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Instructional Methods and Engagement: The Impact of Gamification on Student Learning of APA Style

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Instructional Methods and Engagement:
The Impact of Gamification on Student Learning of APA Style

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Abstract

This research examined the effects of simple gamification on the instructional skill outcome and level of engagement as measured by time, repetitions, and responses to the *Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale* (Saadé and Bahli, 2005). Participants were 70 graduate and undergraduate students randomly assigned to one of two instructional conditions: gamified or typical online instruction. Instruction consisted of three modules on the use of APA 6th ed. (American Psychological Association) citation and reference style in college level writing. Both groups received the same instruction but with different context and directions. Participants in the typical condition received instructions similar to what they would encounter in a typical online course where they have assignments and receive grades. Participants in the gamified condition were assigned an entry level "job" as a research assistant and encouraged to learn and practice to gain greater levels of achievement measured by quizzes presented as "challenges" which were required to "level up." Statistical analyses did not show a difference in outcome skill levels or engagement between the conditions, but several variables did show significance that suggested that all students improved their understanding of APA citation style and students in the typical condition reported feeling higher levels of control and focus during their instructional experiences.

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I would also like to thank Rebecca Martindale for sharing endless peer debriefings throughout the years. Thanks also to my sister Mary who graciously edited the APA lessons and to John Chapman who provided the wonderful voiceovers. Finally, thanks also to all who helped me recruit participants for the study and to my co-workers who have all been exceedingly understanding and patient.

Dedication

This work is dedicated first to my parents who raised me to understand that I could be whatever I wanted to be and especially to my mom who inspired my love of learning. Second, it is dedicated to Kathy who has provided endless encouragement, support, patience, and love while I zigzagged through what sometimes seemed like a futile process. Lastly, I would like to dedicate it to the memory of Dr. Donnie Dutton who was a truly inspirational mentor. He gave me many incredible opportunities but none was more important than the opportunity to fulfill a lifelong goal and continue my education, I will be eternally grateful.

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Chapter 1: Introduction

Many college students are unfamiliar with the publication style of their major area of study and few seem motivated to improve their skills (Park, Mardis, & Ury, 2010). Often, students give little thought to citation format or style and are prone to view it as tedious busy-work (2010). APA style, as it is commonly known, is the publication style of the American Psychological Association. It governs how journal articles and other academic and scientific papers are formatted and cited in the fields of psychology, sociology, education, health sciences, and nursing ([Foreword], 2010).

Students in the United States have traditionally been taught to use MLA style beginning in high school ([Foreword], 2003) and most typical entry-level college composition courses also place a strong emphasis on MLA style (Fallahi, Wood, Shaw-Austad, & Fallahi, 2006). MLA is the common name for the citation style of the Modern Language Association ([Foreword], 2003) and is the format of choice for articles and publications in the fields of language and literature. APA style differs from MLA in a number of important ways including differences in textual expression, document format, and citation of references (Madigan, Johnson, & Linton, 1995). A lack of familiarity with APA means that students may not be adequately prepared for college level writing when attempting major coursework in social sciences, health professions, or education. In fact, many instructors in higher education complain of an increase in the number of students who are unable to write effectively and use proper citation formatting appropriate for their discipline (Jorgensen & Marek, 2013).

The emphasis on MLA style in entry level writing courses means that many students will be at a disadvantage when moving into their major course work. In fact, many psychology professors may have wrongly assumed that APA style was taught to students in their freshman composition courses and thus failed to provide sufficient guidance on the topic (Madigan,

Johnson, & Linton, 1995). Researchers have frequently called for an approach that emphasizes writing across the curriculum, and many social science and education programs have added course requirements that emphasize the structure and style of professional writing in their field (Limke, Holloway, & Knight, 2011). However, this has been difficult to implement effectively and consistently. Writing instruction is time consuming and many instructors outside of language arts do not feel they have the time or preparation to address it in their classes (Fallahi et al., 2006). Since research suggests that many grammatical and citation errors are not marked or corrected by graders, it seems unlikely that this problem will improve much without some form of intervention (Barksdale-Ladd & King, 2000).

Technology has been viewed as a way to mitigate students' shortcomings in college writing. At the present time, students have wide access to tutorials, databases, citation generators, and other resources that are intended to guide writers in the proper use of APA style. Younger students typically express high levels of confidence in their ability to use these digital tools and do so readily (Clarke & Oppenheim, 2006). However, when Kessler and Van Ullen (2006) examined the accuracy of APA citation databases and generators they found an error rate of over 4.4 errors per citation in 2005, and this had improved only slightly in 2012 when a follow-up study found a rate of 3.4 errors per citation (Van Ullen & Kessler, 2012). Buchanan (2006) found similar error rates in science databases and in both cases, the authors suggest that this is at least partly due to the continuous changes that make accuracy difficult for publishers who must continually revise and update their content and technology (Buchanan, 2006; Van Ullen & Kessler, 2012). Park, Mardis, and Ury (2010) have suggested that this high error rate can lead to more incidents of academic dishonesty because students unfamiliar with or unable to recognize correct citation style may rely on these automated resources without question. Although these resources are intended to help inexperienced writers, and because many younger students express

confidence in their own ability to use them, reliance on them may lead to more errors or lead to questions about academic honesty.

Fallahi, Wood, Austad, & Fallahi identified four skills that they considered fundamental to competent writing by psychology students. These are grammar, writing style, writing mechanics, and referencing (2006, p. 172). *Grammar* refers to the rules of word usage, subject-verb agreement, and verb tense that are not unique to any one type of citation style. *Writing style,* in their research, refers to the type of prose and paragraph structure preferred in the field of psychology. *Writing mechanics* includes the punctuation, page numbering, and other rules of document formatting and structure (2006). The fourth skill, *referencing,* is described by the authors as, "Avoidance of plagiarism, proper use of original versus secondary references, referencing within the body of the paper, development of an accurate reference list, and other important elements of APA style" (p. 172). An improvement in referencing skill, as defined by Fallahi et al (2006), is the ultimate goal of this research.

Despite the fact that many students struggle with APA style, studies have found that even small amounts of practice can lead to significant improvements in skill. Drabick, Weisberg, Paul, & Bubier (2007) reported that 5 minutes per week of active engagement over the course of a semester, "produced significantly higher scores on test items than did the same amount of time thinking" (2007, p. 174). This suggests that periods of active engagement in practicing and reviewing APA style may lead to improved APA skills for learners.

Active engagement has long been recognized as an important factor in learning. When a learner is engaged and finds stimulation and enjoyment in a task, she is more likely to persist at the task. As Dewey and Dewey wrote in 1915, "Try to teach a child what is of use to him as a child, and you will find that it takes all his time" (p. 3). This active engagement is also the goal of gamification. The idea of gamification is not new; the term first appeared in education

literature in 2010 (Simões, Redondo, & Vilas, 2012) and is generally defined as the use of game elements and mechanics in a non-game context (Deterding, Dixon, Khaled, & Nacke, 2011). It is gaining popularity as a marketing tool, an instrument for health and personal improvement, and as a way to improve business processes from production, to quality, to return on investment (Werbach & Hunter, 2012). In every circumstance, the goal is to improve user engagement, which is expected to lead to more sales, improved health, enhanced performance or greater learning. It is possible that this type of active engagement will also lead to increased referencing skills in college students who receive gamified instruction in APA style.

The remainder of this chapter outlines the purpose of this study and describes its expected significance. A hypothesis and research questions are presented and the theoretical foundations are introduced. Finally, the chapter concludes with an introduction to terminology and definitions related to the research. This is followed by a review of the relevant literature in chapter two and a description of the methodology in chapter three. Results and discussion are provided in chapters four and five.

Purpose of the Study

The purpose of this study is to investigate the effect of gamified online instruction on college students' knowledge of APA style and citation formatting. This study focuses first on the assumption that the skills of students who receive gamified instruction may improve more than those who receive more traditional online instruction. It is hypothesized that students receiving the gamified instruction will have different levels of engagement and different levels of learning than students receiving typical online instruction.

Significance of the Study

This study is important for three reasons. First, too many students struggle with written communication, proper citation, and academic honesty (both intentional and accidental). Identifying effective ways to improve APA citation skills will help prepare students to become competent communicators in their respective discipline areas. Second, the use of gamification is rapidly growing in popularity and this is certainly true for education. This instruction, with its emphasis on recognizing reference types, identifying media sources, and producing appropriate citation formats seems well suited to evaluate the utility and effectiveness of gamification as a strategy for teaching and learning. Finally, noted game researcher, Dr. Jane McGonigal (2011) makes a convincing case that we are all gamers (or game players) in her book, *Reality is broken: Why games make us better and how they can change the world.* She offers statistics from gaming trade associations to support her argument about games. It is not surprising that over 95 percent of young people play computer or video games today. However, so do 25 percent of people over 50 and, contrary to what many people may assume, gender differences are non-existent as women now makeup over half of the PC gamer population (Chalk, October 28, 2014). The growth of game playing among females and in older populations suggests that gamification might be a strong motivator to a broad spectrum of learners.

Research questions

Research has shown that students who receive instruction on APA style make immediate improvements in the accuracy of their APA citations and references (Fallahi et al., 2006). To determine if there are differences in gamified versus traditional online instruction as a means of improving APA skills, this research will address the following questions:

1. Is there a difference in APA skill levels as measured by pre and posttest scores for participants in the two instructional conditions (typical online or gamified instruction)?
2. Is there a difference in level of engagement as measured by amount of time spent on learning modules and number of quiz attempts for each module quiz for participants in the two instructional conditions (typical online or gamified instruction)?
3. Is there a difference in students' self-reported levels of engagement based on the *Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale* and a scale to evaluate invested mental effort for participants in the two instructional conditions (typical online or gamified instruction)?

Theoretical Framework

It would be difficult to identify a primary theoretical framework relative to online learning or even more specifically, to gamification. Indeed, many theories related to behavior, learning, and personality have found currency in gamification and game-based learning research. Traditional theories such as Skinner's Behaviorism and Bandura's Social Learning Theory have influenced a number of researchers and developers of gamification (Kapp, 2012; Werbach & Hunter, 2012), and these as well as more contemporary theories such as Self-Determination Theory have all focused primarily on various facets of motivation (Chen & Jang, 2010; Deterding, 2012). Most recently, Csikszentmihalyi's concept of *Flow* has become a favorite theory of researchers examining motivation and engagement in games and learning (Ivetić & Petrović, April 2012; Werbach & Hunter, 2012).

Of the theories listed above, *Flow* (Csikszentmihalyi, 1990) provided the clearest connection and is the common thread that connects the components of the instrument used to

assess participants' levels of engagement in the instructional module. This will be explained in more detail in *Chapter 2*.

Definition of Terms

1. *APA:* Acronym for the American Psychological Association. Used in this context as an abbreviation for the official citation and publication style of the American Psychological Association.
2. *Badges and achievements:* In gamification, the tokens used as part of a reward strategy in basic gamification (Werbach & Hunter, 2012).
3. *Cognitive absorption:* In this case, deep involvement with the instructional condition and technology (Agarwal & Karahanna, 2000).
4. *Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale:* Instrument first described by Saadé and Bahli (2005) to combine measures of cognitive absorption with aspects of the Technology Acceptance Model (Davis, 1989). The instrument used in this study.
5. *Cognitive load:* An information processing construct that refers to the amount of mental effort in active use. As cognitive load increases, the amount of effort required to process this load also increases (Sweller, 1998).
6. *Control:* The participant's ability to determine her own involvement and level of participation (O'Brien & Toms, 2008). A state of flow is not possible without a sense of control (Finneran, 2005).
7. *Curiosity:* The participant's interest in delving deeper into the interaction (Morris, Croker, Zimmerman, Gill, & Romig, September 2013).
8. *Engagement:* The general term indicating the amount of interest, focus, involvement, and enjoyment that a participant gets from their participation in the condition or situation. It is a primary theme of cognitive research in gamification.

9. *Facets of engagement:* The eight constructs measured by the survey instrument which include control, curiosity, focused immersion, heightened enjoyment, playfulness, perceived ease of use, and perceived usefulness.
10. *Flow:* Complete absorption in the task to the point of losing track of time. Concept first defined by Csikszentmihalyi (1990) that is similar to engagement and intersects with theories of cognitive absorption (Agarwal & Karahanna, 2000) and technology acceptance (Davis, Bagozzi, & Warshaw, 1992).
11. *Focused immersion*: Being so involved in something that outside interference or stimuli is easily ignored (Cairns, Cox, & Nordin, 2000).
12. *Gamification*: The use of game design and mechanics to engage the "player" for some non-game purpose (Deterding, 2012; McGonigal, 2011; Werbach & Hunter, 2012).
13. *Game-based learning*: Using games to promote and encourage learning (Simões, Redondo, & Vilas, 2012).
14. *Heightened enjoyment*: Experiencing enjoyment in an activity to the point that participation is not mentally taxing or strenuous (Agarwal & Karahanna, 2000).
15. *Invested mental effort*: The amount of intentional cognitive elaborations needed to process the experience (Salomon, 1984).
16. *Leveling up*: In an instructional context, this is the reward for productive performance in the gamified situation. It is the de facto grading scale of a gamified lesson.
17. *Mobile games*: Games played on smartphone, tablets, and other hand-held devices (Simões, Redondo, & Vilas, 2012).
18. *Perceived ease of use*: A central construct of the Technology Acceptance Model (TAM) as described by Davis (1989). The learner's perception of the complexity of the experience and the amount of effort required to participate successfully.

