L2 WRITING PRACTICE: GAME ENJOYMENT AS A KEY TO ENGAGEMENT

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The Writing Pal (W-Pal) is an intelligent tutoring system (ITS) designed to provide students with explicit writing strategy instruction and practice. W-Pal includes a suite of educational games developed to increase writing engagement and provide opportunities to practice writing strategies. In this study, first (L1) ($n = 26$) and second (L2) language ($n = 16$) students interacted with W-Pal over eight sessions. We collected students' daily self-reports of engagement, motivation, and perceptions of performance, as well as their reported game attitudes (difficulty, helpfulness for learning, and enjoyment). Results indicated that, for all students, interactions with W-Pal led to increases in writing performance and more positive attitudes towards the system (engagement, motivation, and perceived performance). For L1 students, game difficulty was a significant predictor of boredom; however, for the L2 students, game enjoyment predicted both their motivation and perceived writing improvement. Notably, the L2 students' game ratings accounted for more variance in these daily reports than did the ratings of L1 students. This study suggests that L1 and L2 students experience similar benefits offered by game-based strategy practice in an ITS. Further, the link between game attitudes and overall daily perceptions of training may be stronger for L2 students than L1 students.

INTRODUCTION

Within the context of a native language, writing is a complex and demanding process that requires individuals to coordinate a number of cognitive skills and knowledge sources, such as goal setting, discourse awareness, memory management strategies, and social-cultural knowledge (Flower & Hayes, 1980; Hayes, 1996; Torrance & Galbraith, 2006). The writing process is further complicated for students who are learning a second language (L2), because text production in a second language introduces demands associated with lower-level language skills, such as grammar and vocabulary knowledge (Myles, 2002; Schoonen, Snellings, Stevenson, & van Gelderen, 2009). Accordingly, L2 writing is a more difficult task and often results in a less effective product than writing in one's native language (Roca de Larios, Murphy, & Marin, 2002; Silva, 1993).

A primary concern amongst L2 instructors is the lack of preparation and focus given to developing L2 students' writing skills (Matsuda, 1999; 2003; Reichelt, 2001; Silva, Leki, & Carson, 1997). Although the field of L2 writing has experienced significant growth in recent years (Matsuda, 2003), much less information is understood about the unique nature of the L2 writing process compared to writing in the

first language (L1). Many educators have, therefore, been left with less guidance on how to provide effective and engaging writing instruction to their L2 students. In contrast, a wealth of research has been conducted on L1 composition processes, resulting in a number of beneficial pedagogical techniques for teaching writing (Graham & Perin, 2007; Hillocks, 1984; Rogers & Graham, 2008). Chief among these techniques is writing strategy training. Writing strategies can help reduce the complex demands of the writing process, particularly for struggling students (Graham & Perin, 2007; Hillocks, 1984; Rogers & Graham, 2008). However, the appropriate methods for training these strategies, as well as their effectiveness for L2 students are relatively unknown. An important caveat is that a number of empirical investigations have examined the effectiveness of L2-specific writing strategies on the writing performance of L2 students. What remains less clear, however, is how more traditional, writing-specific strategies (that are typically applied in high school classrooms) differentially affect the writing process and performance of L1 and L2 students.

Additionally, educational games have been proposed as another method for providing effective and engaging instruction (for a review, see Clark, Nelson, Sengupta, & D'Angelo, 2009; Jackson & McNamara, 2013) by leveraging students' intrinsic enjoyment of gaming (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005; Gee, 2003, 2007). Educational games may be particularly beneficial for L2 writing strategy training, as games have been shown to offset the boredom and disengagement often associated with extended (i.e., over weeks or months) training sessions (Jackson & McNamara, 2013; McNamara, Jackson, & Graesser, 2010). In this paper, we address two gaps in the L2 composition literature; namely, the effectiveness of writing strategy instruction and educational games for L2 writers. Specifically, we examine the efficacy of a game-based writing strategy tutoring system, the Writing Pal (W-Pal; McNamara et al., 2012; Roscoe & McNamara, 2013; Roscoe, Varner, Weston, Crossley, & McNamara, in press), to support the learning, engagement, and motivation of L2 students. We first discuss relevant research in the L1 and L2 writing domains, as well as provide a description of the W-Pal system and games. We then examine students' attitudes towards game-based strategy practice in W-Pal and how those attitudes relate to their overall engagement and motivation during training.

L2 Writing Research and Instruction

The ability to effectively produce written text plays a predominant role in the success of individuals in school and in the workplace (Geiser & Studley, 2001; Light, 2001; Powell, 2009). Unfortunately, national assessments of writing proficiency suggest that students in the United States struggle to reach proficiency levels throughout their high school years (NAEP, 2007; NAEP, 2011). Second language (L2) students are at a particular disadvantage in this area. According to the 2011 National Assessment of Educational Progress (NAEP) report, 8th grade L2 students scored a total of 42 points (out of 300) below average on the national writing assessment. This difference grew to 54 points among L2 students in the 12th grade. Thus, despite the importance of developing writing proficiency, many L2 students in the US exit high school lacking these necessary skills.

In many ways, the writing process for an L2 student is similar to that of a native speaker. Both L1 and L2 students must set goals for their writing, establish a clear purpose, translate their ideas into words, and participate in a variety of other cognitive activities. In addition, L1 and L2 students must maintain motivation and an overall awareness of the social and cultural purpose for the writing task (Graham, 2006; Hayes, 1996; Prior, 2006). Flower and Hayes (1980), for instance, claimed that writers must maintain knowledge of their task environment (e.g., topic, audience, etc.) and knowledge of their own goals (e.g., knowledge of topic, writing plans, etc.), while simultaneously engaging in a complex writing process that involves stages of planning, translating, and reviewing. This process can be difficult for a number of reasons (Graham, 2006). For example, in addition to the cognitive demands brought about by maintaining task and author goals in memory, students must efficiently regulate their cognitive processes and attend to the countless demands associated with the different writing stages (e.g., accessing information from long-term memory, organizing ideas, etc.).

Despite the similar cognitive activities employed during the L1 and L2 writing processes, a number of marked differences can be identified between the two groups (Myles, 2002; O'Malley & Chamot, 1990; Silva, 1993). First, L2 writing is a more cognitively demanding task, which requires individuals to consciously attend to more factors than in the first language. For many L1 writers, lower-level writing processes, such as lexical access and syntactic construction, have become automatized (DeKeyser, 2007). The writing process is therefore less constrained by working memory and cognitive control limitations (Baddeley, 1986; McCutchen, 2000; Shiffrin & Schneider, 1977) hence L1 students can place a stronger emphasis on higher-level writing processes (e.g., the development of coherence; Ransdell and Levy, 1996). However, writing in an L2 requires students to attend to both lower- and higher-level writing features (Schoonen et al., 2009). By placing an emphasis on lower-level writing processes, L2 students may spend less time on higher-level ones (Weigle, 2005) and produce lower-quality texts (Schoonen et al., 2009). Further, because L2 students' reading processes are less automatic than for L1 students, phases of the writing process such as planning and revising may require more time and effort (Kormos, 2012).

Another primary distinction between writing in an L1 and L2 is the influence of language proficiency level. Because students often lack fluency and familiarity in their L2 (Paltridge, 2004), their writing processes are subject to more constraints (e.g., translating and transcribing into their non-native language), which may negatively impact their writing performance (Myles, 2002; O'Malley & Chamot, 1990). In a thorough review of the L2 writing research literature available at the time, Silva (1993) investigated the documented differences between both the processes and products of L1 and L2 writers. Several of the studies suggested that the L2 writing process was different from the L1, with L2 writers spending more time transcribing, and significantly less time planning and organizing their ideas. Additionally, the selected studies reported by Silva reported that the written products of L2 students contained fewer cohesive devices, subordination, and noun modifiers, but more t-units (i.e., the main clauses plus additional embedded and subordinating clauses in a sentence) and longer clauses than those of L1 students.

