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Gamification and Implications for Second Language Education: A Meta Analysis

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Gamification and Implications for Second Language Education: A Meta Analysis

by

Christopher M. Garland

A Thesis

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Abstract

Gamification is a fairly new concept that involves using game elements in non-game contexts. It has been shown that gamification can increase motivation and learning, but there have been conflicting results, with some studies reporting opposite findings. Because of these motivational results and benefits that have been reported, many researchers have attempted to use gamification in educational settings. Again, these studies have shown mixed results. However, as a large number of studies have shown benefits from using gamification in educational settings, it is important to know exactly what aspects of gamification are beneficial so that it can be properly used in second language education. The present study is a meta analysis of gamification of education research that set forth to determine what aspects of gamification are important in educational settings, and how this information can be used to successfully use gamification in second language education. Overall, it was found that gamification typically had a positive effect. Additionally, several moderator variables were of importance, including the length of instruction, inclusion of competitive aspects, and usage of time on task elements.

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Chapter I

INTRODUCTION

Games are a common aspect of both the classroom, as well as many peoples' lives. Because of this, many instructors have attempted to use games in some form or another in the classroom. However, the methods for doing this vary from individual to individual and setting to setting. One new way of incorporating games into the classroom is the idea of "gamification" which Kapp (2012) defined as "using game-based mechanics, aesthetics, and game thinking to engage people, motivate action, promote learning, and solve problems" (p. 10). Simply put, gamification involves using elements from games in the classroom, and can be done in numerous ways. One reason gamification has become so popular in recent years is because of its possible impact on user motivations and learning. This is especially important in second language education, as motivation has been consistently linked with learning (Brown, 2007). Gamification may provide another method through which instructors can motivate their students to learn the target language, which could be extremely beneficial.

However, while games have been commonly used in educational settings gamification itself is a fairly new concept. As such, there is relatively little research on the topic. As Lee and Hammer (2011) stated, the use of gamification has been primarily conducted in marketing or other business fields with varying levels of success. While there are studies suggesting the use of gamification in the classroom, there is very little actual research on the topic, and even less that has been conducted in second language education. However, what research has been done has shown mixed results. While some studies report positive results of gamification on both learning and motivation, others report the opposite. Nonetheless, it is evident that gamification can be

beneficial if used properly. If gamification can have a positive impact on learning and motivation, then it has a place in the classroom. By extension, this impact can also be extended to second language education. Language teachers are always attempting to promote learning and motivate their students, and gamification may be one novel way to do this.

Due to the lack of research in the field of gamification of second language education, numerous questions arise as to how gamification can be used, and how it can be most beneficial. For this study, the chief focus was on what aspects of gamification are beneficial, and how this information can be used in second language education. Therefore, the research questions for the study were as follows:

- What effect can gamification have in educational or learning settings?
- What elements are important when using gamification in an educational situation?
- How can this knowledge be used in order to use gamification in second language learning?

To answer the research questions, a meta analysis of relevant studies concerning gamification in educational settings was conducted. Studies were examined for effects on learning and motivation, as well as the ways in which these gamification studies were conducted. By analyzing these gamification studies that were conducted on learning and in educational settings it was possible to determine the benefits and drawbacks of using gamification in the classroom, as well as the key moderator variables that were most important. This yields important insights into how gamification can best be used in the second language classroom, and provide directions for future research in the field.

It was found that a number of moderator variables seemed to be important when using gamification in educational settings. Length of instruction, competitive aspects, instructional medium, age level, and time on task all showed significant correlations in certain areas. Specifically, it was found that gamification appears to work best in shorter courses that include competitive elements. Additionally, gamification applications are more effective in courses with an online or platform aspect, involving university or older students. Lastly, time on task was an extremely important factor, with studies that used high or medium amounts of time on task applications having a strong positive correlation, and studies using low time on task no correlation. This provides important information for the ways in which gamification can be used in language classrooms, as well as directions for future research.

Chapter II

LITERATURE REVIEW

Games are commonly used in the classroom in order to facilitate learning. Randel, Morris, Wetzel and Whitehill (1992) conducted an analysis of research using games in educational settings. They found that when used properly games could be quite successful in the classroom, and also that games are typically more motivating than normal instruction. Based on their influence on learners, the authors stated “that games/simulations are more interesting than traditional classroom instruction is both a basis for using them as well as a consistent finding” (p. 270). Because games can have an impact on student learning and motivation they can and should be used in the classroom. Additionally, they found that using games in language arts was particularly effective, especially when used with properly defined goals.

Defining Gamification

Gamification is a newer phenomenon that seeks to integrate some elements from games into other settings. According to Deterding, Dixon, Khaled, and Nacke (2011) gamification is “the use of game design elements in non-game contexts” (p. 11). Sheldon (2012) offered a similar definition, in which he stated that “gamification is the application of game mechanics to non-game activities” (p. 75). These definitions, while useful, are at the same time lacking. Games themselves have many different mechanics, and their application to other fields may differ depending on the context.

In order to further clarify exactly what gamification consists of Deterding et al. (2011) established five levels of game elements that should be included in a definition of gamification. These five levels are interface design patterns, game design patterns and mechanics, design

principles and heuristics, game models, and game design methods. These levels include a variety of game elements, from leaderboards to badges, as well as playtesting and time constraints commonly found in games. However, one thing the authors cautioned is that gamification does not necessarily include each and every game element or aspect of these levels. In this aspect, gamification differs from serious games, which is a similar concept to that of gamification.

Serious games differ from gamification in a few key aspects. Firstly, as Deterding et al. (2011) stated, in gamification game elements are used on an already existing course or construct in order to create a gamified experience. Serious games, however, involve the use of game elements to create the course itself. Bedwell, Pavlas, Heyne, Lazzara and Salas (2012) developed a taxonomy of serious game elements which outlined nine categories of game attributes that can be applied to serious games, and are typically found in all serious games, although in different amounts and usage. These nine categories are action language, assessment, conflict/challenge, control, environment, game fiction, human interaction, immersion, and rules or goals. In developing a theory of gamification of learning, Landers (2014) adapted these nine attributes to the field of gamification, and showed how the same categories and theory can be used in the gamification of learning. However, while all of these attributes are present in some form or another in serious games, they are not always present in gamification. Instead, specific attributes are chosen and used in a different context. Therefore, at its most basic form, gamification can be thought of using game elements in other contexts. However, for the purposes of this meta analysis, Landers' definition is most relevant.

Game based learning is another area that has some overlap with gamification. All, Nuñez Castellar, and Van Looy (2016) outlined how game based learning is used, and highlight a few

important aspects of the process. One important thing is that in game based learning the game is the medium through which learning takes place. There are two types of games used in game based learning. The first is that in which a game has been created specifically for an educational purpose, and the other is when games developed for entertainment purposes are used in an educational setting. This differs greatly from gamification, in which aspects of games and game elements are used to facilitate learning. In game based learning, the game is the medium through which learning takes place, whereas in gamification only aspects of games are used in order to facilitate learning and motivate learners.

Motivation and Learning

Motivation is widely accepted as being important for learning. Specifically, there are two kinds of motivation: extrinsic and intrinsic. According to Lepper (1988):

Intrinsically motivated behavior was defined as behavior undertaken for its own sake, for the enjoyment it provides, the learning it permits, or the feelings of accomplishment it evokes. Extrinsically motivated behavior, by contrast, involved actions undertaken in order to obtain some reward or avoid some punishment external to the activity itself.
(p. 292)

As Lepper (1988) stated, learners tend to perform better when intrinsically motivated. Extrinsic motivation has been shown to result in lower motivation and learning over time, even in gamified contexts (Hanus & Fox, 2015). This does not, however, mean that extrinsic motivational techniques cannot still be used in learning. Instead, these extrinsic motivational tools can be incorporated into activities and used in a manner that reinforces students' intrinsic

motivation and behaviors (Landers, 2014). Therefore, depending on how gamification is used and incorporated, gamification can be used to increase both extrinsic and intrinsic motivation.

Motivation is especially important in language learning. As Brown (2007) stated, “Motivation is a star player in the cast of characters assigned to second language learning scenarios around the world” (p. 168). As in other learning scenarios, motivation is both extremely important, and at the same time difficult to engage in second language learners in the classroom. Additionally, as Brown stated, it seems clear that intrinsic motivation is a more powerful player in the classroom. However, the use of gamification typically attempts to increase learners’ extrinsic motivation. Landers and Landers (2014) have demonstrated, however, that careful application of gamified elements can influence learner behaviors and attitudes, which can have a positive effect on intrinsic motivation. Therefore, it stands to reason that gamification will be useful in increasing both student learning and motivation if properly utilized.

Dörnyei (2014) has done extensive research on motivation in second language learning. He proposes a motivational self system. Learners are concerned with their ideal L2 self, the ought-to L2 self, and their L2 learning experience. In order to increase student motivation, he outlines three motivational principles. First, there is more to motivation than rewards and punishment. Second, motivation must be generated, maintained, and protected. Lastly, “it is the quality (not the quantity) of the motivational strategies that we use that counts” (Dörnyei, 2014, p. 523). Additionally, the author lists a number of motivational strategies, which includes group competition and cooperation, as well as making learning tasks more interesting and less monotonous. Many of the principles and methods that Dörnyei outlined are areas in which

gamification can be extremely beneficial, and provides support for the usage of gamification in second language acquisition.