19. *Perceived usefulness*: Another fundamental construct of the TAM (Davis, 1989) describes the degree to which the learner sees the utility in the instruction, tool, or computer application.
20. *Playfulness*: The interaction that occurs between the participant and the situation (Codish & Ravid, 2015).
21. *Player*: Where used in this document, the player is synonymous with the learner or participant.
22. *PBLs*: In gamification, this stands for points, badges, and leaderboards that refer to a reward strategy of basic gamification (Werbach & Hunter, 2012).
23. *Serious games*: Games whose purpose is to help solve a problem or improve quality of life (McGonigal, 2011).
24. *Social games*: Games that allow for communication between remote players. Advancement in these types of games typically is tied to cooperation between players (Werbach & Hunter, 2012).
25. *Technology Acceptance Model (TAM)*: Originally developed by Davis (1989) to help predict why people would or would not use a particular computer application. It has been expanded and applied to other instructional and technology situations since its inception.
26. *Temporal dissociation*: Losing track of time because of involvement with the subject of interest (Agarwal & Karahanna, 2000; Csikszentmihalyi, 1990).

Chapter 2: Review of the Literature

A review of relevant literature serves as the foundation for the methods and measures used to evaluate research questions. The review supports the research questions described in the introductory chapter and both explains and validates the measures used to evaluate the research questions described in the chapter that follows. This review performs the important task by providing relevant literature related to gamification, engagement, and APA instruction. It also serves to demonstrate gaps or inconsistencies in research, especially as they relate to gamification and online learning.

Gamification

Gamification emerged as an area of scholarly investigation around 2010 and since that time, research has mushroomed. A simple search for the term gamification, using Google Scholar, returned only 664 results for the period 2010-2011. A search for the year that followed—2011-2012, produced 2,130 results while a search for 2012-2013 more than doubled that with 4,820 results. The search for 2013-2014 nearly doubled again over the previous year with 8,300 results and the search for the most recent time period—2014-2015, yielded approximately 11,200 results at the time of this writing (February 2016). It should be noted that this general Google Scholar search includes research related to any application of gamification such as marketing and health behavior modification as well as research focused specifically on teaching and learning applications.

However, it is research in gamification for instruction that is considered here. Since researchers have employed game based learning, instructional games, simulations, and other similar innovations for years now, many of the methods and frameworks from these studies have found application in gamification research. The next section offers a look at the use of gamification for instruction. Following that section is a report on current gaps in the research

literature as well as an explanation of engagement which is a central theme for existing gamification research.

Gamification in instruction. Successful gamification depends on several factors including rapid feedback, praise or encouragement, and an approach that continually encourages the learner/participant to work toward the *next level* (Morris et al, September 2013; Wood & Reiners, 2012). Badges, achievements, and increasing levels of accomplishment or recognition have been commonly used to help create these factors, thus adding game-like or gamified components to what otherwise might be termed ordinary or traditional instruction (Barata et al, 2013; Goehle, March 2013; Kim & Lee, 2013; Monterrat, Lavoué, & George, 2011; Sheldon, 2012; Villagrasa & Duran, 2013). This technique differs from learning games in that these components are used with existing instructional materials rather being incorporated into a game (Monterrat, Lavoué, & George, 2011), and examples of how each has been used in gamification will be considered next.

Badges and achievements. Badges and achievements are digital artifacts (Antin & Churchill, 2011) or visual objects that represent skills, knowledge, and other desirable behaviors or traits (Werbach & Hunter, 2011) in a gamified learning environment. They are used to confer status, reward behavior, or enculturate new members of a learning community (2011). Despite the frequency that badges or achievements are used in gamification, research regarding their effectiveness has been slow to appear (Denny, 2013). However, this problem is rapidly changing and recent studies have found generally positive results but with some qualifications.

Hakulinen, Auvinen, and Korhonen (2013) found that badges and achievements were significantly more motivating for some but not all participants. However, they also suggest that badges have a negative impact on time management and may reinforce other negative behaviors such as trial-and-error problem solving (p. 53). A review of 24 gamification studies conducted by

Hamari, Koivisto, and Sarsa (2014) found that gamification does work and yields mostly positive results. As a caveat to their conclusion, the researchers also noted from their review that the research was more complicated than most gamification researchers appeared to acknowledge. They asserted that overarching conclusions were difficult to draw because each gamification study was heavily dependent on the instructional context and the qualities of the participants who used their respective programs (p. 3029).

Recently, Kwon, Halavais, and Havener (2015) examined participants' badge sharing in a social media context and found that specific types of badges were associated with different motivations. Again, this research indicated that results were heavily dependent on situational context but also on characteristics specific to certain participants. Another recent case study of basic gamification did not result in significant differences in performance outcomes, but participants reported more positive psychological outcomes based on their experiences (Harms, Seitz, Wimmer, Kappel, & Grechenig, October 2015). Research that predicts who will be most motivated by this type of reward system would be a useful thread of research since findings related to badges and achievements appear to suggest that gamification isn't the ideal approach for everyone.

Leveling up. Using levels to represent progression of learning or performance is another important component of basic gamification. Whether gamification is used in instruction, health improvement, marketing or for some other reason, it generally is undertaken with the intention of encouraging more of something: increased learning, bigger sales, healthier behavior, etc. Researchers have cited several functions of levels, or progression mechanics (Robson, Plangger, Kietzmann, McCarthy, & Pitt, 2015), in gamification. For example, using levels in an instructional context makes it more likely that the desired behavior will be repeated in the future (2015). Levels provide feedback about the user's progress and the opportunity to practice new

skills or knowledge (Drace, 2013), and frequently provide some type of benefit for the user (Goehle, 2013). An advantage of including levels in the gamification of instruction is that they are readily adapted to the traditional point system used in many high school and college classrooms (Barata, Gama, Jorge, & Gonçalves, 2013).

Gaps in the literature. Even though gamification in education is a hot topic, relatively little experimental research has been completed to this point. Many journal articles and presentations have been devoted to case studies and examples of gamification tools and strategies. Of the experimental studies that have been performed, most report positive outcomes because of the use of gamification, but many of these are self-reported effects. Similarly, it remains unclear who is most motivated by the process of gamification, and whether leveling leads to increased achievement and engagement.

While researchers seem to agree that engagement is the desirable byproduct that will produce the intended outcome (instructional or otherwise), there is some divergence in how engagement is measured in a gamified environment. Researchers have relied on existing measures of learner (or end-user) acceptance, use, and satisfaction with various types of technology. In particular, one study merged commonly used approaches to technology evaluation in an online learning environment (Saadé & Bahli, 2005). The instrument used in that study is used in the present study. An explanation of how the underlying components of this instrument create a suitable measure of engagement in gamification is considered next.

Evaluating gamification

Evaluating gamification involves two very different kinds of comparisons: 1) outcome or performance-based measures and 2) affective measures of engagement which include complex and sometimes conflicting ranges of concepts. Objective, performance-based outcome measures such as test scores, number of repetitions, or other benchmarks are used to evaluate or measure

performance within a gamified environment, similar to the way they are used to measure performance in a traditional instructional setting. However, because test scores, time spent on various tasks, and number of repetitions can be tracked electronically in a typical gamified system such as an online course or content management system, performance outcomes in this environment can be easier to measure than in traditional settings.

In an example of this type of electronic data used for outcome measures, researchers conducted a two-year gamification study of a system that used badges to encourage more use of an online trading application. They measured actual system use rather than reported usage and found that basic game mechanics were associated with improved usage of the system (Hamari, Koivisto, & Sarsa, 2015). This kind of information provides a useful crosscheck against user-reported outcomes typically used to assess the participant's perceived level of performance because it can be used to look for correlations and conflicts with user-supplied data. Measures of engagement are less straightforward and are discussed in the following section.

Engagement

As noted previously, engagement is a central goal in the design and construction of gamified instruction. At this time, no method or model has been accepted as the standard for measuring engagement. In a study of student acceptance of the technology used in online instruction, Saadé and Bahli (2005) introduced an instrument called the *Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale*. The Scale incorporated previously accepted and widely used measures from other areas of research to measure engagement: technology acceptance (Davis, 1989), cognitive absorption (Agarwal & Karahanna, 2000), and invested mental effort (Cennamo, 1993; Salomon, 1984). The next section will provide an overview of each and a description of the components or facets derived from each as measured

by Saadé and Bahli (2005). A description of the instrument and how it was used as a measure for engagement in the current research will follow.

Technology Acceptance Model. In 1989, Davis developed the Technology Acceptance Model or TAM. Subsequently, research to answer the question of why people would or would not engage in the use of a computer, Davis and colleagues found, "that people's intentions to use computers in the workplace are influenced mainly by their perceptions of how useful the computers are…and secondarily by the degree of enjoyment they experience in using the computers per se" (Davis, Bagozzi, & Warshaw, 1992, p. 1124). The Davis, Bagozzi and Warshaw instrument (1992) based on the TAM model has been validated repeatedly and used extensively in information systems (Lee, Kozar, & Larsen, 2003), but has also been extended to applications in many areas including education (Teo, 2009), health care (Hu, Chau, Sheng, & Tam, 1999), and consumer behavior (Koufaris, 2002). Two of the TAM model's primary constructs are perceived ease of use (PEU) and perceived usefulness (PU) (Davis, 1989). Questions related to both constructs are included in Saadé and Bahli's instrument (2005) and described in detail later in this chapter.

Invested mental effort. Another variable that is assumed to impact a learner's level of engagement is invested mental effort (Salomon, 1984). Salomon first described the amount of invested mental effort (AIME) as a way to quantify "nonautomatic, effortful mental elaborations (p. 648)." These elaborations lead to greater depth of information processing and increased mindfulness with higher numbers of elaborations indicating greater levels of invested mental effort (1984) which, in turn, promotes engagement in the learner. In a study of sixth grade students, Salomon (1984) measured learners' perceptions of television and print media as well as the learner's perceived self-efficacy (PSE) with each type of media and found a relationship between learners' self-efficacy with a media type, the student's level of processing effort, and

learning outcomes. Students perceived that instruction from video was easier than instruction from print (1984) and students receiving instruction by video had lower achievement scores that correlated negatively with their level of effort. This processing effort is assumed to increase stimulation of the learner's mental schemata (Cennamo, 1993) leading to a greater level of engagement with the instruction. Conversely, when less processing effort is necessary, the learner is less likely to be engaged in the instruction. Invested mental effort is described in more detail in the section on perceived ease of use, below.

Cognitive absorption (CA). Cognitive absorption introduced by Agarwal and Karahanna (2000) and defined "as the state of deep involvement or holistic experience an individual has with cognitively engaging information technologies…" (Chandra, Srivastava, & Theng, 2012, p. 802). Agarwal and Karahanna defined five dimensions including temporal dissociation, focused immersion, heightened enjoyment, control, and curiosity (Leong, 2011). Agarwal and Karahanna (2000) combined Davis' perceived ease of use and perceived usefulness (1992), theories of flow as described by Csikszentmihalyi (1990), and the idea of cognitive engagement as described by Webster, Trevino, and Ryan (1993) to form an expanded theory of cognitive absorption. In their research, Saadé & Bahli (2005) describe cognitive absorption as "a state of deep involvement with the ILS[1]….an antecedent to perceived ease of use and perceived usefulness" (p. 318). Put another way, the authors suggest that in order for users to find an instructional system easy to use and useful, they should first demonstrate some level of cognitive absorption as an antecedent behavior (Lee, 2010). One can infer from this that learners who show high levels of cognitive absorption will experience higher levels of technology acceptance. Specific aspects of Agarwal

[1] Internet-based learning systems.

and Karahanna's five dimensions (2000) incorporated into the facets of engagement are described in the next section of this chapter.

Facets of engagement. The preceding section introduced the model constructs that provide the basis for the measurement tool used in this research: The *Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale*. The instrument includes eight facets of engagement based on those constructs. Figure 1 shows the eight facets and their relationships. Facets based on cognitive absorption are shown on the left while facets relating to invested mental effort and technology acceptance are shown on the right.

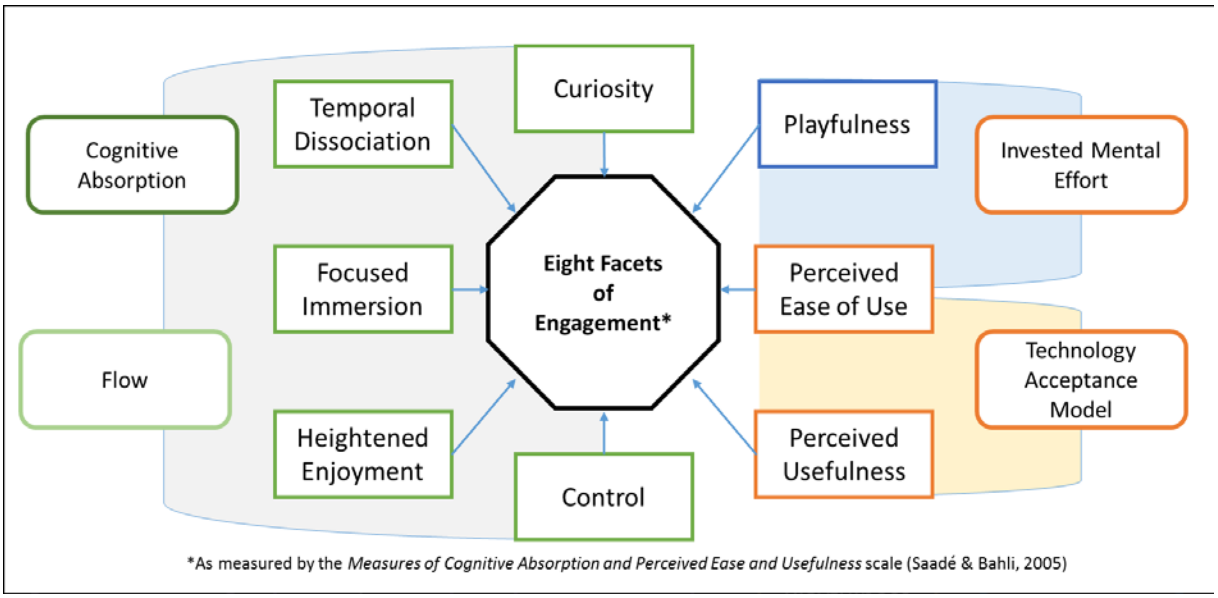

Figure 1. Facets of engagement as measured by Saadé & Bahli (2005).