This added complexity of the L2 writing process often results in a less effective overall product as compared to L1 writing (Roca de Larios, Murphy, & Marin, 2002; Silva, 1993). Paltridge (2004), for instance, found that L2 writers struggle to establish a clear purpose and organization in their written essays. Additionally, L2 writing has been characterized by a lack of awareness and ability to adapt to different audiences (Casanave, 2004; Johns, 1997; Paltridge, 2004). Finally, L2 writing has been shown to contain less lexical diversity and sophistication than L1 writing (Crossley & McNamara, 2009; Linnarud, 1986; Silva, 1993).

Overall, the literature suggests that educators need to place a stronger emphasis on writing instruction for L2 students. For instance, Silva (1993) concluded that L2 writing instruction would benefit from more classroom time devoted to "strategic, rhetorical, and linguistic concerns" (p. 670). This instruction would involve explicit strategy instruction, as well as a focus on the various stages of the writing process such as planning, drafting, and revising. Thus, rather than simply spending more time writing in the classroom, L2 writers need to be given instruction that targets the most efficient methods and strategies for writing. Additionally, students needed to be provided training in a motivating environment in order to avoid fatigue and disengagement during practice.

Strategy Instruction

Considerable research has been conducted to support the notion of strategy instruction as a powerful pedagogical technique in the L1 writing classroom (Graham & Perin, 2007; Hillocks, 1984; Rogers & Graham, 2008). However, the effectiveness of these methods in the L2 classroom appears to have been under researched. In a meta-analysis of over 120 published studies, Graham and Perin (2007) summarized the results from writing interventions conducted on students in grades 4–12. They separated the interventions into 11 distinct categories: strategy instruction, summarization, peer assistance, setting

product goals, word processing, sentence combining, inquiry, prewriting activities, process writing approach, study of models, and grammar instruction. They found that all of the interventions, with the exception of explicit grammar instruction, were beneficial to students (i.e., they reported moderate to large effect sizes). In particular, strategy instruction was the most effective form of pedagogy (large mean weighted effect size = 0.82), and was especially successful for struggling writers (large mean weighted effect size = 1.02).

A year later, Rogers and Graham (2008) extended this investigation in a separate meta-analysis of studies involving single-subject designs. They reported nine writing interventions that were beneficial to student writers. Again, the most effective writing treatment was strategy instruction for planning and drafting texts. Notably, all of these investigations utilized the Self-Regulated Strategy Development (SRSD) model developed by Harris and Graham (1996) to teach the writing strategies. In addition to improving writing performance immediately following training, strategy instruction maintained treatment effects over a period of three weeks or longer and transferred to writing genres for which students had received no instruction.

Despite its apparent benefits for struggling writers, research on the effect of explicit writing-specific strategy instruction for L2 students is fairly scant. As mentioned previously, L2-specific writing strategies have been empirically investigated in L2 classrooms; however, it is unclear how more general, writing-specific strategies apply to L2 students. Additionally, although the effects of strategy instruction for L2 writing have been addressed in the literature (Negari, 2011; O'Malley & Chamot, 1990), most of these strategies are subsumed under the general category of "language learning strategies" and have little relation to the actual writing process. For instance, L2 students are frequently taught to "analyze" and "translate" their ideas; however, they are much less frequently provided with training on strategies specific to the writing process (e.g., strategies for freewriting or developing flowcharts). A number of L2 writing researchers have suggested that L1 writing strategies can be transferred to the L2 in some situations (Arndt, 1987; Berman, 1994; Matsumoto, 1995; Woodall, 2002). However, it is currently unclear how, and if, the instruction of writing-specific strategies should differ for L1 and L2 students. Therefore, further research is needed to investigate the effects of writing strategy interventions, such as those detailed by Graham and Perin (2007), on samples of L2 writers.

Educational Games and Student Engagement

One concern regarding strategy instruction is that it requires extensive training and practice, which requires a lot of time and can negatively affect students' motivation and engagement towards learning tasks (Bell & McNamara, 2007; Jackson & McNamara, 2013; McNamara, Jackson, & Graesser, 2010). To offset these concerns, educational games have been introduced as a method for increasing students' motivation, engagement, and persistence throughout training (Barab, Gresalfi, & Arici, 2009; Corbett & Anderson, 2001; Gee, 2005; Malone & Lepper, 1987; Shaffer, 2007). Educational games can increase students' motivation towards a particular task by leveraging the enjoyable and engaging properties of games (Orbach, 1979; Shank & Neeman, 2001). Additionally, game-based elements, such as narrative or competition, can be integrated into learning environments to increase students' enjoyment of and engagement in a task (McNamara et al., 2010).

Educational games require students to apply target skills or knowledge to successfully explore an environment and complete given tasks (Gredler, 2004). Thus, in addition to completing tasks for the purpose of learning new material, students can be offered additional motivation to engage in learning activities throughout educational gameplay. In other words, while training in a game-based system, students may practice a given skill or strategy for the purpose of learning the material and improving their understanding of a topic, or they may engage in practice to compete with other students or earn rewards (e.g., trophies, points, etc.).

In general, educational games have been linked to increased learning and motivation (e.g., Ricci, Salas, &

Cannon-Bowers, 1996; Rowe, Shores, Mott, & Lester, 2011) in a variety of contexts. Across a wide range of populations that vary in gender, age, and numerous other characteristics, meta-analyses have reported that educational games lead to increases in cognition, skills, and positive affect (Vogel et al., 2006; Wilson et al., 2009). Educational games are designed to offer more engaging learning environments than do traditional, classroom instruction; therefore, it has been suggested that they can lead to more persistent and successful learning (Barab et al., 2007, 2012; Garris, Ahlers, & Driskell, 2002; Steinkuehler, 2006). In addition, if students are engaged, they tend to not grow bored with the learning task, to not lose attention, nor to fail to learn the presented material (e.g., Craig et al., 2004). Further, these learners are more likely to reengage in beneficial learning processes if they have become disinterested (Boekaerts, Pintrich, & Zeidner, 2000; D'Mello & Graesser, 2006; D'Mello, Taylor, & Graesser, 2007).

The Writing Pal

Previous research suggests that deliberate practice is necessary for students to acquire and internalize newly learned strategies (Kellogg, 2008) and that the combination of deliberate practice with writing and revising can improve students' overall performance (Johnstone, Ashbaugh, & Warfield, 2002). Accordingly, for strategy instruction to be effective, L2 students should be provided with opportunities to practice writing strategies for extended periods of time. A number of computerized tools have been developed to provide students with practice opportunities and feedback on their written essays (Grimes & Warschauer, 2010; Shermis & Burstein, 2003), such as e-rater (Attali & Burstein, 2006) and IntelliMetric (Rudner, Garcia, & Welch, 2006). However, the development of these systems tends to focus on reliable and accurate scoring systems, rather than on providing feedback and instruction grounded in effective writing pedagogy (Roscoe et al., in press). As such, explicit instruction and deliberate practice related to effective writing strategies is relatively uncommon among such educational technologies.

The Writing Pal (W-Pal) is an intelligent tutoring system (ITS) designed to provide students with explicit writing strategy instruction, as well as opportunities to engage in deliberate practice with such strategies (McNamara et al., 2012; Roscoe et al., in press). Within W-Pal, students are provided with strategy instruction and strategy practice within the context of eight modules, which contain instructional videos and educational mini-games. The mini-games are intended to offer students' deliberate strategy practice in an effective and engaging environment. Additionally, W-Pal contains an essay practice module, where students can practice applying the writing strategies in the context of a complete essay.