Gamification of Learning

Due to the relatively short time period during which gamification has been utilized in education there has not yet been a great deal of research done in the field. However, the amount of research is growing in a number of ways. Some studies have been done that examine literature in the field in order to gain a better understanding of the research that has been conducted.

Hamari, Koivisto, and Sarsa (2014) conducted review of gamification studies and found that gamification was being frequently utilized in education and learning studies. This suggests that while there is not a great dearth of information on gamification in education, there is interest in the field.

In similar work, De Sousa Borges, Durelli, Reis, and Isotani (2014) examined a number of studies on gamification in education. Two important things that they found were that the context and the research objectives for the use of gamification were extremely important. It was found that gamification has been primarily used in educational contexts within higher education. The researchers believe that this may be related to the growing interest in eLearning in the field of education. As gamification takes many elements from video or computer games, eLearning platforms are a logical extension. Secondly, they also found that engagement was the primary objective of a vast majority of the studies that they examined. According to Lee and Hammer (2011) “Gamification can motivate students to engage in the classroom, give teachers better tools to guide and reward students, and get students to bring their full selves to the pursuit of learning” (p. 1). Simply put, gamification has the ability to motivate students, and many studies have

attempted to use gamification in this way. Lee and Hammer (2011) stated that by using gamification techniques in cognitive, emotional, and social areas, it may be possible to motivate students and increase learning. However, at the same time, they do offer possible drawbacks to gamification. Gamification may be quite taxing on the instructor, and may also only increase extrinsic motivation. It can even lessen the impact and enjoyment students may get from games. Nonetheless, if used properly, the researchers state that gamification can be beneficial.

This impact on motivation is often referenced in other studies on gamification, in that it may motivate different individuals in different ways, depending on the context in which gamification is used. Hamari et al. (2014) conducted an analysis of a number of studies on gamification, some of which included studies that used gamification in educational settings. They found that while motivation increased in a number of studies, the motivational increases were highly dependent on context. In their analysis of gamification research, every study examined reported positive effects from the use of gamification. However, all of the educational studies examined reported both positive and negative effects. Additionally, they reported a large number of different ways in which gamification was used within the research in order to increase motivation. The success of the also study varied greatly depending on the users. Therefore, they suggest that while gamification may be beneficial, more research needs to be done in order to determine what exactly can allow for these benefits.

Because of the various ways in which gamification can be used in the classroom there has also been some confusion. As a fairly new field, it is unclear as to what aspects are to be included in gamification. Landers (2014) set out to provide a clear definition of gamification and how it could be used in learning. His nine attribute categories for gamified learning are different

areas in which gamification can be put to use in the classroom. Because of this variety, there are clearly many different ways in which gamification can be used in the classroom.

Because of this great variety, and the relative novelty of gamification in the field of education, it is no wonder that there are a great number of conflicting views on the use of gamification in education. However, expanding on these attribute categories, Landers (2014) proposed a general framework for the use of gamification in learning. Instead of focusing on the gamification of specific elements of the classroom, he instead proposed a framework that focuses on changing the behaviors and attitudes of learners. Landers believes that the game elements used in gamification can be used to benefit both instruction and learner motivation.

This framework provides directions for instructors when determining how to apply gamification in the classroom. Additionally, this theory of gamification is more about learner behaviors and attitudes, as opposed to the simple enjoyment of the game itself. As Landers (2014) stated:

For gamification to be successful, it must successfully alter an intermediary learning behavior or learner attitude. That behavior or attitude must then itself cause changes in learning directly (as a mediating process), or it must strengthen the effectiveness of existing instructional content (as a moderating process). (p. 765)

By using gamification properly, instructors can influence learner behaviors, which should increase learning both in the present course and in the future.

As of the present study, in learning and educational contexts gamification has been used in a variety of fields with various results. Nevin et al. (2014) found positive motivational effects of gamification when used with graduate medical students. In work with computer science

students, Li, Dong, Untch and Chasteen (2013) found that gamification increased student motivations, which resulted in the gamified group posting three times as much to an online discussion group when compared with students who received no gamification modification. Bellotti, Berta, de Gloria, and Lavagnino (2013) used gamification with engineering students to increase student motivation. Cheong, Cheong, and Filippou (2013) applied gamification principles to a class of undergraduate information technology students and also found increases in learner motivations. Gamification has even been used in the field of art. Han (2015) used gamification in an art class to increase student motivation. Of note is that the majority of these applications of gamification were used in eLearning, which as de Sousa Borges et al. (2014) found, is quite common in the gamification of education. As of yet, however, there has been very little research done on the use of gamification in second language education.

Studies with Positive Results

A more in depth look at gamification studies reveals more specific information about the uses of gamification, and the ways in which it can impact learning. One extremely common way that gamification has been used in education is through the introduction of badges and leaderboards. Gibson, Ostashevski, Flintoff, Grant, and Knight (2015) provided an overview how these badges can be useful and beneficial for both students and instructors. They stated that “Digital badges seem to have important impacts on motivation for learning, status within a community, and can transparently display achievement level” (p. 409). Much of the research on gamification of learning that uses badges seeks to find similar results. In work with an undergraduate course, Denny (2013) sought to determine the effects of badges and achievements on students in an eLearning platform. It was found that badges had a significant impact on

student motivation. Numerous other studies have also used badges. Deterding et al. (2011) included badges in the framework for gamification under interface design patterns. The reason badges are likely so common in gamification is for two reasons. Firstly, badges can easily be applied to an already existing framework. Secondly, badges were one of the first forms of widely accepted gamification. Their status as a mainstay in gamification frameworks likely contributes to their continued use.

In support of this theory of gamified learning, Landers and Landers (2014) set out to use the framework in a study in an online university course by introducing leaderboards. As the author's stated, "Leaderboards represent a combination of three of the nine game attribute categories" (p. 772). Leaderboards are a method of ranking students that presents learners with a challenge, clearly defined rules and goals, as well as a means of assessment. In the course, an online wiki was used, on which students were required to create a page. The researchers hypothesized that the addition of these leaderboards would increase time on task, which would increase learning. Their research found positive results. Firstly, they found that time on task was positively related to learning. Students who spent more time on their course wikis had higher academic performance. However, this alone does not support their theory of gamification. In addition to the relationship between time on task and learning, they also analyzed whether the students in the gamified version of the course worked more on their wikis. They found that the leaderboards they implemented in the course appeared to have a positive impact on students' time on task. Therefore, due to the relationship between these two factors, it was determined that the gamification of this course proved effective. By using leaderboards in order to promote time

on task, the researchers were able to positively influence student behaviors, and as a result increase learning.

Other studies have also found similar results. Ibáñez, Di-Serio, and Delgado-Kloos (2014) used gamification in a computer science course. In order to gamify their eLearning course they developed an online platform that used leaderboards, a showcase area, and badges. The goal was for students to earn 100 points on the platform, which could be done in a number of ways. Students participated in work activities, in which they introduced or evaluated questions related to the programming language of study. They also participated in planning activities, where they could see their progress in the course and how their learning was progressing. Finally, they also participated in social activities by exchanging messages with others in the course. As students progressed through the course and participated in these activities their achievements were shown in all three of the gamified areas of the course.

The researchers conducted their analysis of the effects of the gamification of the platform through both surveys and examination of the work that students did throughout the course. They found that over ninety percent of the participants in this gamified platform did more work than the necessary amount that would grant them the 100 points required of the course. In addition, it was also found that students improved their understanding of the programming language because of the coursework. Through the survey conducted, it was found that a large number of students enjoyed the gamified aspects of the course, and cited this as the reason for continuing coursework past the required amount. Many students wanted to collect all of the badges in the course, improve their leaderboard position, or continue to interact with their classmates. However, some students did cease working on the course after they reached the necessary 100

points because they did not find the gamified aspects interesting. As Hamari et al. (2014) stated, user qualities may have an impact on the effectiveness of gamification, so it could be that these users did not find the gamified aspects of the course interesting.

Studies with Negative Results

However, not all studies on gamification have found positive results. Attali and Arieli-Attali (2015) designed a study to examine how participants performed when assessment was gamified. In their experiment, they conducted two separate studies. The first study used an online platform and added points to the experimental group's responses while participants were actually being assessed. Points were awarded based on the correctness of the answer and the speed of the response. In the second study a similar design was used in a middle school. In the second study participants were also asked to rate their enjoyment of the test. The results of the study found that while students did respond to the gamified aspects of the assessment, it may not have been in an entirely positive manner. While in all instances the speed of responses increased, there were no significant changes in accuracy. This suggests that the participants in both studies responded to the gamified aspects of the assessment. Because they knew that they would receive more points for quicker responses, they increased the speed of their responses. In this sense the gamification of the assessment was successful. While the students may not have shown learning or accuracy improvements, the gamified elements were designed to increase the speed of responses, which did occur. Additionally, in the survey conducted with the middle school students a number of respondents said that the gamified version of the test was more enjoyable, which provides further evidence for the motivational effects of gamification.

In a study by Domínguez et al. (2013), gamification was used with university students in an information and communications technology course. The goal of this study was to motivate students through the cognitive, emotional, and social aspects of gamification. To do this the researchers used an eLearning platform that incorporated both badges and a leaderboard. Throughout the course learners completed assignments and were awarded badges and placed on leaderboards based on these assignments. Students in the control group had the exact same assignments, but did not receive any badges or interact with leaderboards in any way. The results of the study found that students in the gamified course outperformed students in the control group in a majority of the evaluation items. However, participation grades were lower for the experimental group, as well as the final exam scores. According to Domínguez (2013) “Gamified activities help to develop practical competences but somehow they also hinder the understanding of underlying theoretical concepts in contrast with traditional courseware” (p. 386). A survey conducted with the experimental group also found that many students disliked the gamified version of the course due to various reasons.