The scale is comprised of a series of 34 questions located in Appendix A. Table 1 shows the number of questions relating to each facet of engagement as well as a brief description of the dimension. Each of the eight facets of engagement are defined in the sections that follow.

Table 1
Measures of the Cognitive Absorption and Perceived Ease and Usefulness

Construct or Facet	Number of Items	Dimension or Focus
Temporal Dissociation	4	Participant's perceptions about the passage of time during the instructional experience
Focused Immersion	5	Participant's level of focus on the instructional experience.
Heightened Enjoyment	4	Participant's enjoyment of the instructional experience.
Control	3	Degree of control the participant felt during the instructional experience
Curiosity	3	Participant's level of curiosity about the instructional experience.
Perceived Ease of Use	4	Participant's opinions about the ease of use of the instructional experience.
Perceived Usefulness	4	Participant's opinions about the usefulness of the instructional experience.
Playfulness	7	Participant's self-perceptions related to dimensions of playfulness

Temporal dissociation. Agarwal & Karahanna (2000) describe temporal dissociation as "the inability to register the passage of time while engaged in interaction…" (p.673), which aligns neatly with Csikszentmihalyi's conception of Flow (1990). The goal of this construct is to involve the participant (learner) so completely that time is not a concern for the participant and may pass unnoticed (Leong, 2011; Reychav & Wu, 2015) as the participant is engaged in the interaction. Participants in this study were asked to respond to four questions that evaluate their perception of time in relation to participation in the instructional modules. Higher levels of temporal dissociation will correspond to greater engagement.

Focused immersion. Immersion is generally assumed to be the involvement that a participant feels or experiences when participating in an interaction or game (Cairns, Cox, & Nordin, 2000) and where demands outside of the interaction or game are easily ignored (Reychav & Wu, 2015). When the participant is fully focused, or immersed in the experience,

cognitive load is reduced (Zhang, Li, & Sun, 2006). As with temporal dissociation, focused immersion relates to flow in the interaction or game experience (Agarwal & Karahanna, 2000). Participants in this study were asked to respond to five questions that assess their level of absorption in the instructional tasks as well as the extent to which they were distracted by outside factors, with students reporting greater temporal dissociation being more engaged than peers or report being easily distracted.

Heightened enjoyment. While enjoyment seems like a general concept, in this context heightened enjoyment leads the participant to feel that the task or activity is not strenuous or taxing (Zhang, Li, & Sun, 2006) and relates to the pleasure derived from the experience (Reychav & Wu, 2015; Saadé & Bahli, 2005). Thus, as with focused immersion, when learners experience heightened enjoyment the cognitive load and invested mental effort decreases, and cognitive absorption and engagement increase. Heightened enjoyment was assessed in this research through four questions regarding the amount of fun and enjoyment that participants experienced during instructional interactions and activities.

Control. A sense of control is a necessary antecedent for the participant to reach a state of flow (Finneran, 2005), and the amount of control that a user perceives that she has determines the level of engagement and absorption that she experiences (O'Brien & Toms, 2008). An optimum amount of interactivity encourages a greater sense of user control (Bui, Veit, & Webster, 2015), which increases user engagement. Control was evaluated in the current study by three questions asking participants about their personal feelings of control as well as the extent to which they did not have control in the APA course.

Curiosity. Curiosity might best be thought of as the level of desire a learner has to "bridge a gap in information between what is known and what is unknown, but which is also achievable." (Morris, et al, September 2013, p. 4) and is another key measure of cognitive

absorption. When levels of curiosity are high, learners experience higher levels of cognitive absorption and engagement. In the survey instrument for this study, participants were asked to respond to three questions about their level of curiosity toward the APA instruction.

Playfulness. Playfulness is defined as the interaction between the participant or learner and the situation (or instruction) (Codish & Ravid, 2015). As a construct it is strongly related to curiosity and focused immersion (Saadé & Bahli, 2005), and is useful in assessing engagement during a learning activity (Webster & Ho, 1997). In this self-report survey, participants were asked to rate themselves based on spontaneity, imagination, flexibility, creativity, playfulness, originality, and inventiveness. Participants who rate themselves as high in playfulness are assumed to be more likely to report higher levels of other facets of engagement.

This self-rating is also used as a proxy for perceived self-efficacy which is considered one of two factors necessary to evaluate the amount of invested mental effort (Rieh, Kim, & Markey, 2012). Participants who rate themselves highly on self-measures of these characteristics are considered to have greater levels of self-esteem, suggesting more feelings of self-efficacy (Cennamo, 1993; Rieh, Kim, & Markey, 2012). Playfulness measures will be compared with measures of perceived ease of use which are described in the next section.

Perceived ease of use. This construct as well as the construct of perceived usefulness which is describe in the next section are both established constructs of the TAM model. Perceived ease of use (PEOU) was described by Davis as the participant's beliefs about the relative ease that a software application may be used (1989). PEOU has been repeatedly shown to be strongly correlated with intention to use the software application (Beaudry & Pinsonneault, 2010; Gefen, Karahanna, & Straub, 2003), and also with the perceived usefulness of the application. The measures of cognitive absorption described in the sections above are considered to be antecedents of perceived ease of use as well as perceived usefulness (Herzig, Strahring, &

Ameling, 2012), and each of these constructs relate to levels of engagement. PEOU was assessed in this research study through the four standard TAM question stems for perceived ease of use. Perceived ease of use is also used here as a measure for invested mental effort. Learners are expected to show increased levels of engagement as the complexity of the instruction requires more mental effort and increased levels of mental effort (Cennamo, 1993).

Perceived usefulness. According to the TAM model, the perceived usefulness (PU) of a computer application is, "the extent to which a person believes a technology…will enhance" personal productivity (Venkatesh, 1999, p. 240). In a study of e-Learning in Korea, perceived usefulness and perceived ease of use were both found to be significant in determining students' attitudes towards e-Learning, and positive attitudes corresponded to increased participation suggesting greater engagement. However, results of the study indicated perceived usefulness had a greater effect than ease of use (Park, 2009) on attitudes, indicating that perceived usefulness of instruction may also have a greater effect on learner engagement than PEOU. Perceived usefulness was measured in the current study using the standard TAM question stems for PU, with participants indicating their agreement based on a 7-point scale. Higher degrees of perceived usefulness and perceived ease of use were expected to correlate with other facets of engagement.

APA Instruction

Proper APA citation style is broad and encompasses perpetually evolving publication formats, data types, data collection, and presentation methods; a truly comprehensive course on APA style would be lengthy and far beyond the scope of this research. Thus, the challenge was to identify a block of instruction in APA that was relevant and measurable for the purposes of this study. Fortunately, previous studies in this area have shown that any instructional intervention provides some improvement in students' understanding of APA publication style

(Fallahi et al., 2006; Luttrell, Bufkin, Eastman, & Miller, 2010; Skues & Wise, 2014), whether it is performance in written assignments (Luttrell, et al., 2010) or the ability to recognize APA errors (Jorgensen & Marek, 2013). Therefore, a major assumption of this study is that participants who complete the entire unit of instruction are likely to show some improvement in APA skills regardless of the instructional environment (gamified, not gamified). Descriptions of how content for instruction and the performance outcome assessment instrument were identified follow.

APA content. In an examination of writing skills essential for undergraduate psychology students, Fallahi et al. (2006) identified four broad categories: grammar, writing style, writing mechanics, and referencing. For the current study, instruction was limited to the type of information Fallahi et al. classified as "referencing" which was defined as, "Avoidance of plagiarism, proper use of original versus secondary references, referencing within the body of the paper, development of an accurate reference list…" (p. 172). The referencing category was chosen as the framework for the three modules of APA instruction within the current study and included content on the specific topics of reference sources, in-text citations, and properly formatted reference lists. An additional topic, avoidance of plagiarism, served as a theme throughout all instructional modules.

To identify the specific content to include within the three referencing modules, prior research on APA skills gaps was examined. Landrum (2013) surveyed 360 psychology educators ranging from adjuncts to full and emeritus professors who responded to the researcher's "73-item inventory of potential APA writing problems, issues, or challenges (p. 260)." Respondents were asked to estimate the importance of all 73 items and then to estimate the corresponding skill level of students in the upper 50% of their classes. Results of Landrum's study identified significant skill gaps for 54 of the 73 original APA issues. Of the 54 significant skill gaps, only gap areas

pertaining to the referencing category described by Fallahi et al. (2006) were considered for inclusion in the current study. The resulting items then were examined to determine which were relevant to each of the three learning modules. Relevant items were used to generate primary over-arching objectives for each of the three modules and are presented in Table 2. Specific learning objectives for each module were based on these items and are described in more detail in the Materials section of chapter three.

Table 2
Primary Instructional Goal for Each Module

Module 1 Primary Objective: Learners will be able to correctly identify and classify primary and secondary sources, and be able to correctly identify and classify source types.
Module 2 Primary Objective: Learners will be able to cite references (in-text) correctly and appropriately according to APA requirements.
Module 3 Primary Objective: Learners will be able to produce a properly formatted reference list that follows APA rules.

APA assessment. In order to measure the dependent variable (APA skill level) and assess participants' APA knowledge prior to and following the instructional activities, literature for any relevant examples of APA assessments was examined. Tartaro and Levy (2010) constructed a 21-item pre/posttest to evaluate undergraduate criminal justice majors' preparation using APA reference style in research writing. Students were given the pre and posttest (N = 264) and the researchers found a significant mean increase in the post score of 3.58 ($t(263) = -19.060$, $p<.001$) suggesting that student performance improved following a research course that included APA formatting instruction. With permission from the authors, Tartaro and Levy's instrument was modified to abbreviate the survey and exclude questions pertaining to skills and

knowledge not addressed in the three instructional modules of the current study. The eleven relevant questions from this instrument are found in Appendix B.

Summary

The chapter began with literature related to gamification in general and was followed by a discussion of the limitations of existing gamification research. The evaluation of gamified environments relative to performance-based outcomes and engagement was then explored. Measures used to evaluate gamification in previous research were introduced, and relationships between eight facets of engagement evaluated by existing instruments were described. The chapter concluded with a description of the literature on previous APA instruction that was used to inform the development of instructional content and outcomes assessment for the current study. The methods used in this study are presented in the next chapter and include a description of how the APA pre/posttest and the *Measures of the Cognitive Absorption and Perceived Ease and Usefulness* were used to answer the research questions.

Chapter 3: Methodology

The purpose of this study is to compare college students who receive gamified online instruction and students who receive typical online instruction in order to look for differences in APA skill level as well as the level of engagement in the learning experience. In this chapter, the methodology for this research is introduced beginning with the research design and sample selection, followed by instrumentation, materials, and procedures. Finally, the chapter concludes with a description of the data collection and analysis.

Research Design

The model for this study was a pretest-posttest control group design. This type of experimental design has fewer threats to internal validity than other experimental and quasi-experimental designs (Campbell & Stanley, 1963) with history and maturation being the primary threats (Dimitrov & Rumrill, 2003). In the current research, history is controlled in part, by the fact that all participants received the same instruction presented via the computer. This removed the threat that events taking place for one group were significantly different than for the other, minimizing chances for intra-session history (Campbell & Stanley, 1963). This type of design also controlled for maturation because participants were assigned randomly and had an equal chance of experiencing an external event that might have altered their result or perception.

The instructional condition (gamified versus typical) was the single (categorical) independent variable for all research questions. The study included one dependent variable related to APA skill level (research question 1), two dependent variables related to level of learner engagement (research question 2), and dependent variables for to students' responses to each question in the survey instrument (research question 3). The research questions and null hypotheses are provided below:

1. Is there a difference in APA skill levels as measured by pre and posttest scores for participants in the two instructional conditions (typical online or gamified instruction)?
2. Is there a difference in level of engagement as measured by amount of time spent on learning modules and number of quiz attempts for each module quiz for participants in the two instructional conditions (typical online or gamified instruction)?
3. Is there a difference in students' self-reported levels of engagement based on the *Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale* and a scale to evaluate invested mental effort for participants in the two instructional conditions (typical online or gamified instruction)?

Hypotheses

There are three null hypotheses:

1. There is no difference in APA skill level regardless of whether the learner is assigned to the gamified or typical online instructional condition.
2. There is no difference in level of engagement with the instructional materials and quizzes/challenges whether the learner is assigned to the gamified or typical online instructional condition.
3. There is no difference in students' self-reported levels of engagement or invested mental effort whether the learner is assigned to the gamified or typical online instructional condition.

Sample

Participants in this study were students at a mid-size public research university in the southern United States enrolled in graduate or undergraduate classes in education, health sciences, or nursing. Volunteers were encouraged to participate by their instructors and some

received a small amount of bonus points for completing the study at the instructor's discretion. This population was selected because of its accessibility to the researcher and under the guidelines of the university's Institutional Review Board, potential participants received an invitation to participate (Appendix C) directing them to contact the researcher by email for more information and to volunteer. Upon receipt of a student's request to participate, the researcher randomly assigned the student to one of the two conditions and provided notification to the student via email message. Students logging in to the course the first time were met with an informed consent form (Appendix D) before continuing to the pretest and instruction. A more detailed description of this process is included in the *Procedures* section of this chapter.