Knowing that deliberate practice with writing and revising can improve students' overall performance (Johnstone et al., 2002), W-Pal contains an Automated Writing Evaluation (AWE) system that allows students to write essays and receive feedback on the quality of their writing. In this system, students compose timed, persuasive essays in response to a number of built-in SAT[1]-style essay prompts. Essay scores are provided to students using a natural language processing algorithm that assigns scores (1-6) ranging from "Poor" to "Great" (McNamara, Crossley, & Roscoe, 2013). In addition to receiving a holistic score, students are provided with formative feedback that addresses specific writing strategies that can improve the quality of their essays. For instance, if a student's essay lacked paragraph structure and organization, the system might provide feedback suggesting that the student construct an outline before writing essays; additionally, the student would be provided with tips on how to most effectively outline an essay. Students can select to receive up to 10 pieces of formative feedback (minimum of one piece of feedback) on two different topics from the system. After students review their assigned feedback, they are given the opportunity to complete a revision of their essay and resubmit it for a new score.

In addition to essay writing practice, W-Pal offers students the opportunity to receive explicit instruction and strategy-focused practice. Each of the eight strategy modules in W-Pal is based on a specific component of the writing process (e.g., planning, introduction building, and revising). Animated pedagogical agents provide explanations, examples, and demonstrations of each writing strategy within short instructional videos. After watching the videos, students are given the opportunity to practice the

newly acquired strategies in the context of educational mini-games, which allow students to practice each strategy in isolation, as opposed to engaging in a complete writing task. This isolated instruction and practice allows students to individually master specific writing strategies without becoming overwhelmed by the complex demands of the writing process. Within the Planning module, for example, students watch four short videos that provide an introduction to strategies that can increase the organization and "flow" of their essays. Some of the targeted strategies include the use of graphic organizers, such as flowcharts or outlines to increase the cohesion of their essays. After students view the videos, they are transitioned to educational mini-games that provide practice on the specific strategies covered in the lessons such as constructing essay outlines or identifying arguments and evidence.

As discussed earlier, a common concern regarding extended practice environments is that students may disengage or develop negative opinions toward the practice task. Indeed, student disengagement is a well-documented problem, especially within the context of learning technologies (McNamara, Jackson, & Graesser, 2010). Educational games and game-based features (e.g., narratives and incentives) have been proposed as a method for increasing engagement by leveraging the inherent enjoyment of games (Cordova & Lepper, 1996; Malone & Lepper, 1987; Quick, Atkinson, & Lin, 2012; Young et al., 2012). Therefore, a predominant goal of the W-Pal system is to establish and maintain students' motivation and engagement through the use of game-based practice. Housed within the W-Pal system is a suite of 16 educational games (see Table 1), which include a brief narrative and include either generative or identification tasks intended to engage students in strategy practice (see Appendix A for a more detailed description of the W-Pal games)

Table 1. *W-Pal Modules and Corresponding Mini-Games.*

Module	Practice Games
Freewriting	*Freewrite Flash*
Planning	*Mastermind Outline*
	Planning Passage
Introduction Building	*Essay Launcher*
	Dungeon Escape
	Fix It
Body Building	*RoBoCo*
	Fix It
Conclusion Building	*Lockdown*
	Dungeon Escape
	Fix It
Paraphrasing	*Adventurer's Loot*
	Map Conquest
Cohesion Building	*CON-Artist*
	Undefined & Mined
Revising	*Speech Writer*

Planning Passage is an example of a mini-game included within the Planning module. In this game, students are asked to identify certain planning strategies within the narrative of a road-trip adventure (see Figure 1). The various planning strategies include: outlining, identifying evidence, and organizing

arguments. Throughout this game, students visit lakes, parks, and monuments. At each stop, students are prompted to answer a question about the planning strategies (i.e., identify the correct evidence for a particular argument). Correct answers earn trip pictures (corresponding to score increases) and incorrect answers can cause the car to lose fuel (corresponding to score decreases). In this task, students are only presented with one question at a time. This allows them to consider the question and focus on the key elements of the planning strategy. Correct answers early on in the "road trip" are rewarded heavily, as students are able to visit more places on their trip. Overall, the Planning Passage mini-game allows students to implement the planning strategies they were taught in the lesson videos.
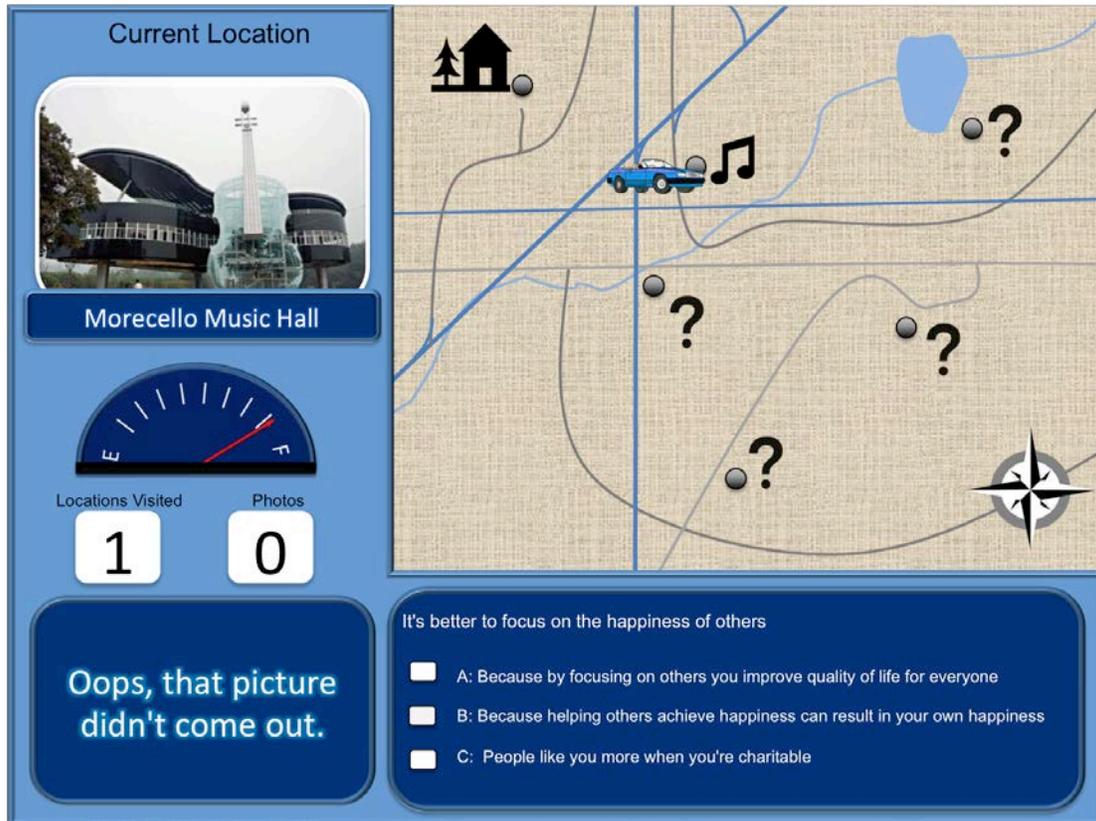
Figure 1. Screenshot of Planning Passage.

Another mini-game offered within the W-Pal system is Map Conquest. Map Conquest is a generative practice game in which students are asked to use strategies to paraphrase given sentences (see Figure 2). The strategies covered in Map Conquest include: condensing, word variety, and sentence structure. In this game, students attempt to take control of a map, which contains their own flags as well as flags from a computer opponent. To earn additional flags, students are prompted to use strategies to paraphrase given sentences. Once students submit their answers, an algorithm assigns a score (0–3) based on the quality of their paraphrasing. This score reflects the number of "moves" a student can make on the board. Students' use their "moves" to place their flags on the map; thus, more moves typically correspond to gaining more control of the map than their computer opponent. The final score in Map Conquest is based on overall task performance and the number of flags students control on the map. Similar to the Planning Passage game, Map Conquest rewards students for the quality of their work. This ensures that students exert thoughtful effort in the generation of their paraphrases.