While this study showed success in many aspects due to gamification, ultimately, students in the gamified version of the course did not show any more learning than the control group. However, this could have been due to the way in which gamification was applied in this course. As Landers (2014) proposed, gamification should be used in ways that will alter student behaviors and attitudes. In this course, however, the gamification elements were simply added to the course and did not encourage any behavioral changes. Students received badges and leaderboard rankings based on their completed assignments. Work by Landers and Landers (2014) showed how gamification can be used to increase time on task in order to influence

learner behaviors and attitudes. This course, however, simply added gamified elements to assignments, as opposed to the actual processes that students undergo while completing said assignments, which could account for the seeming failure of gamification in this specific situation.

In a study that showed similar results, Hanus and Fox (2015) used gamification in a semester long university course. Like many other studies, they employed a badge system and leaderboards in their gamification of this course. Also included was an element in which students could earn coins to use for benefits throughout the course. While the coins and leaderboards were extra portions of the course, students were required to earn badges. The researchers measured students' on a number of measures throughout the course, including students' effort, motivation, and exam scores. It was found that students in the gamified version of the course performed poorer than those in the control group in all measures. Students in the gamified course were less motivated than those in the non gamified course, which the researchers believe resulted in students having poorer final exam grades. However, they also acknowledge limitations with their study. Because the gamified aspect of the course was tied to grades and work in the course it may have had a negative impact on students' motivation. While the leaderboards and coins were supplementary or optional, the badges were mandatory, and as the authors state, "gamification may be more effective for individuals who have the option to engage with badges and leaderboards" (Hanus & Fox, 2015, p. 160). Because they gamified the outcomes instead of attempting to alter students' behaviors, the attempt at gamifying the course was unsuccessful.

In another study involving gamification and eLearning, De-Marcos, Domínguez, Saenz-de-Navarrette, and Pagés (2014) compared gamification against both a control group and a group

that received a social networking measure. The study was conducted with an undergraduate course, which was gamified with the common combination of badges and a leaderboard. A series of activities for the course were gamified, and badges were rewarded for their completion. The number of completed activities by students determined their place on the leaderboard. The results of this study found that students in the gamification group did not outperform the control group on any measures. This included both participation and the final exam scores. However, this could again be related to the manner in which gamification was used. In this situation the researchers stated that the gamification module “overemphasized skill acquisition, resulting in poorer scores on knowledge acquisition” (De-Marcos et al., 2014, p. 90). Of note, however, was that although students in the gamified version performed more poorly they were generally positive and satisfied with the gamification experience.

Overall, from this review of literature, it has been shown that while gamification has been used in a number of studies, they have conflicting results. While some studies report positive effects from the gamification of their courses, others did not experience the same results. It appears that the manner in which gamification is conducted is extremely important in the success of the entire course. Courses that appear to focus on the learners and their activities within the course seem to report more success, whereas applications that focus on gamifying the coursework itself generally report less successful results.

Gamification in Second Language Acquisition

Although there has been a great deal of studies on gamification in learning, there has as of yet been very little research done using gamification in the language classroom. One study by Perry (2015) examined how gamification could be used in a university French class. This

gamification was somewhat different from many other studies, in that there were no leaderboards or badges, as are commonly found in educational gamification research. Instead, this study used game models and game design methods, in the form of quests and challenges from completing those quests. It was found that students generally approved of the gamified system, and found it enjoyable. Some even described the gamification as motivating, which provides support for the use of gamification in second language learning contexts.

In a study of English vocabulary learning, Hasegawa, Koshino, and Ban (2015) used gamification when developing a mobile application. According to the authors, “A smartphone is effective for independent learning such as English vocabulary memorization because a learner can use the smartphone anytime and anywhere when the learner has only little time” (p. 1). To develop their gamified application, the researchers used a variety of gamifying factors, including a character growth system, time trials and ranking, and social network connectivity. This study also differed from many other gamification studies, in that it did not include badges or leaderboards. Nonetheless, the researchers found that this platform had an impact on participants’ learning and motivation. While this study was not performed in a classroom or course context, as many other studies in gamification studies in education have been conducted, it still has implications for learning and motivation, with results that could be transferred to the classroom.

While there is yet little information on the use of gamification in second language learning, what research has been conducted in other fields can be applied to this field as well. As in other gamification research, the two studies above focused gamifying the processes students’ were involved in as opposed to the actual final products. By focusing on the processes students

will participate in, student behaviors and attitudes can be influenced, which can have positive influences on learning and motivation. This can be of great benefit in second language acquisition, as motivation is one aspect of research that is always of interest. If gamification of learning can also be applied to second language acquisition, then it is clear that it is necessary to determine what aspects of gamification can be most beneficial for language learning.

Overview of Meta Analysis

One method to determine exactly how gamification impacts learning and education would be through a meta analysis. By conducting a meta analysis of relevant studies of gamification of education, it will be possible to determine which moderator variables are important, and how gamification can best be used in educational settings and second language acquisition. This study is a meta analysis that was conducted in order to determine exactly what aspects of gamification and the surrounding moderator variables are important in order to determine how to successfully gamify a course. A meta analysis is a procedure by which data from different studies on the same or similar research is gathered and analyzed. According to Field and Gillett (2010), a meta analysis can show three important things: the mean and variance of underlying population effects, variability in effects across studies, and moderator variables that may be important or responsible for the variability. There are a number of steps in a meta analysis, all of which were undertaken, and are detailed in the methods section. The first step in a meta analysis is to search the literature for relevant studies. Then it must be determined which studies will be included in the final analysis. This inclusion criteria is very important, both in order to ensure that studies examined are relevant, as well as include the necessary data needed to conduct a meta analysis. Effect sizes are then calculated for each study, after which the basic

meta analysis is done. After this, it is possible to do some more advanced analysis of the data, and determine moderator variables and their effect. As Field and Gillett stated, “Although the pool of potential moderator variables is often large for any given meta-analysis, not all primary studies provide information about the levels of such variables” (p. 683). Therefore, the actual moderator variables used will not include every possible moderator variable.

Overall, gamification has been found to have varying results in a variety of contexts. While many studies report positive results, others report the opposite. As such, this is an area that warrants further research in order to determine how gamification can be used in education, and by extension, second language acquisition, which this meta analysis hopes to reveal.

Chapter III

METHOD

The purpose of the meta analysis was to answer the following research questions:

- What effect can gamification have in educational or learning settings?
- What elements are important when using gamification in an educational situation?
- How can this knowledge be used in order to use gamification in second language learning?

Searching the Literature

In order to conduct the meta analysis a number of reports on gamification of learning were examined. In order to do this, various online databases were searched using the keywords “gamification”, “education” and “learning”. Sites searched were primarily from the St. Cloud State University libraries databases, and included Academic Search Premier, ACM Digital Library, IEEE Xplore, JSTOR, as well as Google Scholar. Initially, these search results returned thousands of results. However, for the purposes of this meta analysis it was important that the research examined deal with educational situations. Additionally, as gamification is a fairly new field, some studies misuse the term. There were many results that dealt not with gamification, but other aspects of educational games, such as serious games or game based learning. Eventually, a total of over ninety articles were selected for further analysis. These articles were chosen due to their relation to the subject of gamification and learning or education.

Criteria for Inclusion

In order to conduct the meta analysis, it was important that there was statistical data that could be analyzed. Therefore it was necessary to determine which of the selected articles were

qualitative in nature, and which were quantitative. A meta analysis involves a normalization and comparison of correlations or effect sizes (Hunter & Schmidt, 2004), so it is important that the studies have specific data found in quantitative reports. Additionally, it is also necessary that the studies are of an experimental or quasi experimental nature. While many studies report the results of student grades or motivational aspects after their gamification method has been applied, if there is no control or pre test data then it is not possible to use those studies. After removing qualitative reports, and studies that did not use an experimental or quasi experimental design, only 14 studies remained, which are listed in Appendix A. The studies used came from academic journals and conferences, and were all peer reviewed.

Coding

In order to analyze the data for the meta analysis all articles were thoroughly read and examined. They were then coded for various moderator variables. Table 1 shows the variables coded for the purposes of the meta analysis, as well as the codes that were used. There were eight variables that were coded. These were: length of instruction, collaborative or competitive aspects, course subject, instruction medium, age of subjects, game design elements used, gamification learning attribute categories used, and time on task focus.