Instrumentation

Instrumentation to address the first research question consisted of a pre/posttest intended to measure participants' familiarity with APA citation style. In addition to the eleven questions from Tartaro and Levy (2010) described in the preceding chapter, items were constructed to measure potential outcomes from the modules that were not measured by the existing instrument. These questions consisted of seven items that could be broadly categorized as general familiarity with APA (1 question), source types (2 questions), and in-text citations (2 questions), and reference lists (2 questions). Combining the seven authored items and 11 items from the Tartaro and Levy instrument resulted in an 18-item assessment (see Appendix B) that was timed (9 minutes) for both pre and posttest in an effort to minimize the opportunity for participants to use external references to research their response to the test.

The instrument used to evaluate the participants' attitude toward the learning experience was the *Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale* developed by Saadé and Bahli (2005). The instrument is comprised of a series of 34 questions detailed in the previous chapter and provided in full in Appendix A. The researchers demonstrated the

reliability of the instrument using partial least-squares and calculating the Rho coefficient, which was found to be greater than .75 for the five variables scored. The researchers also assessed convergent and discriminant validity using partial least-squares. They found strong correlations between and within variables, with all having correlation coefficients of .73 or greater except for the relationship between cognitive absorption and temporal dissociation (.513). These results indicated an acceptable degree of reliability and validity for the instrument (2005).

To evaluate the amount of invested mental effort, scores from the questions representing the facets of perceived ease of use and playfulness were used. Perceived ease of use measures how difficult or easy the participants found the instructional experience while measures of playfulness align with perceptions of self-efficacy. Higher scores for ease of use suggest that participants experienced lower levels of invested mental effort while higher scores on measures of playfulness reflect greater levels of self-esteem and self-efficacy.

Materials

All instructional materials were presented using Blackboard Learn™, which was the learning management system (LMS) of the university where this research was conducted. Participants were randomly assigned to one of two online courses containing identical instructional materials but with different directions, grading scales, and reward structures. The instructional materials are described below and are followed by an explanation of materials and directions specifically related to each of the treatment conditions.

APA learning modules. The APA learning modules consisted of three lessons that introduced the learner to (a) the differences between primary, secondary, and tertiary sources; (b) how to cite a reference within the body of a written work; and (c) how to construct a works cited list according to correct APA format. The three learning modules were created with Microsoft

PowerPoint and Articulate Storyline 1 and were intended to be completed in sequence. A brief description of each module follows.

Module 1. Module 1 contained instruction on the different characteristics of primary, secondary, and tertiary sources in research. The module used a color wheel analogy to explain how primary, secondary, and tertiary sources fit together as reference materials. In addition to this information, examples of the most common types of sources were presented as along with examples of each type. Figure 2 shows images from module 1.

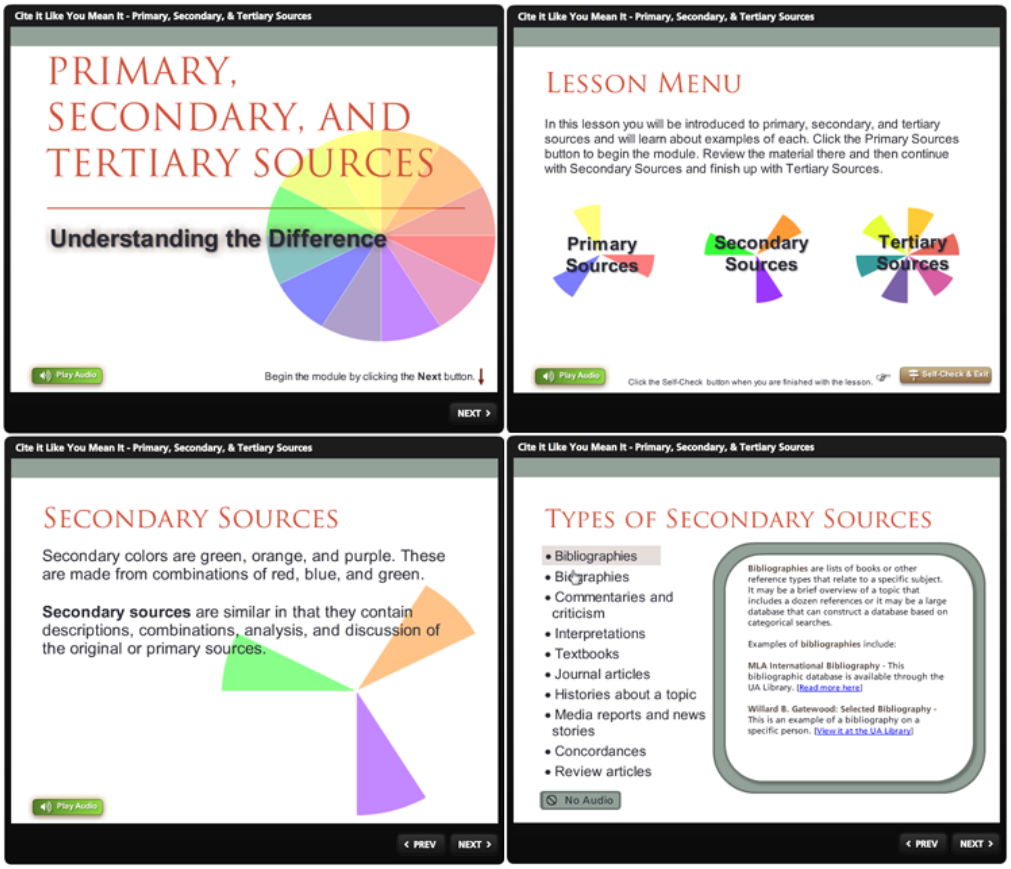

Figure 2. Screenshots from module 1 on primary, secondary, and tertiary sources.

Module 2. The module focused on the body of a document and presented multiple ways in which references may be properly cited, including how to properly cite references with multiple authors as well as how to cite multiple sources within one reference. Students were

provided with definitions and examples and as with all of the modules, most of the instructional content was also included in audio narration for better accessibility for all learners. A visual example from module 2 is shown in Figure 3.

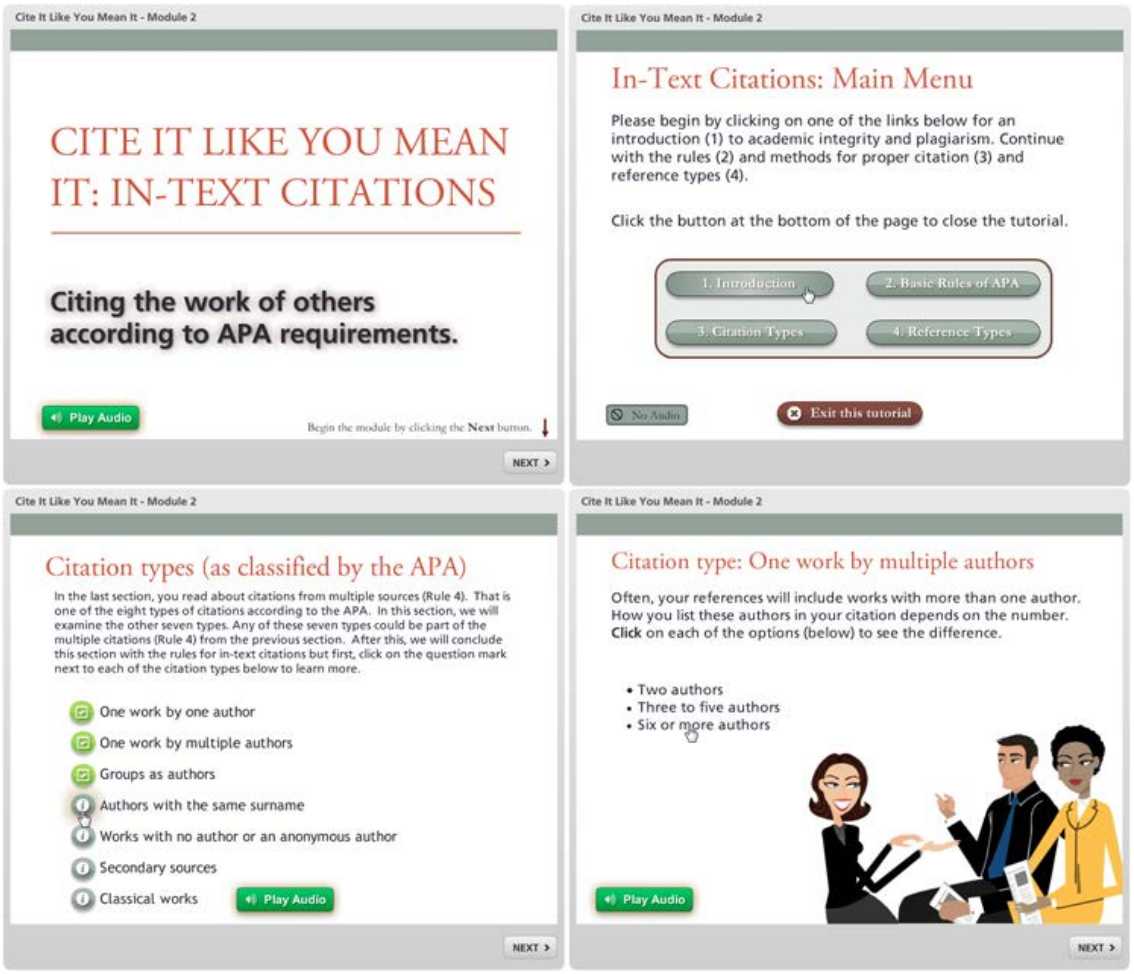

Figure 3. Screenshots from module 2 on in-text citations.

Module 3. In the final module, learners were introduced to the proper way to format reference pages or "works cited" lists. The instruction included the proper structure of a reference listing as well as the order that references are listed on the page. Figure 4 shows sample screens from module 3.

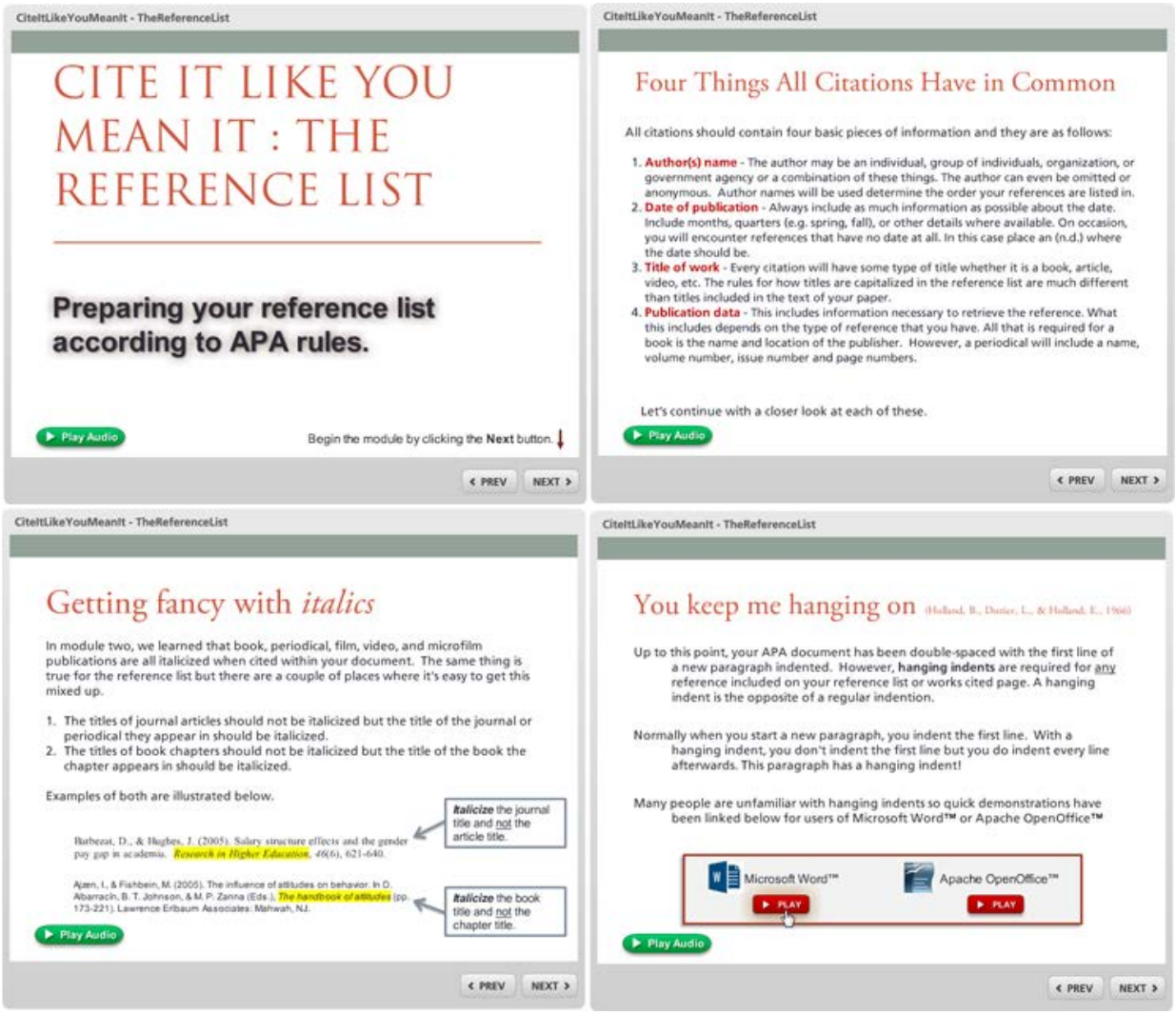

Figure 4. Screenshots from module 3 on preparing a reference list.