Figure 2. Screenshot of Map Conquest.

Overall, the W-Pal system leverages educational games to support students' strategy acquisition and practice. The W-Pal games are intended to offset the disengagement and negative emotions commonly associated with redundant practice tasks such as those common in developing writing proficiency (i.e., deliberate practice). Therefore, these games play a unique role in the learning process by providing students a chance to practice strategies within an engaging and novel environment. Because these games afford students the opportunity to repeatedly practice isolated writing strategies, they may be appropriate for L2 students who need additional practice and feedback.

Research Questions

The purpose of the current study is to investigate the efficacy of a game-based writing strategy tutoring system (W-Pal) to improve the writing performance, engagement, and motivation of L2 students. In particular, we aim to investigate how L2 students' experiences with the Writing Pal system were similar to or different from those of L1 students. Our primary research questions are outlined below.

1) Do L1 and L2 students experience learning gains from interacting with W-Pal and, if so, how do these learning gains compare across extended strategy training with the W-Pal system?
2) Do L2 students experience similar engagement and motivation in W-Pal as do L1 students?
3) How do L1 and L2 students' attitudes towards the W-Pal games relate to their daily reports of engagement, motivation, and perceived learning gains?

METHOD

Participants

The participants in this study were part of a larger experiment ($n = 88$), which compared the Writing Pal tutoring system to an automated writing evaluation (AWE) system condition (Crossley, Roscoe, & McNamara, 2013). In this study, we focus on the students who were in the Writing Pal tutoring system condition ($n =42$), which included writing strategy practice within the mini-games. All participants were recruited from local high schools in the metropolitan Phoenix area using Internet advertisements, flyers posted in the community and classrooms, and through word-of-mouth communication. The high school students were, on average, 16 years of age, with a mean reported grade level of 10.4. Of the 42 students, 57.1% were female ($n = 24$) and 42.9% were male ($n = 18$); 45.2% were Hispanic ($n = 19$), 33.3% were Caucasian ($n = 14$), 11.9% were Asian ($n = 5$), 4.8% were African-American ($n = 2$), and 4.8% reported "other." ($n = 2$). All participants were monetarily compensated for their participation in this study.

L2 Participants

Of the 42 students in the W-Pal condition, 38.1% reported that they were L2 speakers of English, while 61.9% reported that they were L1 speakers. The majority of these L2 students (81.3%) had been studying English for over 7 years, whereas the remaining students (6.3%) reported that they had been studying English for 3 years. Spanish was the native language of 75.1% of the L2 students, with two students missing responses to this question and the remaining two students speaking either Mandarin/Cantonese (n = 1) or Gujarati (n = 1). Students self-reported that they typically used English in multiple formats, including emails (62.5%), letters (62.5%), notes (81.3%), essays (87.5%), research papers (81.3%), reports (81.3%), creative writing (62.5%), and other formats (31.3%).

Study Procedure

The participants were required to complete all sessions of the 10-session study that lasted between two and four weeks. The study was conducted during the summer holiday; therefore, it was unlikely that the students were receiving alternative forms of writing instruction or training during the time of the study. On the first day of the study (session 1), all of the students completed a pretest (approximately 1 hour in duration), which contained measures of their prior knowledge of writing strategies, attitudes (motivation, expected enjoyment and eagerness to participate) and literacy skills. During the following eight sessions, the students completed training sessions with the complete W-Pal system (approximately 1.5–2 hours in duration). The last day (session 10) consisted of a posttest, which comprised similar measures to the pretest (approximately 1 hour in duration). All students were required to complete the same materials throughout the pretest, training sessions, and posttest.

Pretest.

The pretest lasted approximately 1 hour in duration and included a number of individual difference measures: Demographics survey, writing proficiency (25-minute SAT-style essay), reading comprehension ability (assessed through the Gates-MacGinitie (4th ed.) reading skill test (form S) level 10/12; MacGinitie & MacGinitie, 1989), vocabulary knowledge (assessed through the Gates MacGinitie Vocabulary Test), a writing attitudes and perceptions survey, and writing strategy knowledge survey. The measures that are relevant to this study are described in the Measures section.

Training

At the beginning of each training session, students completed a 12-item survey that related to their attitudes and expectations for the training session. During each training session (sessions 2-9), students first wrote a timed (25-minute) essay on an SAT-style prompt. Upon completion of this essay, students received automated feedback from the W-Pal AWE system and were given 10 minutes to revise their essay based on this feedback. Following this essay revision, the students completed one W-Pal module,

which contained lesson videos and game-based practice for a specific component of the writing process (e.g., planning, introduction building, and revising). All students were first required to watch all of the videos for a given module. After completion of the videos, the games were unlocked and students were asked to play each game twice. After each game play, students completed a short survey on their overall perceptions of the game. Although students varied in the amount of time they took to complete the essays, revisions, surveys, and game-based practice tasks, each of the students' training sessions lasted approximately 1.5–2 hours.

Posttest

During their last session, all of the participants completed a posttest, which lasted approximately 1 hour. This test consisted of a daily survey as well as assessments that were similar to the pretest, including: writing proficiency (25-minute SAT-style essay), a writing attitudes and perceptions survey, and a writing strategy knowledge survey.

Measures

Self-report and performance measures were collected from students at pretest, before and during each training session, and finally at posttest. These measures assessed students' writing ability in addition to their attitudes, perceptions, and motivation toward various aspects of the training sessions. They are discussed in greater detail below.

Writing Ability

At pretest and posttest, each student wrote a timed (25-minute), SAT-style essay. The SAT-style essay was chosen because it is a common form of writing assessment that is given to both L1 and L2 high school students in the United States. The prompts and instructions were counterbalanced at pretest and posttest for all participants (see Appendix B). Using a 6-point rating scale developed for the Scholastic Aptitude Test (see Appendix C) to holistically assess the quality of the essays, each essay was scored independently by two expert raters. This rubric was chosen to reflect the actual assessment criteria that would be used for high-stakes tests, such as the SAT. Raters were first trained to use the rubric with a small sample of similar essays. A Pearson correlation analysis was used to assess inter-rater reliability. When the raters reached a correlation of $r = .70$, the ratings were considered reliable and the raters scored a larger subsection of the corpus. The final inter-rater reliability for the raters for the essays was $r > .60$. While this was lower than the .70 reached in training, adjacent agreement between raters was 100% (i.e., in all cases the raters assigned scores to the essays that were within 1 point of each other). Average scores between the raters were calculated for each essay to provide a holistic score.

Daily Surveys

The daily surveys administered before each training session assessed students' experiences from their previous session and their motivation to participate in the upcoming session. The measures related to the previous session asked students to report on their overall impressions of the system, as well as their enjoyment, boredom, frustration, perceptions of learning and improvement, as well as if they had any problems with W-Pal. Additionally, the daily survey asked students to self-report their attitudes and expectations concerning the upcoming training session, including their mood, motivation to participate in the training session, their intention to perform well, and their desire to outperform their peers (see Appendix D for the 12 daily survey questions).

Game Attitude Surveys

Following the completion of each game play, the students were presented with surveys about their attitudes towards and enjoyment of the W-Pal games (see Appendix E). Each question was on a 4-point Likert scale that ranged from negative to positive. The surveys asked students to report their enjoyment of the games (1 = not enjoyable at all and 4 = very enjoyable), as well as their perceptions of how helpful

each game was for strategy practice (1 = not helpful at all and 4 = very helpful) and how difficult each game was to play (1 = difficult and 4 = easy). Finally, students were asked to report on the mechanics of each game, including the quality of the graphics, instructions, and controls.