Table 1

Coding Tables for Studies

| Variables | Codes |
|---|--|
| A. Length of instruction | <ol style="list-style-type: none"> 1. One to four weeks 2. Five to eight weeks 3. Nine to twelve weeks 4. Thirteen to sixteen weeks 5. Seventeen to twenty weeks |
| B. Collaborative or competitive aspects | <ol style="list-style-type: none"> 1. Competitive aspects 2. Both aspects 3. Neither aspect |
| C. Course subject | <ol style="list-style-type: none"> 1. Engineering and computers 2. Humanities 3. Science and Math |
| D. Instruction medium | <ol style="list-style-type: none"> 1. In class only 2. Mixed (in class and online or platform) 3. Online or platform only |
| E. Age of subjects | <ol style="list-style-type: none"> 1. Pre-university (primary and secondary) 2. Undergraduate 3. Graduate (post-undergraduate) 4. Unreported |
| F. Game design elements | <ol style="list-style-type: none"> 1. Two elements 2. Three elements 3. Four elements 4. Five elements |
| G. Gamification learning attribute categories | <ol style="list-style-type: none"> 1. Two learning attribute categories 2. Three learning attribute categories 3. Four learning attribute categories 4. Five learning attribute categories 5. Six learning attribute categories |
| H. Time on task focus | <ol style="list-style-type: none"> 1. Low time on task focus 2. Medium time on task focus 3. High time on task focus |

Moderator Rationale

Length of Instruction

Gamification is a fairly novel construction, and it is not yet known if the time of the course in which gamification is used has an impact on the effectiveness of gamification.

Gamification may be better suited to a specific length of instruction. Due to the distribution of the different lengths of instruction found within the studies, this category was divided into four week intervals.

Collaborative or Competitive Aspects

Some individuals enjoy competitive situations, while others avoid them and prefer collaboration with their peers. Others may enjoy working completely alone. Studies have found positive results in all areas. In a laboratory course, Burkey, Anastasio, and Suresh (2013) used a gamification system with both collaborative and competitive aspects to great success. This framework included both collaborative and cooperative aspects, so it may be that some combination is necessary for success.

Course Subject

Gamification may be better suited to certain course types. Many people think of gaming as being something that is primarily done by those in the computer field, so it may be possible that they are more effective in these areas. This may also mean that they are less effective in other fields.

Instruction Medium

Due to the variety of ways that gamification can take place, it is possible that the method through which the course is taught may have an impact on the effectiveness of the gamification of the course. Learners may also vary in their preference for certain course types.

Age of Subjects

Gamification may work better for certain age groups than others. Gamers are typically thought of as younger, but studies have shown the average video game player in the United States is between the ages of eighteen and thirty five (Entertainment Software Association, 2015). This may have a bearing on the effectiveness of gamification. Additionally, twenty six percent of game players are under eighteen years old. These two groups encompass the majority of age groups in educational situations.

Game Design Elements

Deterding et al. (2011) outlined five different game design elements that can be used when applying gamification. As gamification does not require all aspects of a game, it could be that a certain number of game design elements are more effective. Additionally, all instances of gamification used at least two game design elements.

Gamification Learning Attribute Categories

Landers (2014) outlined nine ways in which gamification can be applied to learning. Similar to Deterding's game design elements, a certain specific number of applications towards learning attribute categories may be more beneficial. Additionally, all instances of gamification used at least two or more learning attribute categories.

Time on Task Focus

In a study by Landers and Landers (2014), the authors experimented on a course using leaderboards in an effort to increase time on task. The authors used the leaderboards and the way that points were awarded to students in order to encourage them to spend more time with the course material, which they believed would increase both learning and motivation. While the authors do not suggest simply adding gamification to any course, they state that “processes that could improve learning (such as increased time-on-task) must be identified, and those processes must be targeted by gamification interventions in order to affect learning indirectly” (Landers & Landers, 2014, p. 782). They believe that if gamification is used to try and directly influence learning, then the outcome is unlikely to be successful. Therefore, studies will be examined to determine whether or not they focus on the processes that underlie learning, as opposed to the course material alone. While studies may have had identical game design elements and the same amount of learning attribute categories, their actual application of the gamification design can differ wildly. Therefore, it is important to determine whether or not the gamification of the course included elements that promote time on task. Gamification elements and processes that encouraged learners to spend more time with material were categorized as promoting time on task, whereas elements that forced students to spend more time simply working on assignments were categorized as low time on task.

Correlations and Effect Sizes

As Hunter and Schmidt (2004) stated, “The goal of a meta-analysis of correlations is a description of the distribution of actual (i.e. construct level) correlations between a given independent and a given dependent variable” (p. 33). For the purposes of this meta analysis, the

Pearson r or correlation coefficient was used. In Pearson's r , there are roughly three different levels of significance. A small effect size is $r = 0.10$, whereas a medium effect size is $r = 0.30$, and a large effect size is $r = 0.50$. According to Hunter and Schmidt, "The optimal statistic (which measures size of effect in a metric suitable for path analysis or analysis of covariance or other effects) is the point biserial correlation r " (p. 275). Some studies use t or Cohen's d in order to present effect size, but these statistics are all able to be algebraically transformed into one another. Therefore, for this study, only r was used. In this study, the software Comprehensive Meta-Analysis was used in order to determine correlations and standard errors for each study and conduct the meta analysis, as well as examine the various moderator variables.

Chapter IV

ANALYSIS

In order to conduct the analysis, the collected articles were first examined and coded based on the methods outlined in the previous section. Relevant data was then extracted from each article and entered into a Microsoft Excel spreadsheet for organizational purposes. Means and standard deviations were of extreme importance. Meta analysis involves the comparison of correlations or effect size data, and this data can be adjusted for populations and samples (Hunter & Schmidt, 2004). This information is most commonly obtained from the means and standard deviations presented by the studies. The various results and data from each study were entered into the program Comprehensive Meta-Analysis, and analyzed through a random effects model.

Fixed and Random Effects Models

In meta analysis, there are both random effect and fixed effect models. According to Hunter and Schmidt (2004):

The basic distinction here is that fixed-effects models assume a priori that exactly the same ρ (or δ) value underlies all studies in the meta-analysis (i.e., $SD\rho = 0$), while random-effects models allow for the possibility that population parameters (ρ or δ values) vary from study to study. (p. 201)

Fixed effect models assume that if there is difference between studies, this difference comes from sampling error. In contrast, outside factors can be assumed to be a cause of variation in the random effect model. Field and Gillett (2010) suggest that a random effects model should be assumed in most situations. Additionally, they stated that “A random-effects approach should be the norm in social science data” (p. 673). A random effect model is better suited for this meta

analysis because it allows for better analysis and assumptions about studies not included or not yet conducted.

Data Synthesis

Because of the variation of the studies selected, there were vastly different effects and data reported. Therefore, it was necessary to determine how to best analyze this data. For studies with multiple effect size or statistical information, these effects were averaged. If there were multiple experimental groups, the largest experimental group was chosen. Additionally, the study by Krause, Mogalle, Pohl, and Williams (2015) had two different experimental groups. One group included only gamification elements, whereas the other experimental group also had a social aspect along with the same gamification application. The group sizes were almost identical, but as the social aspect is also important in gamification, this group was used in the meta analysis.

Chapter V

RESULTS

The total number of participants for the study was 2,838. This gave an average participant number of roughly 203 participants per study. The largest study had 1,031 participants, and the smallest twenty one. This data, as well as the other data outlined in this section, is presented in the following section in Table 2, along with the results from the moderator variable analysis.

The length of the studies that used gamification varied greatly. Studies varied in length from 1 to 20 weeks. Six studies were between one and four weeks, for a total of 43% of the total studies. Only one study was between five and eight weeks, and only one was between 9 to 12 weeks. Four studies, or 28%, were between 13 to 16 weeks, and two studies were 7 to 20 weeks.

The vast majority of the studies conducted were done on undergraduate courses. In fact, only four of the 14 studies were done on other age groups. Of these four, one used elementary school students, and the other middle school students. The other two studies used post graduate students. In addition to the age level of these courses, a large majority of the courses, 71%, were taught with an online or platform aspect to the course. However, only three of these were completely online or platform based. Only one study in the analysis had no online or platform aspect whatsoever. In terms of the subject in which gamification was used, eight, or 57% of the studies were done in an engineering or computer science related subject. Of the six remaining studies, two gamification applications were done to a humanities course, and four were used in science or math courses.

As with many of the other moderator variables, competitive and collaborative applications also leaned strongly in one direction. Eight of the analyzed gamification

applications were done using only competitive, and no collaborative aspects. Three of the studies used both a collaborative and cooperative approach, and three used neither competitive nor collaborative aspects. There were zero studies that used only collaborative applications of gamification.

Game design elements and gamification learning attribute categories were two other moderator variables of interest. These were chosen primarily because of the variation that gamification can have. In terms of game design elements, there was a more even distribution than seen with many other moderator variables. Six studies, or 43%, used two of the five game design elements, and five studies used three game design elements. Only one study used four game design elements, and there were two studies that used all five different game design elements. Learning attribute categories in gamification also showed a larger spread than other groups. Only one study used two of the nine categories, and only one study used six different categories. However, in the middling categories there was a more even distribution. Five studies used three learning attribute categories, or 36%, three studies used four different learning attribute categories, and four studies used five different categories.

In regards to time on task, of the 14 studies there was a fairly even distribution of time on task usage. Only three of the 14 studies, or 19%, had a high amount of activities that focused on time on task. The majority of studies had a medium amount of time on task, with six, or 43%, being classified as medium time on task. Five studies had low time on task, which amounts to thirty six percent of the studies selected.

Results of the Meta Analysis

In order to address the first research question, a standard meta analysis was done before looking at the various moderator variables. Overall, in the random effects model the meta analysis showed a positive medium correlation towards the beneficial effects of gamification ($r = 0.305$). This correlation is a measure of the effect sizes presented by the studies and the effects of the gamification treatment. This data has been presented in Table 2. Additionally, the confidence interval (CI) does not include zero. This means that there was a positive correlation between the use of gamification and the outcomes of the studies.