Instructional conditions. The primary interest of this research was gamification and its use as an instructional strategy. While all participants received the same basic instruction and assessment, the way in which it was framed or presented to the participants was very different depending on the treatment group to which the participant was assigned. The following sections provide an overview of each approach as well as a description of the key differences.

Typical (non-gamified) instruction. Participants in this group might have had a difficult time explaining how this online instructional unit was different from a lesson in any other online course. When participants located the course in the campus learning management system

(Blackboard), they found it listed as *Basic APA Citation Course*. Clicking on the course link took participants directly to the consent form, which was followed by the pre-test. Next, participants saw an overview not unlike a typical college syllabus. It included the list of assigned materials (learning modules), list of assessments (module quizzes) and provided a grading scale (see Table 3). In order to pass, students had to achieve a score of satisfactory (75%) on each of the three module quizzes. The scale is one that students might encounter in any upper level or graduate course.

Table 3
Typical Course Grading Scale

93% – 100%	Excellent
82% – 92.9%	Good
75% – 81.9%	Satisfactory
< 75%	Unsatisfactory

Figure 5 shows an example of the dialog presented to participants in this condition. The assessment was identified as a quiz and a floor was established—users had to get 75% to succeed. Participants could repeat the test until they were "happy with [their] score." Successful completion of a module quiz released the next module of the lesson. Students could check their scores or review their quizzes by visiting the *My Scores* section of the course. The link for that was located in the Blackboard course menu and followed the same arrangement that students were conditioned to expect in an online course or face-to-face course that used Blackboard as a supplement to classroom instruction.

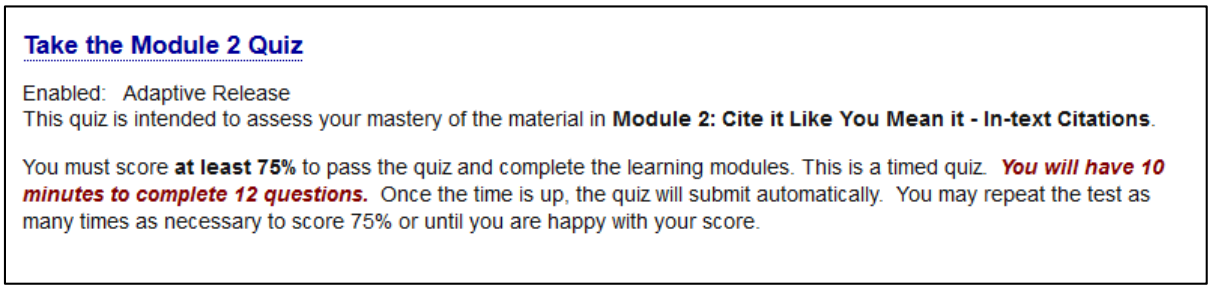

Figure 5. Example of quiz instructions from the typical instructional condition.

Once participants in the typical course completed all learning modules, module quizzes, pre and posttest, and post-lesson survey, they were presented with a Certificate of Completion. As an incentive to participate, students could give the Certificate to their instructor to receive extra credit. This certificate was not available to the student until all tasks were completed.

Gamified instruction. Participants assigned to the gamified condition found a course called *Rookie Researcher* in their Blackboard course listings. When the participant clicked the link to begin, they immediately were presented with the consent to participate just like participants in the non-game condition. Once this was complete, they were instructed to begin the "Rookie Researcher Challenge" by taking the pre-assessment. Once this step was complete, students were informed that they had reached Level 1 and attained the title of "Research Technician." Participants were then directed to the next step in the challenge, which was to complete the level 1 module and accompanying challenge to advance to level 2, also known as "leveling up." Figure 6 shows the dialog and graphic for the Level 1 instructions that directed participants to complete the learning module.

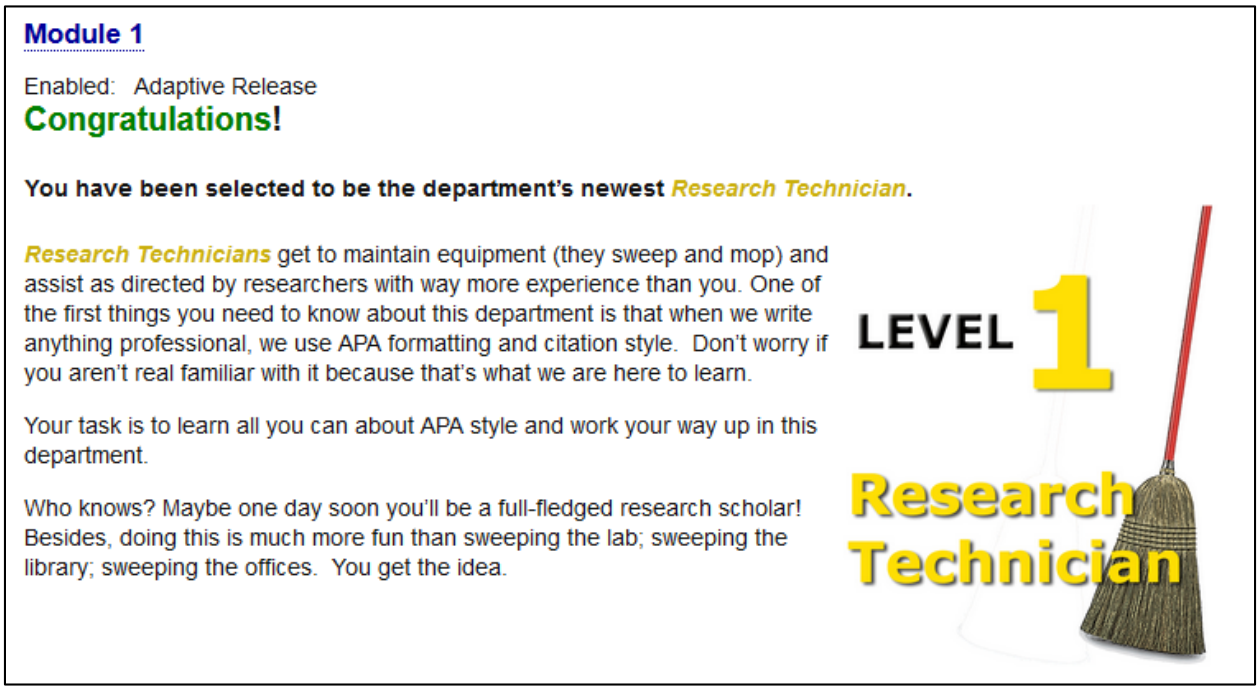

Figure 6. Example of instructions from the gamified instructional condition.

As students used learning modules and completed challenges to level up, they received badges to reflect their status as higher level members of the research team (Appendix E). Participants advanced when they reached the 75% threshold on the level challenge. They were awarded the next badge and presented with the next module. Each level represented advancement in APA understanding as well as advancement within the research "community." Researchers were encouraged to repeat modules for additional status. The details for the additional status achievements were visible to participants through the Badges & Achievements page as an option for participants. A score of 75% was required of any participant to advance, but higher scores lead to additional recognition with challenge performances of 82% or greater receiving "Noted" status, scores of 93% or greater identified as "Esteemed" and scores of 100% identified as "Distinguished." Participants who achieved "Noted" status for all three challenges received an additional badge called "Naturally Noted," while participants who achieved "Esteemed" status three times were recognized with a badge called "Especially Esteemed."

Participants who achieved 100% on all the challenges were recognized with the “Definitely Distinguished” badge shown in Figure 7.

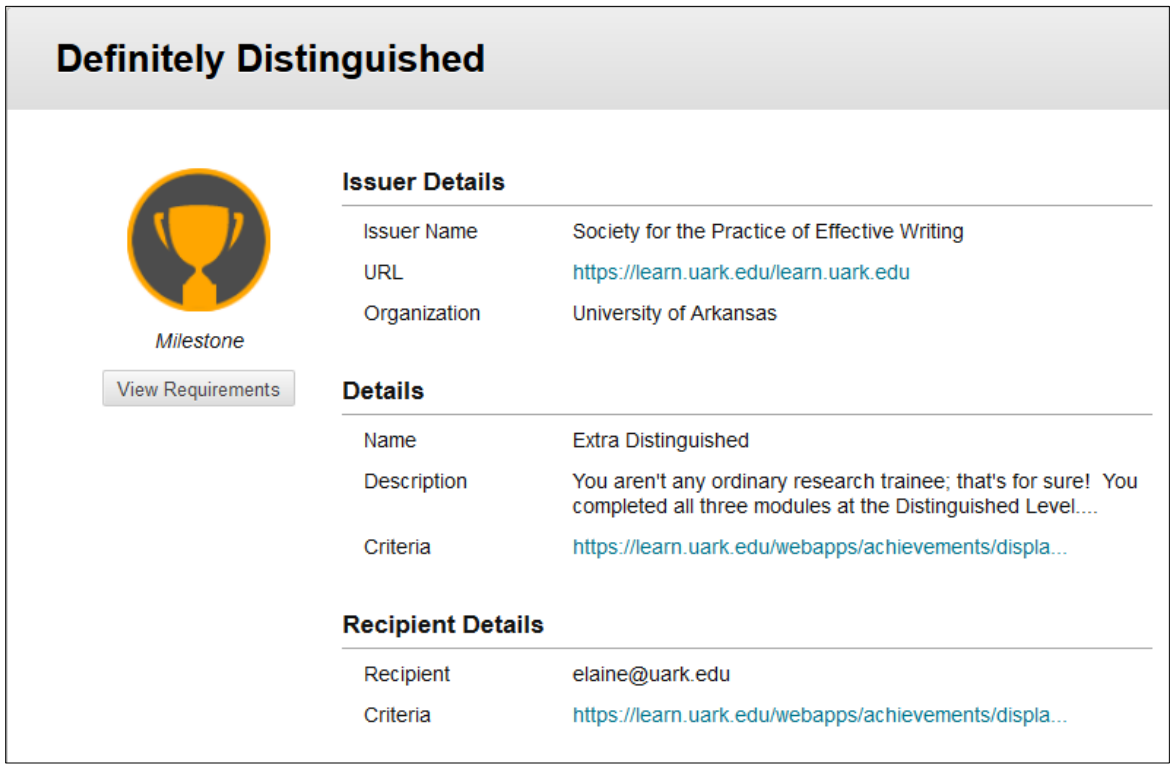

Figure 7. Definitely Distinguished milestone badge as it appears in Blackboard™.

The metaphor used throughout the gamified modules did not resemble a typical course. Every participant started at level 1 and the expectation was always that the learner would continue to be successful and “win” by completing all four levels including Research Technician, which was awarded for completing the pretest. Thus, the lack of failure in the gamified group stood in contrast to the typical instructional group where they had the potential to “fail” and be unsatisfactory.

Procedures

Each participant was assigned to one of two conditions: typical online instruction (non-game) and gamified online instruction (game). To maintain balance between the two groups, the initial participant was assigned by a coin toss. The next volunteer was assigned to the opposite

condition. Participants were added based on the order in which their request to participate was received. This pattern repeated until all available volunteers were assigned. Data collection continued over an extended period of time and volunteers could sign up at any time depending on when their instructor shared the invitation to participate. Every time treatment groups had an equal N, then the next new volunteer was assigned at random based on a coin toss. This assignment process for participants continued until the end of the data collection period. Data collection occurred over a period of four months, which allowed instructors the freedom to invite students to participate at an appropriate point within their semester course, and afforded participants adequate time to complete the required work. Details and procedures regarding the data collection are addressed in the next section of this chapter.

Data Collection

Data were collected within Blackboard from November 1, 2015 until March 11, 2016. Students were allowed to complete instruction at their convenience but were be asked to complete all tasks related to the program within two weeks of being added to the course. As tasks were completed, data from all completed instruments as well as module specifics related to time and number of quiz attempts were gathered within Blackboard. The type of data varied based on the independent variable. Performance improvement for the APA unit was calculated based on the sum of raw posttest scores and were used to address Research Question 1. The total time spent to complete the learning modules was derived by compiling the time spent within each module, and the total number of attempts at end of module quizzes/challenges was calculated by totaling all attempts. These data were used to evaluate Research Question 2. Lastly, raw scores on the 34 questions of the *Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale* were computed and used to evaluate self-reported levels of engagement as well as invested mental effort for Research Question 3. These data were exported from Blackboard

and converted for import into IBM SPSS Statistics 22 for analysis. Specifics on the data collected to address each research question are provided in the sections below.

Data Analysis

This section describes the steps intended to analyze the results for each of the research questions and is presented by research question.

Research question 1.

A one-way analysis of co-variance (ANCOVA) was conducted to determine if a significant difference existed between the two categories of the independent variable (gamified versus typical online instruction) and the dependent variable, posttest scores on the APA skills quiz controlling for pretest scores. Because participants were assigned at random to one of the two categories of the independent variable, the assumption of independence of observations was met. Levene's test was used to check the homogeneity of variances and SPSS was used to calculate the F statistic, degrees of freedom, and level of significance to determine if a difference existed between the two groups on posttest scores. The alpha level was set at $p < .05$.

Research question 2.

With SPSS, a one-way multivariate analysis of variance (MANOVA) was conducted to evaluate two continuous dependent variables (total time and number of quiz attempts) for the two categories of the independent variable (gamified versus typical online instruction). Because participants were assigned randomly to one of the two categories of the independent variable and both dependent variables were interval, two of the assumptions of the MANOVA were met. Levene's test was used to check the homogeneity of variances and the Shapiro Wilk test was used to evaluate the homogeneity of variances. SPSS was used to calculate the F statistic, degrees of freedom, and level of significance to determine if the two groups were different on the total amount of time spent within the instructional modules. The alpha level was set at $p < .05$.

