christ since 1971

1971 UNIVERSITY BLVD. LYNCHBURG, VA. 24515   IRB@LIBERTY.EDU   FAX (434) 522-0506   WWW.LIBERTY.EDU