Table 2

Overall Meta Analysis Results for Moderator Variables

| Group | Subgroup | r | k | N | CI (Low, High) |
|--|------------------------------|--------|----|-------|-----------------|
| Overall | | 0.305 | 14 | 2,838 | [0.114, 0.474] |
| Length of Instruction | 1. One to four weeks | 0.388 | 6 | 1331 | [0.201, 0.547] |
| | 2. Five to eight weeks | 0.059 | 1 | 278 | [-0.069, 0.186] |
| | 3. Nine to twelve weeks | 0.838 | 1 | 136 | [0.793, 0.874] |
| | 4. Thirteen to sixteen weeks | -0.037 | 4 | 864 | [-0.285, 0.217] |
| | 5. Seventeen to twenty weeks | 0.402 | 2 | 127 | [0.008, 0.688] |
| Collaboration and Competition | 1. Competitive | 0.317 | 8 | 1653 | [0.102, 0.504] |
| | 2. Both | 0.397 | 3 | 733 | [-0.354, 0.836] |
| | 3. Neither | 0.144 | 3 | 431 | [-0.078, 0.353] |
| Course Subject | 1. Engineering | 0.362 | 8 | 1512 | [0.071, 0.597] |
| | 2. Humanities | 0.032 | 2 | 92 | [-0.669, 0.730] |
| | 3. Sciences | 0.310 | 4 | 1234 | [0.017, 0.554] |
| Instructional Medium | 1. In class | 0.838 | 1 | 136 | [0.793, 0.874] |
| | 2. Mixed | 0.245 | 10 | 2395 | [0.035, 0.435] |
| | 3. Online or platform only | 0.215 | 3 | 307 | [-0.003, 0.414] |
| Age Level | 1. Pre-university | 0.200 | 2 | 153 | [-0.213, 0.552] |
| | 2. Undergraduate | 0.303 | 10 | 2558 | [0.061, 0.511] |
| | 3. Graduate | 0.402 | 2 | 127 | [0.008, 0.688] |
| Game Design Elements | 1. Two | 0.409 | 6 | 1477 | [0.066, 0.666] |
| | 2. Three | 0.119 | 5 | 625 | [-0.060, 0.590] |
| | 3. Four | 0.398 | 1 | 102 | [0.190, 0.571] |
| | 4. Five | 0.403 | 2 | 634 | [0.016, 0.685] |
| Gamification Learning Attribute Categories | 1. Two | 0.550 | 1 | 1031 | [0.513, 0.586] |
| | 2. Three | 0.267 | 5 | 557 | [-0.340, 0.717] |
| | 3. Four | 0.303 | 3 | 504 | [0.106, 0.478] |
| | 4. Five | 0.356 | 4 | 706 | [0.195, 0.498] |
| | 5. Six | -0.212 | 1 | 40 | [-0.479, 0.091] |
| Time on Task | 1. Low time on task | -0.059 | 5 | 636 | [-0.228, 0.114] |
| | 2. Medium time on task | 0.494 | 6 | 1048 | [0.190, 0.712] |
| | 3. High time on task | 0.513 | 3 | 1154 | [0.413, 0.601] |

Notes. R = correlation coefficient

k = number of studies

N = sample size

CI = confidence interval

Results of Moderator Variables

The various moderator variables showed differing results. These were each separately investigated through the examination of their correlations and confidence intervals.

In regards to the length of the use of gamification, there were four different groupings. Of these, only the thirteen to sixteen week group showed a negative correlation ($r = -0.037$). However, this group did include the CI of zero. Of the entirety of the studies, only this group and the five to eight week group showed a correlation that included the CI of zero. However, there was only one group in the five to eight week group, and it showed a small to no correlation ($r = 0.059$). Of the remaining groups, all showed a medium to high correlation. The one to four week group, while not necessarily having the largest correlation, still nonetheless showed a medium correlation ($r = 0.388$), and also had the largest amount of studies within the group.

Collaboration and competitive applications of gamification were also of interest for the study. The analysis of this moderator variable showed only studies with only competitive aspects to have a CI that did not include zero, with a medium correlation ($r = 0.317$). No studies examined had only collaborative aspects, although there were some that used both collaborative and competitive means. Studies that used both methods had a medium to high correlation ($r = 0.397$) while studies that used neither competitive nor collaborative aspects of gamification had a small correlation ($r = 0.144$). However, both groups had a CI that included zero.

The subject on which the courses were taught were examined, and revealed that only courses that used gamification in humanities fields had no correlation ($r = 0.032$). Courses taught in the fields of engineering and computing or science and math both showed a medium

correlation ($r = 0.362$ and $r = 0.310$, respectively). Additionally, neither field included the CI of zero.

Instructional medium analysis revealed that both mixed and in class methods had a positive correlation. The group that had only in class usage of gamification had an extremely high correlation ($r = 0.8380$). However, only one study was conducted using an entirely in class approach. Studies that used a mixed approach had a small to medium correlation ($r = 0.245$), as well as a CI that did not include zero. Courses that used a platform or online only approach had a small to medium correlation ($r = 0.215$). However, this group's CI did include zero.

Gamification applications done with younger learners showed a small to medium correlation ($r = 0.200$) with a CI that included zero. However, there were only two studies in this group. Gamification applications at the undergraduate level showed a medium correlation ($r = 0.303$) and applications at the graduate level showed a medium to high correlation ($r = 0.403$). Neither grouping included the CI of zero. However, there were only two studies that used a graduate level course, with the vast majority of gamification applications being done at the undergraduate level.

Only gamification applications that used three different game design elements showed a low correlation ($r = 0.119$). This grouping was also the only one to include the CI of zero. All other amounts of game design elements showed a medium to high correlation. The group that used only two of the five possible game design elements was the largest with six studies ($r = 0.409$). Groups that used four and five game design elements were fewer in number, with only one group using four game design elements, and two groups using five game design elements. These groups both had a medium to large correlation ($r = 0.398$ and $r = 0.403$).

Learning attribute categories used in gamification also varied greatly. One study used only two learning attribute categories, to large correlation ($r = 0.550$) and one study used six, to a small to medium negative correlation ($r = -0.212$). However in this study the CI included zero. Five studies used three learning attribute categories, with a medium correlation ($r = 0.267$), but this group also included the CI of zero. Gamification applications that had four or five learning attribute categories used both showed a medium correlation ($r = 0.303$ and $r = 0.356$). Neither group included the CI of zero.

Lastly, the moderator variable of time on task was examined. Studies that had low time on task elements had a small negative correlation ($r = -0.059$) as well as a CI that included zero. Studies that had medium or high time on task focus both had a high correlation ($r = 0.494$ and $r=0.513$), neither of which included the CI of zero.

Chapter VI

DISCUSSION

Overall Effects of Gamification

One of the primary purposes of this study was to determine if gamification is an effective and beneficial practice in the field of education. Overall, it seems that gamification is beneficial in educational settings. The majority of the studies examined were interested in how gamification could impact motivation, with a few interested in learning. It appears that gamification did in fact have a positive correlation with the outcomes of the studies. However, this should not necessarily be taken at face value. For one, although there is a growing amount of research on gamification of education or learning, the field is still quite new. Because of this, there are as of yet very few studies that use quantitative methods, which resulted in the relatively small number of studies used in this meta analysis. The majority of studies on gamification are case studies, and while they do produce positive results, without a control of some sort it is hard to determine gamification's true effect in those scenarios.

Additionally, due to the nature of research, it is also possible that there may as of yet be a large number of unreported studies. As Hunter and Schmidt (2004) stated, although one of the strengths of the meta analysis is to compare with the population at large and account for unreported studies, the file drawer problem is still something to be aware of. It could very well be that there is a dearth of studies in progress or unreported that report negative or non significant findings. Despite these limitations, from the data readily available at this time it appears that gamification does have a positive correlation with learning and motivation in educational and learning scenarios.

In addition to the overall effectiveness of gamification, the elements that are important in gamification seem to vary a great deal as well. However, there were a few aspects of gamification that had significant differences depending on their usage. These were the length of the gamification application, the inclusion of collaborative aspects, and a focus on time on task. The specific ways in which these variables were important are outlined in the following sections.

Length of Instruction

From the results of the meta analysis, there is a positive correlation between length of instruction and gamification in four of the five areas examined. However, only one of these, the one to four week group, had a large number of studies. This could provide evidence for the use of gamification in shorter courses. In fact, one of the later length groups, the 13 to 16 week group, revealed a negative correlation. As the authors of one study in this group wrote, “This may be due to the relative novelty of gamification; in a traditional classroom, introducing some game elements may feel more exciting at first, but over time the novelty expires and excitement decreases” (Hanus & Fox, 2015, p. 160). This is an important finding, especially as this includes the typical time of a university course. Other research also supports the idea that the newness and excitement over gamification may disappear over time. In their literature review of gamification Hamari et al. (2014) found that “the results of gamification may not be long-term, but instead could be caused due to a novelty effect” (p. 3028). It could be that gamification is interesting primarily at the beginning, and other methods are required to maintain that interest. The fact that the only group that showed a definite positive correlation was the group with the smallest amount of time using gamification seems to support this idea as well.

Of the six studies in the one to four week range, five studies showed a medium to high correlation. This again supports the idea that gamification is more effective in shorter courses. In the gamification of a computer science course by Ibáñez et al. (2014), the authors even stated that they designed their gamification aspect with this shorter time table in mind due to the constraints of their course. However, they listed this length of time as a limitation for their study, when it may have actually been beneficial. It appears that there may be some factor related to the time of the course that seems to increase the impact of gamification in shorter courses. There are a great number of variables that could be at play here, however it may just be that longer courses do not benefit as much from gamification as longer courses.