Statistical Analyses

To examine differences between L1 and L2 students' writing performance and attitudes toward the W-Pal system, we conducted ANOVA, correlation, and regression analyses using pretest and posttest essay scores, daily survey responses, and game survey responses. Differences in L1 and L2 students' performance and attitudes (i.e., engagement, motivation, and perceived learning) were assessed with mixed-design ANOVAs. For each of these analyses, there was a between-subjects factor of language and a within-subjects factor of session (for daily surveys) or test (for pretest and posttest essay scores). Additionally, one-way (language) between-subjects ANOVAs were conducted on the game survey responses to assess whether L1 and L2 students rated the games similarly or differently. Finally, correlation and stepwise regression analyses were conducted to assess the relation between the posttest daily survey responses (to the posttest session, or session 9) and the students' reported perceptions of the W-Pal games. Due to system logging issues, posttest surveys were not recorded for 4 students (2 L1 and 2 L2 students).

RESULTS

The current study investigated the effect of W-Pal writing strategy training on L1 and L2 students' writing performance, engagement, and perceived learning gains. Our analyses investigate whether changes in these dependent variables across time are similar or different for L1 and L2 writers. Additionally, we examine whether students' self-reported perceptions of helpfulness, difficulty, and enjoyment of the W-Pal games are related to learning gains and self-reported engagement within the system.

Writing Performance

We examined students' holistic essay scores both prior to and after receiving writing strategy training in W-Pal. The means, standard deviations, and ranges for L1 and L2 students' pretest and posttest essays are reported in Table 2. An ANOVA including participants' reported language (L1, L2) and test (pretest, posttest) yielded a significant main effect of test, $F(1, 40) = 102.87$, $p < .05$, confirming that both L1 and L2 students' writing improved from W-Pal training. However, there was no significant main effect of language and no interaction between test and language ($Fs<1$). Based on these results, we can assume that this particular sample of L2 students had a relatively high level of writing proficiency in English. These results also suggest that all participants, regardless of their native language, improved in terms of their holistic essay scores between pretest and posttest.

Table 2. *Pretest and Posttest Holistic Essay Scores as Functions of Test and Language.*

Variable	M*	SD
First Language (L1) Students		
Pretest Holistic Score	2.67	.53
Posttest Holistic Score	3.13	.48
Second Language (L1) Students		
Pretest Holistic Score	2.97	.62
Posttest Holistic Score	3.22	.80

Note: Range = 2-4.

Self-Reported Motivation, Engagement, and Perceived Learning

Our next series of analyses examined L1 and L2 students' perceptions of their writing performance and experiences engaging with W-Pal (see Table 3). Using the daily survey questions related to perceived learning (perceived learning of the material and perceived writing improvement), engagement (enjoyment of session and boredom), and motivation (eagerness to participate and motivation to perform well), we examined differences between these two groups. Mauchly's test of sphericity indicated that the assumption of sphericity had been violated for each variable ($p < .05$ for all X2 values); therefore, degrees of freedom were corrected using the Greenhouse-Geisser estimates of sphericity.

Table 3. *Daily Survey Responses as Functions of Session (S) and Language (L1 and L2).*

Variable	Perceived Learning		Perceived Improvement		Enjoyment of Session		Boredom		Eagerness to Participate		Motivation to Perform Well	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
L1 Students												
S 1	4.14	1.15	3.29	1.23	4.05	1.20	2.81	1.03	4.10	1.14	5.38	.67
S 2	4.38	.97	4.19	1.21	4.14	1.20	2.71	1.01	4.29	1.15	5.29	.85
S 3	4.62	.81	4.10	1.00	4.29	1.06	2.43	.93	4.29	1.15	5.10	.89
S 4	4.52	1.17	3.95	1.2	4.19	1.37	2.52	.93	4.14	1.24	5.00	1.27
S 5	4.43	1.02	4.33	1.16	4.10	1.14	2.43	1.08	4.14	1.28	4.90	1.18
S 6	4.38	1.16	4.29	1.06	4.05	1.20	2.48	1.08	4.19	1.21	4.95	.92
S 7	4.52	.93	4.38	.74	4.29	.96	2.29	1.01	4.24	1.18	4.81	1.08
S 8	4.38	.92	4.43	.81	4.14	1.11	2.33	.97	4.05	1.20	4.86	1.20
S 9	4.71	.85	4.57	.93	4.52	1.03	2.24	.89	4.81	.81	5.10	.89
L2 Students												
S 1	3.86	1.70	3.00	1.47	4.07	1.59	2.57	1.02	4.43	1.02	5.36	1.01
S 2	4.57	1.22	3.71	1.14	4.29	1.44	2.50	.94	4.50	1.23	4.93	1.33
S 3	4.86	.66	4.50	.86	4.64	.84	2.57	.94	4.43	1.16	4.86	1.23
S 4	4.50	1.29	4.21	1.25	4.50	1.00	2.36	.93	4.57	.94	5.00	1.24
S 5	4.57	.94	4.43	1.02	4.50	1.09	2.36	1.01	4.43	1.34	4.57	1.51
S 6	4.36	1.01	4.36	1.15	4.57	1.02	2.21	.98	4.64	1.01	4.93	1.21
S 7	4.79	.98	4.50	1.02	4.71	1.14	2.57	1.51	4.79	.98	5.00	1.18
S 8	4.79	1.05	4.79	1.12	4.79	.98	2.57	1.02	4.64	.93	4.93	1.00
S 9	4.64	1.01	4.64	.93	4.64	1.01	2.50	1.12	5.00	1.04	5.21	.98

Note: All daily survey responses were rated on a 1-to-6 scale from negative to positive.

The results revealed that there was a significant effect of training session for the following daily survey measures: perceived learning of the material, $F (8, 5.35) = 3.50$, $p = .004$, perceived writing improvement, $F (8, 4.83) = 14.61$, $p < .001$, eagerness to participate, $F (8, 5.05) = 2.72$, $p = .021$, and motivation to perform well, $F (8, 4.04) = 3.75$, $p = .006$. These four daily survey measures are displayed in Figure 3 as a function of session, indicating that perceived learning, engagement, and motivation increase across the

nine training sessions. However, there were no significant effects of variables related to engagement: enjoyment of session, $F_{(8, 3.71)} = 1.83$, $p = .133$, or boredom, $F_{(8, 4.23)} = 1.33$, $p = .262$, nor were there significant interactions between training session and language on the daily survey responses. These results suggest that all participants, regardless of their native language, experienced increases in their perceptions of learning and motivation across the training sessions. Therefore, it appears that the second language students in this study experienced similar attitudinal benefits from game-based practice as did L1 students.
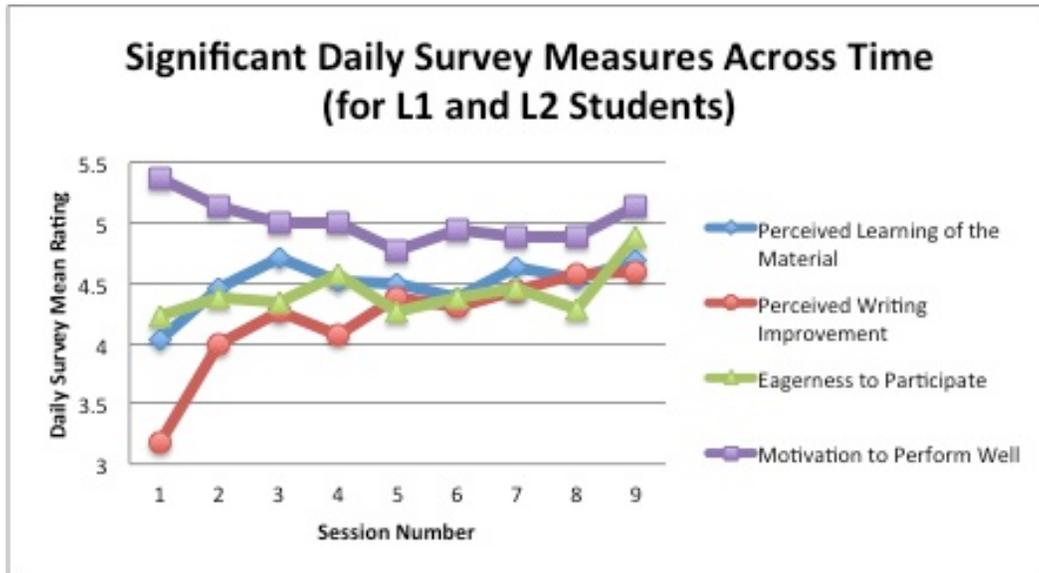

Figure 3. Daily survey measures as a function of training session.