Research question 3.

Data for this question were evaluated using a one-way multivariate analysis of variance (MANOVA) to determine if a difference existed between the two categories of the independent variable. MANOVAs are preferable in a situation with a greater number of dependent variables as it reduces the risk of type 1 errors. The assumptions of random assignment and type of dependent variables (interval) satisfied two of four assumptions of the MANOVA. Levene's test and the Shapiro Wilk test were used to verify homogeneity of variances and normality of distribution. Multicollinearity was evaluated with a correlation matrix.

Research question 1.

Is there a difference in APA skill levels as measured by pre and posttest scores for participants in the two instructional conditions (typical online or gamified instruction)?

Data to address this question were obtained by calculating the raw scores on the posttest for participants in each instructional condition and using raw scores for the pretest as a covariant.

Research question 2.

Is there a difference in level of engagement as measured by amount of time spent on learning modules and number of quiz attempts for each module quiz for participants in the two instructional conditions (typical online or gamified instruction)?

This question was addressed by gathering data for two dependent variables. The first dependent variable was the total time (interval measure) spent on learning modules. Total time was calculated based on the total time for all attempts (calculated in total minutes) at each of the three learning modules. Because participants must complete all stages of the instruction to be

considered successful, each participant will have at least one attempt at each module and was calculated as $M_1 + M_2 + M_3 = Total\ Minutes$. Participants with multiple attempts on one or more of the modules was calculated as $(M_{1A} + M_{1B} + M_{1C}) + (M_{2A} + M_{2B}) + (M_{3A}) = Total\ Minutes$ where *A, B,* and *C* represent repeated attempts for a single learning module.

The second dependent variable intended to measure level of engagement was the number of attempts for each end of module quiz/challenge (interval). As with the preceding dependent variable, all participants must have completed all stages to be considered successful so each participant had a minimum of 3 attempts and the total number was $(M_{1T} + M_{2T} + M_{3T}) = Total\ Attempts$ where *T* = number of tries (attempts) for a quiz/challenge. Analyses for these data are described in detail in the next section of this chapter.

Research question 3.

Is there a difference in students' self-reported levels of engagement based on the Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale and a scale to evaluate invested mental effort for participants in the two instructional conditions (typical online or gamified instruction)?

Survey results were collected and responses were coded numerically for each of the seven potential responses with +3 indicating strongest agreement and -3 indicating strongest disagreement, with zero indicating a neutral response. Reverse coding was used to standardize answers for the following questions:

- When doing the APA Course, I got distracted by other things very easily. (Focused immersion)
- The APA Course bored me. (Heightened enjoyment)
- I felt I had no control over my interaction with the APA Course. (Control)

After reverse coding was complete, variables were created for each question for analysis in SPSS.

Summary

This chapter described the parameters and procedures necessary to address the research questions in this study. Participants were assigned to one of two treatment conditions: gamification or typical (non-game) instruction. Data collected for analysis included: difference in pre and posttest scores, time spent on each learning module, and number of assessment attempts. Students' levels of cognitive absorption and perceptions about the instruction were assessed using scores from the *Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale* (Appendix A), and the amount of invested mental effort was evaluated using items from the scale related to perceived ease of use and playfulness. The next chapter presents the results of the analyses for all data collected.

Chapter 4: Results

This study involved a comparison of learning outcomes and levels of engagement for a unit of instruction delivered online where one group viewed the instruction in the context of a typical online course and the other group viewed the same instruction in a gamified instructional context. The purpose was to determine the extent to which students who received the gamified instruction performed differently or had different levels of engagement or amount of invested mental effort than students in a more familiar online course condition. This quantitative research utilized several measures to check for differences in dependent variables as well as measure the interaction between the independent variable and various dependent variables.

Demographics

A total of 138 students volunteered and were assigned randomly to each of the two treatment conditions. Each group had 69 students assigned and in each group, only 35 students completed all modules and instruments, which was a requirement for inclusion in the final analyses. This resulted in a total sample size of 70, with participation by gender skewed heavily toward females. Although females were overrepresented in the study as a whole, males were evenly distributed between the two conditions as illustrated in Table 4.

Table 4
Participant Gender by Instructional Condition

	Gamified Instruction	Typical Instruction	Total
Female	28	29	57 (81%)
Male	7	6	13 (19%)

Participants were mostly undergraduates with juniors and seniors making up the largest proportions. Total participant distribution by grade level and instructional condition are shown in

Table 5. As with gender, the distribution of grade level within each category was more or less equal across each of the instructional conditions.

Table 5
Participant Makeup by Grade Level and Instructional Condition

	Gamified Instruction	Typical Instruction	Total
Sophomore	1	3	4 (6%)
Junior	12	13	25 (36%)
Senior	16	14	30 (43%)
Masters	5	5	10 (14%)
Doctoral	1	0	1 (1%)

Question 1 Results

Is there a difference in APA skill levels as measured by pre and posttest scores for participants in the two instructional conditions (typical online or gamified instruction)?

Participant's pre and posttest scores were analyzed using an ANCOVA with the posttest score serving as the dependent variable, the instructional condition as the independent variable and the pretest score as a covariant. The mean score on the posttest was 11.89 for both groups with standard deviations being 2.795 for the gamified group and 2.259 for participants in the typical instructional condition suggesting little difference between the two ($F(1, 69) < .001$ $p = 1.0$). Levene's test did not yield a significant result so both groups were assumed to have equal variances.

The results of the analysis of variance between the independent variable and the dependent variable (posttest score) were not significant indicating that there was no difference in outcomes between the two instructional conditions. However, the covariant (pretest score) did show significance in the difference between pre and posttest scores for both instructional conditions combined ($F(1, 69) = 19.017$ $p < .001$) suggesting that while results did not differ

based on instructional condition, the group as a whole showed improvement on the posttest as compared to participants' initial scores. A partial eta^2 of .221 suggests that this relationship between pretest and posttest is strong.

Question 2 Results

Is there a difference in level of engagement as measured by amount of time spent on learning modules and number of quiz attempts for each module quiz for participants in the two instructional conditions (typical online or gamified instruction)?

A one-way MANOVA was conducted in order to determine if there is a relationship between the time spent on learning modules and the independent variable—gamified or typical instruction with the number of quiz attempts. Although participants in the gamified condition (N = 35) had a slightly greater number of quiz attempts (M = 15.09, SD = 5.633) and an average of over thirty minutes more time spent in modules (M = 1:28:08, SD = 1:44:35), they did not differ statistically from participants in the typical condition (N = 35) who had a mean time of just under an hour combined on all modules (M = 0:56:20, SD = 0:46:23) and completed slightly fewer quizzes (M = 14.26, *SD* = 6.099). The extremely large standard deviations for all variables indicated that a large amount of error existed and the test of relationships between the two dependent variables did not reveal a statistically significant relationship in this case (F (1,69) = 2.706 p = .105).

Question 3 Results

Is there a difference in students' self-reported levels of engagement based on the Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale and a scale to evaluate invested mental effort for participants in the two instructional conditions (typical online or gamified instruction)?

A one-way multivariate analysis of variance (MANOVA) was used to determine if survey responses were different for the two conditions of the independent variable (gamified and typical). Means and standard deviations were calculated for each level of the independent variable for each of the 34 survey questions and are provided in full in Appendix F. The results of the multivariate tests were evaluated using Wilks' Lambda and were found to be nonsignificant ($p > .10$). Between-subject effects were noted for two of the survey questions. In response to the question: *While I was doing the APA Course, I was able to block out most other distractions* (F (1, 68) = 4.743 $p = .033$), students in the traditional condition expressed greater ability to ignore distractions (M = 1.29, SD = 1.62) than students in the gamified condition (M = .34, SD = 1.99). The partial eta^2 of .065 suggests that this relationship between condition and response to the question was weak. For the question: *When taking the APA Course, I felt in control* (F (1, 68) = 7.33 $p = .009$), participants in the traditional condition (M = .74, SD = 1.36) also reported greater levels of control than students in the gamified condition (M = -.17, SD = 1.47). The partial eta^2 of .097 suggests that this relationship between condition and response to the question was moderate.

An additional one-way multivariate analysis of variance (MANOVA) was conducted to isolate the variables associated with invested mental effort, which included questions on perceived usefulness and playfulness. The resulting Wilks' Lambda was non-significant ($p = .142$) indicating that there was no difference for the two conditions of the independent variable in terms of invested mental effort. Tests of between-subject effects showed no significant relationship for any of the questions used to measure perceived usefulness or playfulness.

Summary

The results for question one showed no relationship between the two factors of the independent variable and the final outcome on the pre/posttest. However, the results showed that

participants as a whole did significantly better on the posttest indicating that APA knowledge improved. The second question considered the amount of time participants spent on the learning modules and the number of times they took the quizzes. Results showed there was no difference in the two factors of the independent variable for either of the amount of time spent on modules or the number of module quizzes repetitions. A comparison of the results on the *Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale* showed no significant effect overall but it did reveal a slight but significant difference between the two factors of the independent variable for two individual questions: 1. *While I was doing the APA Course, I was able to block out most other distractions* and 2. *When taking the APA Course, I felt in control.* An examination of the questions on perceived ease of use and playfulness did not result in any difference in the amount of invested mental effort for the two instructional conditions. These findings will be discussed in more detail in the next chapter.

Chapter 5: Analysis

The purpose of this study was to investigate the effect of gamified online instruction on college students' knowledge of APA style and level of engagement students experienced with the instruction. Volunteers were randomly assigned to one of two instructional conditions (typical online or gamified) and presented with three modules of identical instruction in the publication format of the American Psychological Association. The instruction was based on criteria described in research by Fallahi et al. (2006), and was evaluated using a survey (Saadé & Bahli, 2005) that combined components of existing instruments measuring facets of engagement which included temporal dissociation, focused immersion, heightened enjoyment, control, perceived usefulness, perceived ease of use, playfulness, and curiosity. Data collection was presented in the preceding chapter. The next section will present the findings as they relate to each of the research questions and the literature on gamification. That is followed by a discussion of the limitations of the research. Finally, the chapter concludes with a discussion of the implications for future research.

Findings

Research Question 1. The lack of significance that resulted from the analysis of pre-posttest scores for both gamified and typical instruction supported the findings of a recent study (Harms, Seitz, Wimmer, Kappel, & Grechenig, October 2015) which did not find a difference between gamified and typical instructional conditions related to changes in performance or skill. While this finding didn't provide any indication that gamified instruction might be better than typical instruction, it is consistent with a long line of research (Bernard et al., 2004; Means, et al., 2009; Neuhauser, 2010; Russell, 1999) that has repeatedly found that the delivery method or instructional context does not lead to significant differences in outcome. It is possible that the difference in approach and context between gamified instruction and typical instruction is more

superficial than is assumed but the results of this study support this possibility as no differences emerged in relation to performance gains. Based on the results of this study, we fail to reject the null hypothesis since no significant differences were found between the two groups in their APA skill levels.

However, the finding that all students who participated in the study did significantly better on the posttest following APA instruction supported Fallahi and colleagues (2006) who found that any instruction on APA will lead to some improvement in students' APA referencing and citation skills. This reinforced the idea that providing students with opportunity to learn about APA publication style leads to improvements in college writing and may also lead to fewer incidences of academic dishonesty.

Research Question 2. Although changes in behavior or response—be it better sales figures, greater weight loss, or more time spent on instruction —are considered a benchmark of gamification efforts (Werbach & Hunter, 2012), no meaningful time differences were recorded in this study. Participants in the gamified condition were likely to spend the same amount of time repeating the modules as their counterparts in the typical condition. The same was true for quiz attempts. No relationship could be identified between gamification and the number of times a participant attempted quizzes. Thus, the gamified instruction within this study did not appear to motivate participants to interact with the modules and quizzes more or less than traditional instruction.

This finding contradicts Kwon, Halavais, and Havener (2015) who suggested that badges increased learner motivation to achieve higher levels of understanding, as well as other studies including a recent meta-analysis of gamification research that suggested gamification led to greater engagement and use of technology (Hakulinen, Auvinen, & Korhonen, 2015; Hamari, Koivisto, & Sarsa, 2015; Landers & Landers, 2014). Results of the current, study did not support

these previous findings. Students in the gamified condition did not spend any more time on the instruction than their typical instruction counterparts did, and were not motivated to seek higher levels of achievement once they obtained the minimum passing quiz scores. This offers little support for the idea that badges and challenges encouraged greater investment from the participants in terms of time or effort in the APA lesson and supports Denny's (2013) assertion that more research is needed relative to the impact of gamification elements such as badges and leveling up on the amount of time invested.

Research Question 3. No difference was found between the gamified and typical conditions when comparing the totality of all responses to the *Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale* (Saadé & Bahli, 2005). No difference was found when comparing items from the scale used to measure invested mental effort including perceived ease of use and playfulness suggesting that invested mental effort was roughly the same for both conditions. However, an analysis of individual survey questions found significance for two items that were counter to previous literature on gamification.