Collaboration and Competition

While all groups showed a positive correlation between gamification and the application of competitive or collaborative aspects, the only group that did not include the CI of zero was the group that only included competitive aspects. Additionally, there were no groups that included only collaborative aspects. It appears that the inclusion of competitive elements does have an effect, but it remains to be seen as to the effect of the collaborative elements of gamification. Regardless, it appears that the inclusion of either collaborative or competitive aspects is important to the success of a gamification application.

This difference in variations could be to the different motivations individuals have in relation to collaboration and competition. Some learners prefer to work together, and some individuals enjoy and are motivated by competition. De Schutter and Abeele (2014) used gamification on a liberal education course that used both competitive and collaborative aspects by having groups compete against each other. One thing they found was that students would

have preferred more experience points rewarded for the collaborative aspect of the class, and not just the competitive aspect. Adding this kind of competition or collaboration to a course may have positive or negative effects depending on the individual, which is shown by the fact that this study had a negative correlation. If there had been more collaborative focus, then perhaps the results may have differed. In gamification especially, competitive aspects seem to be quite common. Dicheva, Dichev, Agre, and Angelova (2015) conducted a mapping study of gamification in education and found that leaderboards were one of the more common methods of gamifying courses. When gamifying a course, it is important to determine the type of learners in the course, and keep them in mind when selecting which elements of gamification will be used. One game design element that Deterding et al. (2011) mentioned was that of game design methods, such as playtesting. Pilot studies and focus groups would be examples of game design methods that could be used when creating a gamified course, which could possibly help when determining whether to use competitive or collaborative aspects in a course.

Course Subject

The majority of courses that used gamification were in the engineering or technology fields. Both these courses as well as those in the sciences showed a positive correlation towards gamification. The courses in humanities showed a negative effect, although small, as well as a CI that included zero. This reveals that gamification appears to work better in more computer-based, scientific or math centered fields.

One reason for this apparent success of gamification in these fields could be due to the nature of the learners in these areas. Studies have shown that there is a small relationship between students choosing the computer science major and their video game usage (Disalvo &

Bruckman, 2009). However, the relationship is small, and not necessarily the reason that those students entered their chosen field. Regardless, studies have shown that a number of computer science majors do play games, so it is possible that their game usage may have aided in the successful implementation of a gamification course. Additionally, some of the gamification applications were done in courses on game development (Caton & Greenhill, 2014; De Schutter & Abeeel, 2014). These students have an interest in games, or else they would likely not be taking the course. Therefore it is likely that the gamification application in this type of course would result in a greater interest in the gamification, and therefore the course. In fact, the course gamified by Sheldon (2012) was a game development course, which showed positive results partially due to the nature of the students themselves. This course has even been reproduced by other instructors in game design courses, such as a course by Bierre in 2012 that found mixed results.

However, the negative correlation between gamification in humanities does not necessarily mean that it should not be used. Paisley (2013) used gamification to great effect in the gamification of a communications course. As studies have shown that gamification can have positive results, it stands to reason that it is still possible to use gamification regardless of the field. Additionally, only two of the 14 studies analyzed were conducted in a humanities field. One of these studies reported a positive result, while the other a negative result, which could account for the negative correlation. Dicheva et al. (2015) also found that the majority of studies of gamification of education have been done in courses other than humanities. It may simply be that as of yet there has simply not been enough research done in the gamification of courses outside of computer and science related fields.

Instructional Medium

The majority of the courses taught were done using a mixed style, with courses that included lectures or in class work supported by an online or other platform. These studies reported a positive correlation. There was only one study that included only in class use of gamification, and it did have a positive correlation (Caton & Greenhill, 2014). Online or platform only courses showed a positive correlation, but this had a relatively small correlation as well as a CI that included zero. Due to the variations between these results, it appears that gamification works best in situations where learners are supported by in class lectures and learning, and use the gamification element in addition to other learning aspects.

This result could be due to the fact that motivation is typically low in online courses (Carr, 2000). Online courses typically have lower participation rates and high dropout rates due to their nature. This is especially true of larger courses, or MOOCs, as noted by Krause et al. (2015). However, adding game elements may make these courses something that students enjoy. Regardless, a great many studies that used gamification in an in class capacity along with the online aspect also resulted in positive results. A mixed approach appears to have better results than other methods, so it may be that gamification functions better when used in addition to other methods.

Age Level

Studies that used gamification with younger learners reported a smaller correlation than studies that applied gamification to other groups. Additionally, the CI for this group also included zero. The largest group was that which used gamification with undergraduate students, and this group had a medium correlation. This reveals that gamification may be better suited to

older students. The majority of video game players in America are between the ages of eighteen and thirty five (Entertainment Software Association, 2015). This may account for the success that gamification has had with university aged learners.

However, even though gamification has shown more positive results with older learners does not mean that gamification should be abandoned with younger learners. There were only two studies that used gamification with primary or secondary students, which is a fairly small group. Additionally, this group did still have a positive correlation, although small. It may be that one of the studies in this example did not use adequate gamification elements or some other factor. In fact, the study by Su and Cheng (2014) experienced positive results, with a medium to large correlation. They used a mobile based support system with their gamification of a science class to great success. Nonetheless, while it seems that at this point gamification is better conducted with older students, more research is necessary to confirm this.

Game Design Elements

One of the things that separates gamification from other applications of games to learning is the fact that gamification does not necessarily include all aspects of what other games do. As Deterding et al. (2011) stated, “What distinguishes ‘gamification’ from ‘regular’ entertainment games and serious games is that they are built with the intention of a system that includes *elements* from games, not a full ‘game proper’” (p. 4). The majority of the studies in the meta analysis only used two to three game design elements. While some studies showed a greater correlation than others, their CI either included zero, or there were very few studies. Only the group that used two game design elements had more than two studies and a CI that did not include zero, as well as a medium correlation.

The study by Ibáñez et al. (2014) used only two different game design elements: game interface design patterns and game design patterns and mechanics. Even though they used only two of the five available game design elements, the study still showed a high correlation. In another study that used only two game design elements, Domínguez et al. (2013) showed very different results, with a low correlation and both positive and negative outcomes from their gamification system. In contrast, Iosup and Epema (2014) used all five different game design elements in their gamification of a computer science course. However, even though they included all five game design elements, this still only resulted in a small to medium correlation.

This shows that although there are varying game elements that can be used, this may not in fact be important. This variation shows no clear advantage to a specific amount of game elements. The amount of gamification used in a course appears to be unimportant. This means that it is likely the method and application of those specific elements that creates the variation that results in either a positive or negative experience.

Learning Attribute Categories

Landers (2014) looked at serious games and gamification, and identified a number of ways in which gamification could be used in learning. As was found with the amount of game design elements used, it does not appear that the amount of different learning attribute categories affected by gamification influences the effectiveness of the course. While groups that focused on more learning attribute categories did appear to have a higher correlation, the group with the most learning attribute categories showed a negative correlation. Again, as with game design element usage, it appears that it is not the quantity, but the quality of the gamification methods used, and how they are applied.

Time on Task

Lastly, analysis of the moderator variable time on task showed interesting results. As Landers and Landers (2014) demonstrated with their study on time on task, using gamification in a way that encourages students to spend more time on task showed positive results in learning. The results of the meta analysis showed that studies using low amounts of activities of time on task had a negative effect on gamification, although the CI did include zero. More importantly, studies that used medium and high amounts of gamification applications that focused on time on task production showed a moderate to high correlation.

This reveals that time on task is quite important in the gamification of education. If gamification elements are used in such a way that they do not influence time on task, they can have a negative result. However, when used properly, gamification can be quite beneficial. Gamification should not simply be applied to already existing course frameworks, or applied specifically to assignments. Careless application can result in negative motivational effects, which can decrease the effectiveness of the gamification application. Instead, gamification should be used in ways that focus more on the process, rather than the product.

This means using gamification in ways that encourages students to spend more time focusing on and interacting with the material, rather than having them only complete work and produce results. Much can be learned from the studies that used medium to high time on task in this research, as well as those that used lower time on task elements. Paisley (2013) used a high amount of time on task in a course on cross cultural communication. In this activity, experience points were awarded for simple activities such as learning how to say something in a foreign language, or writing about or participating in an event. While these activities did translate into

experience points for their course, they were not simply added to assignments. These rewards seemed tailor made to have students interact more with the course subject.

Denny's (2013) gamification of a population studies course followed a similar approach to that of Paisley's. However, instead of experience points, students were encouraged to obtain badges that were added to an online platform. In this system, students were required to author questions about the coursework, and answer and interact with others on the platform. The gamified group in this system had a higher amount of questions authored, questions answered, and days active. Their method of gamifying the question process involved giving badges for authoring and answering questions, as well as other actions that required interaction with the system. While there were some badges that were made for activities that were essentially the same that students in the non gamified group would be doing, the majority of badges were designed to encourage students to continue to interact with the platform, and therefore the material.