Attitudes towards W-Pal Games

In addition to the daily surveys, students' responses on the game surveys were analyzed. In particular, we examined whether L1 and L2 students reported similar levels of enjoyment, difficulty, and helpfulness for the W-Pal games. Students' responses were averaged across all of the games to provide a mean game enjoyment, difficulty, and helpfulness response for each student. The descriptive statistics for game responses are provided in Table 4.

Table 4. *Game Survey Responses as Functions of Language.*

Game Survey Response	*M*	*SD*	Range
First Language (L1) Students			
Game Enjoyment	3.06	.53	1.63–4.00
Game Difficulty	2.90	.62	1.75–4.00
Game Helpfulness	3.18	.49	1.88–4.00
Second Language (L1) Students			
Game Enjoyment	3.15	.41	2.56–3.94
Game Difficulty	3.03	.51	2.19–3.94
Game Helpfulness	3.10	.60	1.90–3.94

The descriptive statistics for the mean game responses suggest that, on average, students enjoyed the games, and felt they were helpful and easy to play (i.e., mean self-reported game ratings were above 2.5 on a 4-point scale). ANOVAs including language as a between-subjects factor for each mean game score (i.e., enjoyment, difficulty, and helpfulness) indicated that there were no significant differences in L1 and L2 students' perceptions of the games (all Fs < 1). Therefore, it appears that L1 and L2 students had similar, positive attitudes towards the game-based practice environments within the W-Pal system.

Game Attitudes and System Engagement

We investigated the relation between students' attitudes towards the W-Pal games and their engagement and motivation when interacting with the system. These analyses were intended to provide a more fine-grained investigation into the specific effects of the games on students' attitudes during training. Table 5 presents the correlations between the daily survey responses for the posttest day (session 9) and the mean game survey responses for both L1 and L2 students. The session 9 daily survey responses were reported on the day of the posttest; therefore, it was assumed that they were most indicative of students' final system perceptions after training.

Table 5. *Correlations between Mean Game Survey Responses and Session 9 Survey Responses for both L1 and L2 Students.*

Session 9 Survey Questions	Enjoyment	Difficulty	Helpfulness
Perceived learning of the material	.54**	.29	.62**
Perceived writing improvement	.61**	.40*	.55**
Enjoyment of session	.59**	.43**	.45**
Boredom	-.60**	-.50**	-.58**
Eagerness to participate	.56**	.43*	.43*
Motivation to perform well	.37*	.15	.30

The correlation analyses indicate that L1 and L2 students' reports of game enjoyment, difficulty, and helpfulness were significantly related to their overall enjoyment, motivation, and perceived learning gains within the W-Pal system. Students' perception of learning gains and writing improvement were positively related to their ratings of game helpfulness and enjoyment. However, students' perceptions of game difficulty had little to no relation to their perceived learning gains. In addition, students' enjoyment of the W-Pal system (i.e., the enjoyment and boredom questions on the daily survey) was significantly related to their mean game survey responses. In particular, students' self-reported enjoyment during the training sessions was positively related to their perceptions of both the helpfulness and enjoyment of the games.

Boredom, on the other hand, was negatively related to reports of the games' helpfulness, enjoyment, and ease. Thus, the more enjoyable, helpful, and easy students perceived the games, the less likely they were to report feeling bored during the sessions. Finally, students' self-reported eagerness to participate on the last day of training (looking forward to participating) was significantly related to their perceived helpfulness, difficulty, and enjoyment of games. Thus, the more students felt the games were beneficial, difficult, and enjoyable, the more motivated they were to participate in the training session.

To further examine these relations, we conducted three separate stepwise regression analyses on students' reports of engagement, motivation, and perceived learning (on session 9) from their mean game survey responses. For the dependent variables, we chose the daily survey measures from each category (engagement, motivation, and perceived learning) that were most highly correlated with the game responses. Our dependent variables were: perceived writing improvement, boredom, and eagerness to participate. The regression for the perceived writing improvement variable yielded a significant model,

F (1, 36) = 20.83, *p* <.001 R2 = .37 with one predictor: game enjoyment [β = .60, *t* (1, 36)= 4.56, *p* <.001]. These results suggest that students were more likely to perceive they had learned the W-Pal material when they rated the games as more enjoyable. Additionally, the regression on boredom yielded a significant model, *F* (1, 36) = 20.30, *p* < .001 R2 = .36 with one predictor: game enjoyment [β = -.60, *t* (1, 36)= -4.51, *p* < .001]. Students were less likely to experience boredom during strategy training and practice if they perceived the W-Pal games to be enjoyable overall. Finally, the regression for eagerness to participate yielded a third significant model, *F* (1,36) = 16.65, *p* < .001; R2 = .32 with one predictor: game enjoyment [β = .56, *t* (1, 36)= 4.08, *p* < .001]. Similar to the boredom analysis, the results of this regression suggest that students' enjoyment during training is significantly related to their enjoyment of the W-Pal games.

These results provide confirmatory evidence for the correlation analyses and suggest that students' engagement, motivation, and perceived learning gains during the W-Pal training sessions were strongly tied to their perceptions of the games. In particular, students' reported enjoyment of the W-Pal practice games was the strongest predictor of students' perceived writing improvement, boredom, and eagerness to participate on the final day of training.

A driving research question for this study regarded the degree to which the usefulness of the Writing Pal system differed as a function of primary language. In particular, we were interested in examining whether the game-based practice elements of W-Pal had differential effects on L1 and L2 students' engagement and perceptions towards the training sessions. Hence, in the following regression analyses, we examined these relations separately for these two groups.

L1 Regression Analyses

Three stepwise regression analyses were conducted including only L1 students. This analysis served as a baseline with which to compare the results of the L2 regression analysis. The regression for the perceived writing improvement response yielded a significant model, *F* (1, 22) = 8.96, *p* =.007; R2 = .29 with one predictor: perceived enjoyment [β = .54, *t* (1, 22)= 2.99, *p* =.007]. These results suggest that L1 students were more likely to perceive they had learned the W-Pal material when they rated the games as more enjoyable. Additionally, the regression on boredom yielded a significant model, *F* (1, 22) = 19.84, *p* < .001; R2 = .47, with one significant predictor: game difficulty [β = -.69, *t* (1, 22) = -4.45, *p* < .001]. L1 students reported more boredom during W-Pal when they had also perceived the games to be easier, and less boredom when the games were more difficult. Finally, the regression for eagerness to participate yielded a third significant model, *F* (1, 22) = 7.47, *p* =. 012; R2 = .25 with one predictor: game enjoyment [β = .50, *t* (1, 22)= 2.73, *p* = .012. Similar to the results for the writing improvement and boredom analyses, the findings of this regression suggest that L1 students' enjoyment during training is significantly related to their ratings enjoyment of the W-Pal games. Overall, the results of these regression analyses indicate that, for L1 students, the perceived enjoyment of the W-Pal games was strongly related to students' overall engagement during the W-Pal training sessions.