The broad concept of cognitive absorption has been touted as part of the appeal of gamification, and is based on the assumption that higher levels of cognitive absorption can lead to greater outcomes (Agarwal & Karahanna, 2000). In particular, the specific facets of 'focused immersion' and 'sense of control' are believed to be two important factors in that absorption (Cairns, Cox, & Nordin, 2000). Researchers have reported that participants who are sufficiently involved and experiencing 'focused immersion' are more likely to be able to ignore distractions outside of the gamified situation (Reychav & Wu, 2015), making it reasonable to assume that participants in a gamified condition would be more immersed and focused than those in a typical online approach. However, of the five survey questions that measured focused immersion within the current study, the traditional group reported slightly greater levels of focused immersion for

three questions with a fourth one reaching a significant level of difference. The participants in the gamified condition reported greater focused immersion scores on one question only, and the difference between the two group means was minimal. Thus, participants in the typical condition showed higher levels of focused immersion than those in the gamified condition, indicating that nothing about the gamified condition made participants more likely to become particularly focused or immersed in the experience. As a potential explanation for this counterintuitive finding, it may have been that participants in the traditional condition had a better idea what to expect within the traditional online instructional environment, and as a result were able to feel more focused on the instructional materials that were presented. On the contrary, the gamified group may have been distracted by the gamified instructional environment which contained a new method for delivering instructional directions, and novel approaches to measuring results.

This unexpected reverse association continued with a survey question based on the facet of engagement referred to in the literature as ‘control’ (Agarwal & Karahanna, 2000). Participants in the typical instructional condition expressed significantly greater feelings of control compared to their counterparts in the gamified instructional condition. Because control is considered an antecedent for flow (Csikszentmihalyi, 1990) and is the basis for many of the other constructs measured by the instrument (Agarwal & Karahanna, 2000; Davis, 1989; Finneran, 2005), it would be reasonable to assume that participants in a gamified scenario would feel a higher sense of control, which would ultimately lead to greater levels of cognitive absorption. However, in this study the students who participated in the typical instructional context demonstrated greater feelings of control than those in the gamified instructional condition. This proved to be the case on every measure of control within the survey instrument, with statistically significant differences found for one question. This presents a fundamentally confounding problem for gamification in this setting and is discussed next.

The results of the current research appear to suggest that the design and delivery of the instruction may not have presented a level of fun and playfulness sufficient to make a meaningful difference (Sheldon, 2012; Werbach & Hunter, 2012). In this study, participants in the gamified condition received directions and guidance that was more playful and less serious than the typical group participants. Students assigned to the gamified condition may have not taken it as seriously or made the same effort because, as noted in the previous chapter, participants in the gamification condition felt less control and were more likely to report being easily distracted. Feeling a sense of control is essential to the success of gamification (Finneran, 2005; Saadé & Bahli, 2005) and to the achievement of a state of flow as described by Csikszentmihalyi (1990). The students in the gamified condition felt less control than their counterparts, which suggests that simple gamification using levels instead of letter grades and tokens as rewards as described by Sheldon (2012) demonstrated little effect in this study. Gamification appears to be a useful incentive in many contexts but it requires more work than traditional instructional approaches and may not be worth the extra effort required of a typical classroom teacher.

Limitations

As with all research, there were several limitations and barriers that made conclusions less robust or even impossible within the current study. Three things in particular created limitations that possibly impacted this research. The limitations include (1) small sample size, (2) high attrition, and (3) problems with one of the module quizzes. Each will be discussed in the following paragraphs.

Small sample size. The original goal for this study was to recruit over 300 students to participate fully in one of the two instructional conditions. Many instructors shared the information with potential recruits but the pool was composed almost entirely of students who

received extra credit for completing the study as a supplement to their regular courses. A collection period of four and one half months resulted in 138 volunteers and of those just half completed all the requirements for inclusion in this study. Time constraints prohibited further data collection. While the current author considered the smaller sample size as a potential limitation of this study, Saadé and Bahli's (2005) original findings were based on a sample size of 70 participants. So, the author was able to learn from this previous study and adjust for the smaller sample size.

High attrition rate. Roughly half of the students who volunteered to participate gave up at some point before reaching the end of the course. Figure 8 illustrates the declines in participation for each condition. Note that attrition was roughly even between the both conditions which may suggest that neither condition made participants more (or less) likely to complete all work.

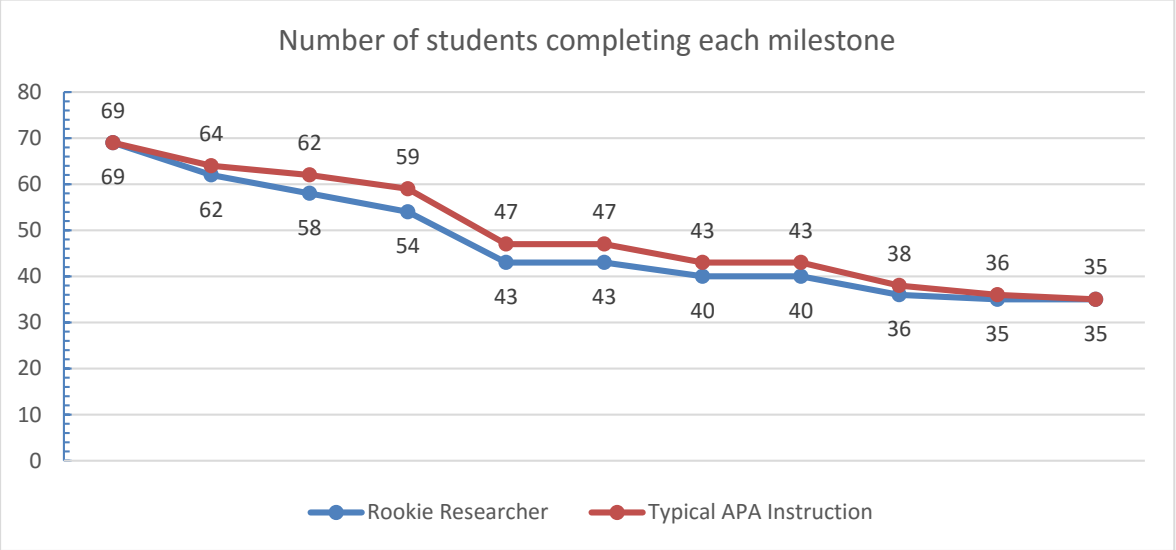

Figure 8. Decline in participation over time.

Module 3 Quiz. This quiz (or level 3 challenge) proved to be more difficult than expected and some students required many attempts in order to receive a passing score. Although this became quickly obvious to the researcher, in an effort to maintain consistency as much as

possible, the only modification made was to increase the amount of time that students had to complete the quiz. Even with the extra time, many participants continued to experience difficulties with this particular quiz and expressed frustration in communications with the researcher as well as feedback in the open-ended portion of the final survey.

Future Research

Although there was no difference in performance on the pre/posttest between gamified and typical online instructional conditions, results showed that the *Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale* appeared to measure the constructs that it intended to measure. The results provided from the survey instrument showed good intercorrelations between questions related to each of the eight facets of engagement. This would seem to confirm Saadé and Bahli's (2005) combination of measures from other instruments as being reliable as a measure of the constructs as intended, and results of this study indicated the instrument should be considered for use in future research.

Implications for future research include modification of the gamified condition for an improved user experience. Since gamified participants reported feeling less control than their counterparts, removing restrictions such as timed quizzes might lead to greater feelings of freedom for participants in the gamified condition. The timed quizzes were originally intended to reduce the ability for students to hunt for the correct answers but it may have proven to be a disincentive when students became frustrated about being unable to complete quizzes in the time allowed. Regardless of any other modifications in the presentation of content, revision of the third quiz is critical to ensure that the instructional conditions and requirements do not do more to frustrate and antagonize participants than to aid in their understanding.

Since only the students who received extra credit for participating in this study actually completed all the work, it seems very likely that unless the curriculum is required for a course

grade, incentives must be provided to encourage students to begin and persist through the instruction and post instruction survey. Many instructors who previewed the instruction have expressed an interest in continuing to use it with their students. If the gamified condition were modified and simplified by removing time limits for the quizzes thus allowing students more freedom to explore the material in their own way, the students might experience greater feelings of control and lead to an increased level of participation.

Another possible avenue for continued research is to incorporate a social aspect to the gamified condition. In this research, participants had no feedback regarding their own standing in regards to fellow participants. Adding a ranking system that shows the student how they or their team ranks may encourage greater participation, which could lead to a greater level of engagement.

Conclusion

This research offered little support for the use of gamified techniques in online instruction. However, the similarities in outcomes between the two groups with both improving in their APA knowledge suggests that either instructional approach provides benefit to learners. The results suggest that adding badges and achievements does not do much to encourage increased levels of participation. The complexity of instructional development as well as the time needed to construct the narrative and create the rewards required an extensive amount of time on the part of the researcher. A teacher in a typical K-12 classroom is not likely to have the time to devote to gamify an instructional program, especially one that is delivered via the Internet. However, it may be more practical for teachers to make use of the techniques of gamification in a regular face-to-face classroom. Certainly a good deal more research is necessary in order to make a determination about how best to develop and use gamification techniques in an online environment.

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Appendix A

Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale

Cognitive Absorption, Perceived Ease of Use and Perceived Usefulness Scale

The following questions are presented randomly to the participants with the following scale: Answers to all questions (except one) are presented in the form of seven-point scales: 1 = strongly disagree, 2 disagree, 3 somewhat disagree, 4 = neutral, 5 = somewhat agree, 6 = agree, and 7 = strongly agree. The final question is a request for the participant to comment about any aspect of the experience and is optional.

TEMPORAL DISSOCIATION

TD1. Time appeared to go by very quickly when I was doing the APA Course.
TD2. Sometimes I lose track of time when I was doing the APA Course.
TD3. Time flies when I was doing the APA Course.
TD5. I spent more time on the APA Course than I had intended.

FOCUSED IMMERSION

Fl1. While I was doing the APA Course I was able to block out most other distractions.
FI2. While I was doing the APA Course, I was absorbed in what I was doing.
FI3. While doing the APA Course, I was immersed in the task I was performing.
FI4. When doing the APA Course, I got distracted by other things very easily.
FI5. While doing the APA Course, my attention did not get diverted very easily.

HEIGHTENED ENJOYMENT

HE1. I had fun interacting with the APA Course.
HE2. Taking the APA Course provided me with a lot of enjoyment.
HE3. I enjoyed the APA Course.
HE4. The APA Course bored me.

CONTROL

C01. When taking the APA Course, I felt in control.
C02. I felt that I had no control over my interaction with the APA Course.
C03. The APA Course allowed me to control my computer interaction.

CURIOSITY

CU1. Doing the APA course excited my curiosity.
CU2. Interacting with the APA course made me curious.
CU3. Taking the APA Course aroused my imagination.

PERCEIVED EASE OF USE

PEOU1. Learning how to do the APA Course was easy for me.
PEOU2. I found it easy to get the APA Course to do what I want it to do.
PEOU3. It was easy for me to become skillful at the APA lessons.
PEOU4. I find the APA Course easy to use.

PERCEIVED USEFULNESS

PUl. Taking the APA Course enhances my effectiveness in college.
PU2. Taking the APA Course enhances my productivity.
PU3. I will find the APA Course useful in my college activities.
PU4. Taking the APA Course improves my performance in college.

PLAYFULNESS

CPS1. In general, I am Spontaneous.
CPS2. In general, I am Imaginative.
CPS3. In general, I am Flexible.
CPS4. In general, I am Creative.
CPS5. In general, I am Playful.
CPS6. In general, I am Original.
CPS7. In general, I am Inventive

Comments: (open ended for optional user response)

Appendix B

Pre/Posttest

Initial Pre/Posttest Questions ***(with question category)***

1. Many academic disciplines utilize APA style to format publications and papers. APA stands for: ***(General familiarity)***
a. American Philosophical Association
b. American Pedantic Association
c. American Psychiatric Association
d. American Philatelists Association
e. none of the above

2. When writing research papers, it is helpful to classify the source of a reference in order to know how to cite it properly. Reference sources are generally classified as: ***(Sources)***
a. online or printed
b. primary, secondary, and tertiary
c. copyrighted, public domain, and trademarked
d. none of the above

3. Primary sources include things like almanacs and dictionaries. ***(Sources)***
a. True
b. False

4. According to APA, page numbers are required in all citations within the body of your paper. ***(In-text citation)***
a. True
b. False

5. According to APA, it is acceptable to list more than one reference within a single citation as long as you arrange them in chronological order. ***(In-text citation)***
a. True
b. False

6. There are four basic parts to a reference list entry and they have a specific sequence. Can you identify the correct sequence from the choices below? ***(Reference list)***
a. Author, Publication Data, Title, Date
b. Author, Title, Date, Publication Data
c. Date, Author, Title, Publication Data
d. Author, Date, Title, Publication Data

7. Of the five reference entries shown below, identify the two that are correct. ***(Reference list)***
a. Kerr, D., Ackland, T., Maslen, B., Morton, A., & Prince, R. (2001). Resistance training over 2 years increases bone mass in calcium-replete postmenopausal women. Journal of Bone and Mineral Research, 16(1), 175-181.
b. Yee, J. L. & Schulz, R. (2000). Gender Differences in Psychiatric Morbidity Among Family Caregivers: A Review and Analysis Gerontologist, 40(2), 147–164.

c. National Assembly on School-Based Health Care, (n.d.) School-based health center performance evaluation. Retrieved November 13, 2006 from http://www.nasbhc.org/EO/EQ_EvaluationTools1.htm
d. Gambrill, E. (1997). Social work practice: A critical thinker's guide New York: Oxford University Press
e. August, L. P. (2005). A study of attrition among female tenure-track faculty (Doctoral dissertation). Available from ProQuest Digital Dissertations. (UMI No. 3186566)

Selected questions from Tartaro and Levy (2010) ***(with question category)***

1. Which of the following article references is formatted correctly? ***(Reference List)***
   a. Jones, Abner; Willis, Carol; & Huffman, Seymore (1998). Children's temperament and style in first grade. *Journal of Children's Development, 23,* 44-48.
   b. Jones, A., Willis, C., & Huffman, S. (1998). Children's temperament and style in first grade. *Journal of Children's Development, 23,* 44-48.
   c. Jones, A., Willis, C., & Huffman, S. (1998). "Children's Temperament and Style in First Grade." *Journal of Children's Development, 23,* 44-48.
   d. Jones, Abner; Willis, Carol; & Huffman, Seymore (1998). Children's Temperament and Style in First Grade. *Journal of Children's Development, 23,* 44-48.