On the opposite end of the spectrum were courses with low time on task focus. In one such study, Hanus and Fox (2015) applied gamification to a communications course. Both badges and leaderboards were used. The researchers found that students in the gamified section of the course reported lower motivation, satisfaction, and gave less effort than the non gamified group. However, while their badges were designed to have students do more outside class work, they appeared to have a negative effect. This could be to the nature of the badges themselves. While Denny used the badges to encourage students to work more with the specific platform, the badges in this course by Hanus and Fox seemed to be somewhat secondary in nature, with a small focus on time on task activities. Additionally, while these activities required to earn badges

were related to the course, there was little direct focus. Students could earn the variety of badges in any number of ways, from playing a video game and writing a review, to turning assignments in early, and even by dressing up as a character and coming to class. While some of these activities did focus on the coursework at hand, others seemed to be unrelated, which may have damaged time on task focus.

In the study by Abramovich, Schunn, and Higashi (2013), middle school students used a gamified tutor platform while learning math. They were able to earn badges based on their performance in the platform. However, while the criteria for earning badges were more focused towards learning than other examples of low time on task gamification, they still did not encourage continued usage and time on task. Some badges were awarded for simply using the platform, and others for answering problems correctly, not simply attempting them. Nonetheless, some badges were awarded that did focus on time on task, such as badges for using the tutor for certain prolonged periods of time.

The variety in the applications of time on task shows how varied similar gamification applications can be. However, it is clear that the way in which the gamification is carried out is extremely important. If there is little focus on time on task, then learning and motivation can be damaged, and the gamification application detrimental.

Implications for Second Language Acquisition

Overall, it appears that gamification has many varying applications and uses. However, there are a variety of ways that gamification could be successfully used in the second language classroom. Additionally, gamification has been shown to have positive results on both learning and motivation. The numerous positive results strongly suggest that gamification can be applied

to second language acquisition. However, there are some issues in the ways that gamification may best be applied to the field.

Second language acquisition is considered a humanities field, and studies in this area showed no correlation with gamification. However, as stated earlier, this does not mean that this should be abandoned in the field. There were very few studies that actually used gamification in humanities. Gamification is a fairly new field, and there is still little research. Additionally, there are other quantitative studies that have been done in the field of humanities that have shown positive results, although their data was not appropriate for this meta analysis. A study by Leaning (2015) used gamification in a media theory course. While the student grades did not necessarily show significant results, students reported increased motivation and interest in the course. Han (2015) successfully used gamification in an art course, and increased student motivation and learning.

Time of instruction is something else that could be important in gamification. Language courses go on for varying lengths of time, and varying lengths of instruction. However, the results of the meta analysis suggest that gamification applications are better when performed over a shorter period of time. This period of time does not necessarily encompass an entire university semester. However, language courses can vary greatly in their length. Additionally, one strength of gamification is the flexibility that can be used when designing a gamification system. Many of the gamification systems were used on shorter courses, but some of these were actually a part of a larger course. One example is Su and Cheng's (2014) gamification of a science class. This shows that even though gamification is better suited for shorter time periods, it is still possible to use it within a longer course in order to increase motivation and learning.

Competition is something that appears important in order for a gamification system to be successful. However, competition is not always necessary. One issue with the idea of competition in a language learning setting is that many classrooms are not organized in such a way as to incorporate this kind of work. However, this may actually be a problem with the classroom itself. Throughout time language learning has changed time and time again, but so many classes are still primarily lecture based, using methods similar to the grammar translation method, with little or no student input (Richards & Rodgers, 2001). This kind of coursework will not fit into this framework very well, but it is nonetheless possible. Even adding leaderboards to assignments can be a way of gamifying a course; however, this should not be carelessly done as it could possibly have detrimental effects if incorrectly applied.

Even though competitive aspects appear to have quite a large importance, some studies have found that direct competition is not actually necessary to have a similar effect. Hakulinen and Auvinen (2014) used gamification on a computer science course and examined the different goal orientations of students. It was found that students who preferred competition were still bolstered by the gamification of this course even though there were no actual competitive aspects. They found that “students who prefer to compare their performance to others respond to badges even if the badges are not public or particularly competitive” (p. 15). This further shows how competitive aspects of gamification may be beneficial. Even when not explicitly competitive, or designed to be so, competitive users may still experience an increase in motivation due to the nature of gamification itself.

Age of learners is also something that while important, has varying results due to the vast majority of gamification applications being done in university learning settings. However,

language learners come in all shapes and sizes, and language learning occurs at all ages. It has been shown that gamification can be effective at almost any age level, and therefore gamification should be considered appropriate to use with any age group of second language learners. While the research suggests that gamification would best be suited for university aged students, it can also be applied to other ages. Su and Cheng (2014) successfully used gamification with children as young as third grade.

Second language courses are taught through a variety of instructional mediums, and CALL applications are becoming more and more common today (Cerezo, Baralt, Suh, & Leow, 2014). Although the correlation between gamification and in-class-only courses are the strongest, there was only one study in this meta analysis in that area, which could skew results. Mixed methods courses showed a medium correlation, but this included the CI of zero. What this all means is that there is no strong relationship between the medium of the course and the effects of gamification.

Simply put, gamification can be used in almost any course type. As SLA courses can be conducted in many different mediums, then it stands to reason that gamification could likely be used. The motivation effects mentioned in any variety of studies, both on and offline, show that gamification can be used. Even in courses with no online or platform aspect gamification has been used successfully. Sheldon (2012) outlined numerous examples of gamification that have been done in offline settings to great effect.

Additionally, even though SLA is traditionally thought of as a traditional face to face, offline subject, computer assisted language learning (CALL) is gaining more ground. In fact, as Cerezo et al. (2014) stated, “The use of computer-assisted language learning (CALL) to promote

foreign/second language (L2) development is clearly proliferating in higher education, with many programs going hybrid or fully online” (p. 294). In their study, the researchers found that language learning in various technology supported platforms did not differ drastically from traditional face to face learning. Therefore, the fact that gamification seems to be primarily used in mixed medium settings may actually not be a hindrance or a benefit. It may simply be another way in which gamification can be used, and possibly be beneficial with the emergence of CALL in second language acquisition.

Extremely important to the field of second language acquisition are the effects that gamification can have when properly applied to time on task. Language learning has shown benefits from time on task, and the fact that gamification also seems to show strong support for time on task suggests that their usage together could be extremely beneficial. In a study looking at language learners studying abroad in China, Du (2013) found strong support for time on task in the acquisition of Chinese. It was found that students who used the language more in their daily lives experienced more growth in fluency. Even among students who attempted to use Chinese as much as possible, those who were more active socially tended to experience greater growth. Students who actively sought out opportunities to use and practice the language experienced greater improvements than those who did not. As the author stated, “Regardless of the context of learning, students who spend more time on task using the target language tend to make more progress in fluency than those who do not” (p. 132). Huang, Wilson, and Eslami (2012) also found similar results in the relationship between time on task and vocabulary learning. In their study a meta analysis was conducted to examine the effects of output tasks on incidental vocabulary learning. They found that “learners who spent more time in the output task

gained more vocabulary than those who spent less time on task” (p. 552). The fact that gamification had a strong correlation to time on task means that gamification can definitely be used in order to create more opportunities for students to practice and use the language that they learn. If done in a meaningful manner, this can have an impact on vocabulary, speaking, and overall fluency.

Work by Ellis (2006) also provided evidence for the importance of time on task, especially in task based language teaching (TBLT). Giving learners ample time to work with material and focus on the task at hand has been shown to result in more complex and accurate language. Even when imposing time limits, fluency has been shown to improve. Robinson (2007) has also done extensive work in TBLT, and has demonstrated that more complex task work can result in more interaction with material and more complex language production. Gamification can be used in a similar manner in order to encourage students to spend more meaningful time working with the material. As this work in TBLT shows, this can result in increased learning and more complex language usage, which gives further support for the usage of gamification in SLA.

One thing to keep in mind, however, is that this application must be meaningful. Gamification, if done improperly, can have detrimental effects on motivation and learning. The same can be said for time on task applications. Chang, Wall, Tare, Golonka, and Vatz (2014) examined the relationship between time spent on homework and course outcomes in foreign language learning. They actually found a negative relationship between time spent on homework, and grades and proficiency ratings. Of importance here were the perceptions students had of the homework that they were doing. The authors found that “students’ perceptions of the relevance

of homework, the usefulness of homework feedback, and the fairness of homework grading were positively correlated with outcomes, whereas reported time spent on homework was negatively correlated with outcomes” (p. 1059). While this may seem to work against the benefits of time on task, the aspects that students found important are also strengths of gamification. For example, feedback is one area that is important in gamification. Feedback can be extremely important, especially in gamification. Li, Grossman, and Fitzmaurice (2012) placed a heavy focus on immediate feedback in their GamiCAD system, which was very beneficial for learners. As they stated, “We believe this approach could serve to correct mistakes more quickly before the user gets frustrated by a lack of progress in learning” (p. 111). This same application can be used in other gamification systems in order to encourage student motivation. Proper use of time on task can lead to increased motivation and language learning, which gamification can excel at.

Suggestions for Second Language Acquisition

Results from the meta analysis show many varying results, but the data from time on task appears to be the strongest. The results suggest that when applying gamification to a language learning situation time on task should be strongly considered. While one can simply add leaderboards and badges to an existing course, this is not necessarily an effective method. In fact, studies that have done similar things have shown negative results from gamification. In SLA, it is extremely important to consider student motivations when designing coursework as this can greatly impact learning (Brown, 2007). Leaderboards and badges are two common methods through which gamification is commonly accomplished, so this will likely be a common place to start. Therefore, when using these methods, make sure to focus on the manner in which learners will interact with the material, and not the products themselves, as having students engage in

meaningful usage of language may be more important than the actual products. For example, if students were to write a paragraph, it may be better to award a badge or points for going back and editing their work, as opposed to simply submitting the finished product. This editing would result in meaningful time on task, whereas the simple submission would be only a reward for completing the task, and not necessarily encourage any focus on the target language.