L2 Regression Analyses

Similar stepwise regression analyses (three analyses) were conducted including only L2 students. All three of the regression analyses yielded significant models: perceived writing improvement, boredom, and eagerness to participate. The perceived writing improvement regression analysis, *F* (1, 12) = 21.36, *p* = .001; R2 = .64, had one significant predictor: game enjoyment [β = .80, *t* (1, 12)= 4.62, *p* = .001]. The boredom response yielded a significant model, *F* (1, 12) = 8.06, *p* = .015; R2 = .40, with one significant predictor: perceived helpfulness [β = -.63, *t* (1, 12) = -2.84, *p* = .015]. Finally, the eagerness to participate response yielded a significant model, *F* (1, 12) = 14.04, *p* = .003; R2 = .54, with one significant predictor: game enjoyment [β = .73, *t* (1, 12) = 3.75, *p* = .003]. The results of these regression analyses indicate that, for L2 students, game enjoyment was a significant predictor of both perceived writing improvement and motivation to participate in the training session. In particular, this variable alone accounted for

approximately three-quarters of the variance in L2 students' perceived learning of the system, and over half of the variance in their eagerness to participate in the session. Additionally, for L2 students, the perceived helpfulness of the W-Pal games was a significant predictor of their boredom during the daily training sessions (i.e., students were less bored when the games were perceived to be helpful for learning). Therefore, it appears that game enjoyment and perceived helpfulness played strong roles in L2 students' overall engagement, boredom, and perceived learning from the W-Pal system.

DISCUSSION

Compared to L1 writers, L2 writers more frequently struggle to produce high quality writing, primarily because of the added difficulties associated with weaker language skills (NAEP, 2007; NAEP, 2011). One method that has been proposed to improve the writing skills of L1 writers is explicit writing strategy instruction. Such training has proven successful among native language writers (Graham & Perin, 2007; Hillocks, 1984; Rogers & Graham, 2008); however, the efficacy of such writing strategy interventions for L2 students has not been widely studied. In this study, both L1 and L2 writers interacted with a game-based writing strategy tutoring system designed to provide instruction and practice in an engaging environment. Using these interactions, we investigated whether the L2 students benefited from this game-based training intervention similarly or differently to the L1 students.

We examined changes in students' writing performance (i.e., pretest and posttest holistic essay scores) and system attitudes (i.e., daily reports of engagement, motivation, and perceived learning gains) across training sessions. Additionally, we analyzed the relation between these reported system perceptions and students' ratings of the strategy practice games in the W-Pal system. The results of the current study indicate that L2 students can indeed benefit from explicit writing strategy instruction within a game-based learning environment. Additionally, their enjoyment of strategy practice games is strongly linked to their overall engagement, motivation, and perceived performance towards strategy training sessions. Our results, therefore, support our predictions that writing strategy interventions that have been developed and tested for L1 students can be beneficial for L2 writers. Additionally, they suggest that game-based practice environments can be used as an engaging alternative to repetitive strategy training sessions, such as practice drills.

One substantial contribution of this study is the comparison of L1 and L2 students' development of writing performance (holistic essay scores) and system perceptions (daily reports of engagement, motivation, and perceived learning gains) across extended exposure to explicit writing strategy instruction. Although researchers have investigated the effects of writing-specific strategy interventions for L1 students, far fewer studies have focused on the benefits of such instruction for L2 students. A second contribution of this study is the examination of L2 students' perceptions of game-based strategy practice. Specifically, we investigated how students' reported perceptions of the games were related to, and predictive of, their overall reported engagement, motivation, and perceived learning after training. These analyses provided a glimpse into the similarities and differences between L1 and L2 writers during interactions with a game-based tutoring system. Additionally, they allow us to confirm a strong link between second language students' perceptions of strategy practice games and their overall perceptions of the Writing Pal training sessions.

L2 Writing Strategy Training

The results of this study provide an extensive analysis of the development of L2 students' writing performance and system perceptions across writing strategy-training sessions. Students in this study repeatedly interacted with W-Pal during which they received explicit strategy instruction, game-based strategy practice, and holistic essay writing practice (McNamara et al., 2012; Roscoe et al., in press). A series of instructional videos provided students with explanations, examples, and demonstrations on how to effectively apply writing strategies to their own essays. In addition, strategy practice games allowed

students to practice applying the strategies within isolated tasks, minimizing the potential to grow overwhelmed with the complex demands of the writing process. Finally, W-Pal offered students the opportunity to combine the strategies they had learned in a holistic essay-writing module.

Because the writing process is a complex cognitive task, L2 students may benefit from supplementary instruction and practice in engaging environments in a similar manner to L1 writers. Writing Pal provides such an environment, where these students can receive instruction and repeated, deliberate practice in an engaging and adaptive environment. The current study investigated whether L2 students would benefit from exposure to this system, in terms of writing performance or attitudinal measures. Our analyses revealed that L1 and L2 students exhibited similar positive developmental patterns across training session. Regardless of their native language, students improved in terms of writing performance as well as self-reported levels of engagement, motivation, and perceived writing improvement.

Student engagement plays a vital role in the efficacy of extended practice training sessions (McNamara et al., 2010). When practice tasks become repetitive and redundant, students can disengage from training. This may be particularly troubling for L2 students, who may need more practice than L1 students. Our results suggest that game-based strategy practice may offset potential negative training effects. In particular, repeated strategy training interspersed with game-based strategy practice in W-Pal not only maintained students' levels of engagement and motivation, it also led to overall increases in writing performance and affect (i.e., motivation, engagement, and perceived performance) for both L1 and L2 students. Therefore, the results of this study suggest that the addition of game-based features to repeated practice tasks has the potential to increase L2 students' engagement and motivation.

An obvious limitation of the current analyses is the equivalence of the pretest essay scores for L1 and L2 students. Although the L2 students in this study benefitted from the writing strategy training and game-based practice, it is unknown whether less proficient L2 students would experience similar benefits. Nonetheless, the results of this study provide confirmation that writing strategy training can benefit more advanced L2 writers in a similar manner as L1 writers. In addition to writing proficiency increases, the results of this study suggest that the L2 students experienced similar affective benefits from game-based practice as L1 students. Thus, we can conclude that, at least for highly proficient L2 students, game-based strategy training can lead to increases in writing performance, as well as motivation and engagement towards practice.

Game-based Writing Strategy Practice

Beyond our analysis of students' performance and attitudinal changes, we further investigated the degree to which students' perceptions of the practice games were related to their posttest reports of engagement, motivation, and perceived learning. Although students' daily perceptions of the W-Pal system increased throughout training, it was unclear whether these positive attitudinal ratings could be attributed to the W-Pal games. Hence, we further examined the game ratings that were associated with students' daily survey responses in order to determine the degree to which students' attitudes towards the games affected students' perceptions of strategy training.

The correlation and regression analyses confirmed that there was, indeed, a relation between attitudes towards the games and students' perceptions of their performance. Further, these relations were different for L1 and L2 students. Averaging across first and second language, students tended to rate their training perceptions more highly if they also found the games to be enjoyable, easy to play, and helpful for learning. However, L1 and L2 students' game ratings were predictive of different measures of motivation and engagement. Namely, game enjoyment and difficulty were predictive of L1 students' daily self-reports of perceived learning, motivation, and engagement during W-Pal training, whereas for L2 students, game enjoyment and perceived game helpfulness were both predictive of daily self-reports. Importantly, the L2 students' attitudes towards game-based practice also accounted for more variance in their engagement, motivation, and perceived performance than did the ratings of L1 students. Overall, the

results of these analyses suggest that L1 and L2 students may experience similar benefits from educational games. However, these results further suggest that the link between game enjoyment and overall engagement and perceived performance may be stronger for L2 students than L1 students.