2. Which of the following is acceptable according to APA style? ***(General familiarity)***
   a. Single spacing for the body
   b. bullets
   c. 12 point font
   d. colored paper

3. Which of the following is true about references? ***(Reference List)***
   a. Only works used in the paper should be cited.
   b. All related works should be cited.
   c. Only books and articles in APA journals should be cited.

4. Which of the following is the best way to cite the reference for the first time in the text or an article? ***(In-text citation)***
   a. Some investigators have found that rats have delayed response times when stressed by the threat of shock (Lewis, Turner, and Saranson, 2001).
   b. Some investigators (Lewis, Turner, and Saranson, 2001) have found that rats have delayed response times when stressed by the threat of shock.
   c. Some investigators have found that rats have delayed response times when stressed by the threat of shock (Lewis et al., 2001).
   d. Some investigators have found that rats have delayed response times when stressed by the threat of shock (Lewis, Turner, & Saranson, 2001).

5. When citing more than one source with the same author's name in a reference section (e.g., Jones has 3 separate article cited), organize the citations by the ***(In-text citation)***
   a. first word of the article title.

b. year of publication with the most recent one first.
c. year of publication with the earliest one first.
d. order they appeared in the text.

6. Which is the correct way to cite paraphrased material? ***(In-text citation)***
   a. Peer pressure becomes a greater factor than parental influence for early teens (Van Wyck, p. 24).
   b. Peer pressure becomes a greater factor than parental influence for early teens (Van Wyck, 1995).
   c. Peer pressure becomes a greater factor than parental influence for early teens (Van Wyck, 1995, p. 24).
   d. No citation is necessary.

7. Which is the correct way to cite multiple sources in the text of a paper? ***(In-text citation)***
   a. The last decade of literature has shown that generally foster homes provide inferior environments compared to residential placements (Langley & Swift, Sanger & Tilton, Wunderburg, Lawrence, & Gale, 2000, 1999, 1998).
   b. The last decade of literature has shown that generally foster homes provide inferior environments compared to residential placements (Langley & Swift, 2000; Sanger & Tilton, 1999; Wunderburg, Lawrence, & Gale, 1998).
   c. The last decade of literature has shown that generally foster homes provide inferior environments compared to residential placements (Langley & Swift, 2000) (Sanger & Tilton, 1999) (Wunderburg, Lawrence, & Gale, 1998).
   d. The last decade of literature has shown that generally foster homes provide inferior environments compared to residential placements (Langley and Swift, 2000, Sanger and Tilton, 1999, Wunderburg, Lawrence, and Gale, 1998).

8. The reference list should be organized ***(Reference List)***
   a. by publication date.
   b. according to the order they appear in the text.
   c. alphabetically by author's last name.
   d. in order of importance.

9. All sources listed on the page that lists the sources used should ***(Reference List)***
   a. have the first line indented.
   b. be justified left.
   c. use the hanging indent (the first line is normal, but the rest of the lines are indented).
   d. be single-spaced and have the first line indented.

10. Which of the following is the correct format for a direct quote: ***(In-text citation)***
   a. He believes qualitative research is an "anathema to rigorous scientific inquiry (Jenkins, 1999, 13)".
   b. He believes qualitative research is an "anathema to rigorous scientific inquiry." (Jenkins, 99, p. 13)
   c. He believes qualitative research is an "anathema to rigorous scientific inquiry. (Jenkins, p. 13)"
   d. He believes qualitative research is an "anathema to rigorous scientific inquiry" (Jenkins, 1999, p. 13).

11. When should an ampersand (&) be used? ***(General Familiarity)***
    a. When writing out “and” will not fit.
    b. At any time, it is interchangeable with “and”.
    c. To list more than one author in the text.
    d. To list more than one author either when set off by parentheses or in the reference

Appendix C

Invitation to Participate

Research Volunteers Needed!

As part of her dissertation work in Curriculum and Instruction in the College of Education & Health Professions, PhD Candidate Joyce Elaine Terrell is seeking volunteers to participate in a pilot study investigation of different delivery methods for online learning. The instruction involved is on correct usage of A.P.A.* citation and reference styles in academic writing. This is an opportunity for participants to improve their knowledge and understanding of A.P.A. which will better equip them to present their ideas and research correctly and to minimize the risk of questions about academic integrity.

This study is completely online and will require approximately 2 to 4 hours of the participant's time. Participants may complete this instruction in one sitting or work intermittently but it is recommended that all work be completed within one week from their start date.

It is open to undergraduate and graduate students.

For more information, or to volunteer to participate, contact the researcher at elaine@uark.edu.

*A.P.A. = American Psychological Association.

Appendix D

Informed Consent Document

INFORMED CONSENT

Title: Instructional methods, motivation, and social influence: The impact of gamification on student learning of APA style.

Description: The present study will investigate the effects of various instructional methods on students' knowledge of APA citation style and formatting. You will be asked to participate in some instruction on APA. Your familiarity with APA will be assessed prior to and immediately following instruction. You will also be asked to provide your opinions about the instructional material and presentation methods.

Risks and Benefits: The benefits include contributing to the knowledge base on the effects of various methods of online instruction. You will also receive the benefit of increasing your skill in APA style which is required for students majoring in social sciences, education, nursing, and other health professions. There are no anticipated risks to participating in the study.

Voluntary Participation: Your participation in the research is completely voluntary. There are no payments for participating.

Confidentiality: You will be assigned a code number that will be used to match assessment and survey results. All information will be kept confidential to the extent allowed by law and University policy. Results from the research will be reported as aggregate data.

Right to Withdraw: You are free to refuse to participate in the research and can withdraw from this study at any time. Your decision to withdraw will bring no negative consequences - no penalty to you.

If you have questions or concerns about this study, you may contact Elaine Terrell (researcher) at elaine@uark.edu, or Dr. Cheryl Murphy (Advisor) at cmurphy@uark.edu. For questions or concerns about your rights as a research participant, please contact Ro Windwalker, the University's IRB Coordinator, at (479) 575-2208 or by e-mail at irb@uark.edu.

Otherwise, click the link below to complete the *Informed Consent* process.

Informed Consent:

I agree that I have read the description, including the purpose of the study, the procedures used, the potential risks and side effects, the confidentiality, as well as the option to withdraw from the study at any time. Each of these items has been explained to me by the investigator. The investigator has answered all of my questions regarding the study, and I believe I understand what is involved. My signature below indicates that I freely agree to participate in this experimental study and that I have received a copy of this agreement from the investigator.

Yes, I agree to participate.

No, I do not agree to participate.

Appendix E

Instructional Materials

Table of Badges for Gamified Condition

Badge	Requirements to earn
	• First (default) badge • Awarded for completion of informed consent and pre-test • No advanced or special version
	• Badge awarded for successful completion of the module 1 challenge. • Player receives this after obtaining a score of 75% on the assessment. • Includes three advanced or special versions: o Level 2 ***Noted*** – 83% or greater on the assessment. o Level 2 ***Esteemed*** – 91% or greater on the assessment o Level 2 ***Distinguished*** – 100% or greater on the assessment
	• Badge awarded for successful completion of the module 2 challenge. • Player receives this after obtaining a score of 75% on the assessment. • Includes three advanced or special versions: o Level 3 ***Noted*** – 83% or greater on the assessment. o Level 3 ***Esteemed*** – 91% or greater on the assessment o Level 3 ***Distinguished*** – 100% or greater on the assessment
	• Badge awarded for successful completion of the module 3 challenge. • Player receives this after obtaining a score of 75% on the assessment. • Includes three advanced or special versions: o Level 4 ***Noted*** – 83% or greater on the assessment. o Level 4 ***Esteemed*** – 91% or greater on the assessment o Level 4 ***Distinguished*** – 100% or greater on the assessment
 *Milestone*	• ***Naturally Noted*** – Awarded for participants who earn 83% or more on each of the three challenges.
 *Milestone*	• ***Especially Esteemed*** – Awarded for participants who earn 91% or more on each of the three challenges.
 *Milestone*	• ***Definitely Distinguished*** – Awarded for participants who earn 100% or more on each of the three challenges.

Appendix F

Descriptive Statistics for Survey Results

Descriptive Statistics

	Gamified or Typical Instruction	Mean	Std. Deviation	N
Time appeared to go by very quickly when I was doing the APA Course.	Gamified	.37	2.016	35
	Typical	.54	1.990	35
	Total	.46	1.990	70
Sometimes I lose track of time when I was doing the APA Course.	Gamified	-.03	1.963	35
	Typical	-.60	1.735	35
	Total	-.31	1.861	70
Time flies when I was doing the APA Course.	Gamified	.14	2.074	35
	Typical	.31	1.827	35
	Total	.23	1.942	70
I spent more time on the APA Course than I had intended.	Gamified	1.37	1.699	35
	Typical	1.66	1.552	35
	Total	1.51	1.622	70
While I was doing the APA Course I was able to block out most other distractions.	Gamified	.34	1.984	35
	Typical	1.29	1.619	35
	Total	.81	1.860	70
While I was doing the APA Course, I way absorbed in what I was doing.	Gamified	.83	1.485	35
	Typical	1.06	1.211	35
	Total	.94	1.350	70
While doing the APA Course, I was immersed in the task I was performing.	Gamified	.94	1.434	35
	Typical	1.11	1.255	35
	Total	1.03	1.340	70
When doing the APA Course, I got distracted by other things very easily.	Gamified	.11	1.510	35
	Typical	.23	1.832	35
	Total	.17	1.668	70
While doing the APA Course, my attention did not get diverted very easily.	Gamified	.40	1.459	35
	Typical	.66	1.697	35
	Total	.53	1.576	70
I had fun interacting with the APA Course.	Gamified	.23	1.848	35
	Typical	.31	1.906	35
	Total	.27	1.864	70
Taking the APA Course provided me with a lot of enjoyment.	Gamified	-.37	1.767	35
	Typical	-.49	1.772	35
	Total	-.43	1.758	70
I enjoyed the APA Course.	Gamified	.26	1.837	35
	Typical	.34	1.697	35

	Total	.30	1.756	70
The APA Course bored me.	Gamified	.03	1.932	35
	Typical	-.11	1.659	35
	Total	-.04	1.789	70
When taking the APA Course, I felt in control.	Gamified	-.17	1.465	35
	Typical	.74	1.358	35
	Total	.29	1.476	70
I felt that I had no control over my interaction with the APA Course.	Gamified	.63	1.330	35
	Typical	1.06	1.259	35
	Total	.84	1.304	70
The APA Course allowed me to control my computer interaction.	Gamified	1.00	1.111	35
	Typical	1.26	1.268	35
	Total	1.13	1.191	70
Doing the APA course excited my curiosity.	Gamified	-.09	1.738	35
	Typical	.03	1.485	35
	Total	-.03	1.606	70
Interacting with the APA course made me curious.	Gamified	.40	1.666	35
	Typical	.09	1.522	35
	Total	.24	1.592	70
Taking the APA Course aroused my imagination.	Gamified	-.63	1.682	35
	Typical	-.74	1.421	35
	Total	-.69	1.547	70
Learning how to do the APA Course was easy for me.	Gamified	-.26	1.788	35
	Typical	-.03	1.839	35
	Total	-.14	1.804	70
I found it easy to get the APA Course to do what I want it to do.	Gamified	.63	1.646	35
	Typical	.91	1.401	35
	Total	.77	1.524	70
It was easy for me to become skillful at the APA lessons.	Gamified	-.43	1.668	35
	Typical	.34	1.644	35
	Total	-.04	1.689	70
I find the APA Course easy to use.	Gamified	1.11	1.694	35
	Typical	1.14	1.556	35
	Total	1.13	1.614	70
Taking the APA Course enhances my effectiveness in college.	Gamified	1.40	1.333	35
	Typical	1.69	1.323	35
	Total	1.54	1.326	70
	Gamified	1.09	1.483	35

Taking the APA Course enhances my productivity.	Typical	1.14	1.478	35
	Total	1.11	1.470	70
I will find the APA Course useful in my college activities.	Gamified	1.66	1.282	35
	Typical	1.97	1.224	35
	Total	1.81	1.254	70
Taking the APA Course improves my performance in college.	Gamified	1.29	1.506	35
	Typical	1.66	1.056	35
	Total	1.47	1.305	70
In general, I am Spontaneous.	Gamified	1.00	1.627	35
	Typical	.86	1.593	35
	Total	.93	1.600	70
In general, I am Imaginative.	Gamified	.94	1.714	35
	Typical	1.34	1.413	35
	Total	1.14	1.572	70
In general, I am Flexible.	Gamified	1.80	1.079	35
	Typical	1.23	1.497	35
	Total	1.51	1.327	70
In general, I am Creative.	Gamified	1.31	1.491	35
	Typical	1.51	1.173	35
	Total	1.41	1.335	70
In general, I am Playful.	Gamified	1.77	1.087	35
	Typical	1.31	1.388	35
	Total	1.54	1.259	70
In general, I am Original.	Gamified	1.66	1.349	35
	Typical	1.40	1.063	35
	Total	1.53	1.213	70
In general, I am Inventive	Gamified	1.00	1.715	35
	Typical	1.00	1.393	35
	Total	1.00	1.551	70