Time on task can be encouraged in a variety of ways, and there are also a large variety of language tasks that students can participate in. Therefore there are many pitfalls when designing a gamification system. However, if we keep time on task at the forefront when designing these gamification systems then there should be success. Reward and encourage students to use the language they learn, in a meaningful manner. While there is typically a focus on points and scores in gamification, it should not be the students' actual scores and grades that are focused upon. Rather the focus should be on the scores on the gamification system, which will allow students to grow and learn.

Data suggests that learners in a university setting may be more likely to have positive results from gamification, but younger studies have also shown promise. Therefore, there really appears to be no specific age limit for gamification. Gamification can and should be used in language classrooms with both young and older learners.

One of the more interesting findings of the meta analysis was that shorter term applications of gamification seem be more geared towards success than longer term applications. Therefore, it is recommended to use gamification in the language classroom over shorter periods of time. This, however, does not necessarily mean that gamification should only be restricted to shorter courses. If the course is shorter, then it is definitely suited towards gamification, but

many courses tend to be longer than the one to four weeks that gamification was found most successful in. Therefore, in order to best utilize the motivational and educational benefits of gamification, it may be best to use gamification on a shorter scale.

While many shorter scale lectures and courses have shown positive effects of gamification, there are other methods in which to use gamification on a shorter time frame as a part of a larger course. One way that gamification can be used in a larger course is by gamifying only part of the course. Instead of using the gamification application for the duration of the entire course, it is possible to instead use it for only part of the course. Su and Cheng (2014) used gamification for only a short time when teaching science to elementary schoolers to great success. The initial “teaching” in this situation was done in a traditional manner, with normal classroom instruction. Then, later in the course, gamification was used on the experimental group in order to encourage motivation and increase learning. In second language acquisition, similar methods could also be utilized. Traditional coursework could be done and then bolstered by a gamification module later in the semester or course. This would allow for the usage of gamification to remain on a shorter time frame, but still exist and remain beneficial.

Given that gamification has shown benefits in almost all types of courses, there is no clear cut reason to not gamify a course depending on whether or not it is online or in class only. However, research in gamification has primarily been done in mixed methods courses, and CALL courses are becoming more common throughout the second language acquisition world. It stands to reason that gamification would be an excellent application of CALL methodology. Many gamification elements such as badges, leaderboards, and instant feedback, can be easily applied to online platforms or courses. Therefore, it is recommended that gamification be used in

CALL platforms and situations. However, even though gamification is best suited for CALL, it is still of benefit in all situations.

Competition is one aspect of gamification that should also be considered important. While collaboration is also common, courses with competitive applications seemed to show more benefits. Therefore the inclusion of some sort of competitive aspect is recommended. This can most easily be accomplished with leaderboards, but there are various methods. This can also be done along with a collaborative aspect, such as having students compete against each other groups when doing group work. However, as Hakulinen and Auvinen (2014) found, “it seems that students who prefer to compare their performance to others respond to badges even if the badges are not public or particularly competitive” (p. 15). Therefore, direct competition may not even be necessary. Gamification itself may be enough to engage students who enjoy competitive aspects. Keeping this in mind, when gamifying language courses there are a variety of ways in which instructors can create or foster competition.

Future Research

There is a great deal of research that still can and needs to be done within gamification. One aspect that was touched on in a few studies is the relationship between gamification and the amount of games that students play. In a study by Akpolat and Slany (2014), the authors applied gamification to a programming course. They found three types of students, and students who were most active and interested in the gamification of the course also tended to play video games. Studies have shown that more people today are playing games than in the past. This could aid the future of gamification, by helping to direct and determine if gaming has an effect on the effectiveness of gamification. However, in the studies examined, only one reported any specific

statistics on the gaming of the users in the gamification experiment. Therefore more research needs to be done in order to determine if game usage by the learners is an important factor.

Another aspect that deserves future study is in relation to the demographics of the individuals within the studies, specifically in regards to gender. Only four of the 14 examined studies reported gender statistics. Today, more and more females are playing games than before, and this could help to further cement or bolster the effects of gamification. In fact, even though gaming is traditionally thought of as a traditionally male hobby, data reveals that 44% of game players are female (Entertainment Software Association, 2015). However, some studies have reported that gamification can have a negative impact on female learners, so it warrants research to determine how gamification impacts both genders (Christy & Fox, 2014).

More research also needs to be done on gamification in different age groups. Game players are of all different ages, but gamification applications have been done primarily with adult learners, mostly university aged. However, language learners come from a variety of different backgrounds. It is necessarily to do more research on both younger and older learners in order to determine whether gamification can impact different age groups in different ways. The collaborative and competitive aspects of gamification are something else that needs further research. While there appears to be a great deal of information on competitive aspects of gamification, there is as of yet no qualitative research that included only collaborative applications of gamification.

In addition to examination of specific gamification aspects, much research needs to be done in regards to second language acquisition. As of yet, there have only been a small handful of studies done that concerned language acquisition and gamification. The vast majority of

gamification applications have been done in technology or science fields. However, gamification has also shown success in other areas. Research needs to be done using gamification in second language classrooms to determine how it can benefit language learning. As gamification has been shown to be an effective motivator, and motivation is an extremely important aspect of language learning, studies need to be done to demonstrate how this can be effectively carried out.

Limitations

One of the largest drawbacks in this study was the sample size itself. As Hunter and Schmidt (2004) stated, larger sample sizes are always more beneficial in a meta analysis. This study could be conducted again at a later time, after more research on gamification has become available. As gamification is still yet a fairly young and new concept, there are more and more studies being published every year. With time, there may be even more studies that are available.

One reason for the lack of studies was the data reporting by many studies. In order to conduct a meta analysis certain statistics are necessary, typically means and standard deviations. However, some studies, while reporting quantitative data, still left out crucial numbers. Reporting must be done in a specific way so as to maximize the efficacy of study results, but this was not always done. While initially it seemed that there would be 40 to 50 studies in this meta analysis, after carefully analyzing and categorizing the data it was revealed that a large number of studies did not report enough statistics. Stricter standards need to be used when reporting data on gamification studies. In the future, for those conducting research in gamification it is imperative that data is properly reported. Means and standard deviations are necessary in order to determine the effects of a gamification application, so these should be included in every report.

Without this information it is impossible to determine the true benefits or drawbacks of gamification.

Chapter VII

CONCLUSION

Overall, the results of the meta analysis provide evidence for the usage of gamification in educational settings. More importantly, the analysis of moderator variables has revealed specific areas and ways in which gamification applications can be more or less effective. Gamification appears to work better in shorter doses, which means it could be used in short term courses, or as a module within a larger course. Additionally, competitive elements are also beneficial in gamification. Lastly, the usage of elements that focus on time on task are extremely important when designing a gamified course. Studies that appropriately applied time on task elements experienced positive results, whereas studies that did not use time on task properly experienced the opposite effect.

These results suggest that gamification could have definite applications in the field of second language acquisition, even though the current meta analysis included no studies in this field. As of yet, gamification is a new field that has rarely been used in SLA. However, with the emergence of CALL applications there is space for research to be done using gamification in language learning. At this point more research is necessary to determine the exact effects gamification can have when used in SLA. From the benefits shown by gamification in general, and the importance of specific moderator variables discovered by this meta analysis, evidence strongly suggests that gamification could have beneficial effects in the language classroom.

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Appendix

Summary of Gamification Studies

| Study | Population | N | Areas of Interest | Results | Design |
|---|----------------------------|------|---------------------|----------|---------------------------------|
| Abramovich et al. (2013) | Middle school students | 51 | Motivation | Mixed | Experimental group only |
| Barata, Gama, Jorge, & Groncalves(2013) | Graduate students | 77 | Engagement | Positive | Experimental and control groups |
| Caton & Greenhill (2014) | Undergraduate students | 136 | Engagement | Positive | Experimental and control groups |
| De Schutter & Abeele (2014) | Undergraduate students | 40 | Motivation | Mixed | Experimental and control groups |
| Denny (2013) | Undergraduate students | 1031 | Participation | Positive | Experimental and control groups |
| Domínguez et al. (2013) | Undergraduate students | 196 | Badge effects | Mixed | Experimental and control groups |
| Hakulinen & Auvinen (2014) | Undergraduate students | 278 | Motivation | Mixed | Experimental group only |
| Hanus & Fox (2015) | Undergraduate students | 71 | Motivation | Negative | Experimental and control groups |
| Ibáñez et al. (2014) | Undergraduate students | 22 | Motivation | Positive | Experimental group only |
| Iosup & Epema (2014) | Undergraduate students | 557 | Motivation | Positive | Experimental and control groups |
| Krause et al. (2015) | Undergraduate students | 206 | Motivation | Positive | Experimental and control groups |
| Nevin et al. (2014) | Graduate students | 50 | Knowledge retention | Positive | Experimental group only |
| Paisley (2013) | Undergraduate students | 21 | Motivation | Positive | Experimental group only |
| Su & Cheng (2014) | Elementary school students | 102 | Motivation | Positive | Experimental and control groups |