A potential explanation for the stronger game enjoyment-engagement connection amongst L2 students may be a result of the isolated strategy practice offered by the W-Pal games. The game-based practice allows students to practice individual components of the writing process, such as outlining or revising, without having to produce an entire essay. This process reduces many of the demands associated with the writing process. Thus, students may be less overwhelmed and more likely to remain engaged in the task. This result may be particularly strong for L2 students because the L2 writing process is typically more resource demanding, as students must attend to lower- and higher-level aspects of their writing (e.g., DeKeyser, 2007; Schoonen et al., 2009). An obvious limitation of this study is the relatively low number of L1 and L2 participants. Based on this small sample of students, it is worth noting that more attention should be paid to the results that were significant at the $p <. 001$ levels. Indeed, future studies should attempt to replicate these findings with a larger sample of students. Nonetheless, the results of this study provide a starting point as well as important insights into the potential efficacy of strategy training for L2 students.

The current study did not afford the opportunity to analyze how the various W-Pal games may have differentially impacted students' engagement, motivation, and perceptions of performance. Future studies, however, should attempt to identify the specific features of educational games that contribute most strongly to increases in motivation and engagement. Further, research should investigate whether these features differentially impact L1 and L2 students who interact with these games. For example, it may be that there are differential effects of generative and identification tasks on L1 and L2 students. Because the L2 writing process can be overwhelming, students may grow more disengaged during game-based practice that requires them to produce larger quantities of text. Results from such studies could provide critical information for researchers and designers that could inform the adaptation of game-based systems for L2 students.

CONCLUSIONS

Our results indicate that L2 students can improve their writing performance through a combination of explicit writing strategy instruction, game-based practice, and holistic essay writing practice. Despite the apparent benefits of repetitive strategy practice, students can easily grow disengaged with extended learning tasks. The current study suggests that L2 students' engagement towards learning tasks is strongly related to their enjoyment of the practice environment. Therefore, L2 students' inherent interest in games can be leveraged to improve their engagement and motivation towards strategy training.

The results of this study revealed a connection between game enjoyment and overall perceptions of the training system; however, it did not provide specific information about the game features that were most strongly related to the L2 students' engagement and perceived learning gains. Future work should investigate the impact of different features of the games, such as narrative or personalization, to determine what game characteristics are more beneficial to the writing process. In addition, because L2 students' engagement and motivation was strongly predicted by their game enjoyment, future research should be conducted to examine which types of games are most enjoyable and beneficial for L2 students.

Potential limitations of this study lie in the relatively high English proficiency level of the L2 students and the relatively low number of participants. Indeed, these factors deserve further attention in future studies. Nonetheless, the results of this study provide a starting point as well as important insights into the potential efficacy of strategy training for L2 students. A more complete understanding of the questions explored in this study will hopefully emerge from future studies that investigate the effects of language skills on the effectiveness of strategy training and game-based practice.

APPENDIX A. Description of the Writing Pal Games.

Game	Description
Freewrite Flash	Freewrite on a given prompt to fill the Idea Meter and earn Idea Flash Cards
Mastermind Outline	Create an outline from argument and evidence statements that are provided in order to repair the Mastermind Mainframe
Planning Passage	Select appropriate arguments and evidence to advance to new travel destinations and earn souvenirs
Dungeon Escape	Label attention-grabbing techniques by selecting appropriate doors to avoid the castle guards and the rising floodwaters.
Essay Launcher	Select thesis statements and attention-grabbers for given introduction paragraphs in order to rescue spaceships
Fix It	Fix a broken circuit board by evaluating paragraphs for their missing elements, such as evidence or thesis statements
RoBoCo	Write topic and evidence sentences for a given thesis statement to earn the necessary parts to build a robot
Lockdown	Write conclusion paragraphs for a given essay outline in order to stop computer hackers
Adventurer's Loot	Identify the correct use of paraphrasing strategies to explore various locations and obtain treasure
Map Conquest	Identify paraphrasing strategies to earn flags that can be used to conquer the game board
Undefined & Mined	Identify undefined referents in texts to disarm mines
CON-Artist	Solve clues by selecting transition words that link sentences. These clues then allow students to catch a thief
Speech Writer	Identify the main problems in a friend's speech and then help your friend edit the speech to improve it

APPENDIX B. Pretest and Posttest Essay Prompts.

Essay Title	Prompt
Images and Impressions	All around us appearances are mistaken for reality. Clever advertisements create favorable impressions but say little or nothing about the products they promote. In stores, colorful packages are often better than their contents. In the media, how certain entertainers, politicians, and other public figures appear is sometimes considered more important than their abilities. All too often, what we think we see becomes far more important than what really is. Do images and impressions have a positive or negative effect on people?
Competition and Cooperation	While some people promote competition as the only way to achieve success, others emphasize the power of cooperation. Intense rivalry at work or play or engaging in competition involving ideas or skills may indeed drive people either to avoid failure or to achieve important victories. In a complex world, however, cooperation is much more likely to produce significant, lasting accomplishments. Do people achieve more success by cooperation or by competition?

APPENDIX C. Holistic Rating Form

After reading each essay, assign a holistic score based on the rubric below. For the following evaluations you will need to use a grading scale between 1 (minimum) and 6 (maximum). The distance between each grade (e.g., 1–2, 3–4, 4–5) should be considered equal.

Score	Criteria
6	An essay in this category demonstrates clear and consistent mastery, although it may have a few minor errors. A typical essay effectively and insightfully develops a point of view on the issue and demonstrates outstanding critical thinking, using clearly appropriate examples, reasons, and other evidence to support its position is well organized and clearly focused, demonstrating clear coherence and smooth progression of ideas exhibits skillful use of language, using a varied, accurate, and apt vocabulary demonstrates meaningful variety in sentence structure is free of most errors in grammar, usage, and mechanics.
5	An essay in this category demonstrates reasonably consistent mastery, although it will have occasional errors or lapses in quality. A typical essay effectively develops a point of view on the issue and demonstrates strong critical thinking, generally using appropriate examples, reasons, and other evidence to support its position is well organized and focused, demonstrating coherence and progression of ideas exhibits facility in the use of language, using appropriate vocabulary demonstrates variety in sentence structure is generally free of most errors in grammar, usage, and mechanics.
4	An essay in this category demonstrates adequate mastery, although it will have lapses in quality. A typical essay develops a point of view on the issue and demonstrates competent critical thinking, using adequate examples, reasons, and other evidence to support its position is generally organized and focused, demonstrating some coherence and progression of ideas exhibits adequate but inconsistent facility in the use of language, using generally appropriate vocabulary demonstrates some variety in sentence structure has some errors in grammar, usage, and mechanics.
3	An essay in this category demonstrates developing mastery, and is marked by ONE OR MORE of the following weaknesses: develops a point of view on the issue, demonstrating some critical thinking, but may do so inconsistently or use inadequate examples, reasons, or other evidence to support its position is limited in its organization or focus, or may demonstrate some lapses in coherence or progression of ideas displays developing facility in the use of language, but sometimes uses weak vocabulary or inappropriate word choice lacks variety or demonstrates problems in sentence structure contains an accumulation of errors in grammar, usage, and mechanics.
2	An essay in this category demonstrates little mastery, and is flawed by ONE OR MORE of the following weaknesses: develops a point of view on the issue that is vague or seriously limited, and demonstrates weak critical thinking, providing inappropriate or insufficient examples, reasons, or other evidence to support its position is poorly organized and/or focused, or demonstrates serious problems with coherence or progression of ideas displays very little facility in the use of language, using very limited vocabulary or incorrect word choice demonstrates frequent problems in sentence structure contains errors in grammar, usage, and mechanics so serious that meaning is somewhat obscured.
1	An essay in this category demonstrates very little or no mastery, and is severely flawed by ONE OR MORE of the following weaknesses: develops no viable point of view on the issue, or provides little or no evidence to support its position is disorganized or unfocused, resulting in a disjointed or incoherent essay displays fundamental errors in vocabulary demonstrates severe flaws in sentence structure contains pervasive errors in grammar, usage, or mechanics that persistently interfere with meaning.

Holistic score based on attached rubric (1-6): ___

Daily Surveys.

Please answer the following questions about your MOST RECENT Writing Pal session.
1: My Most recent session in W-Pal was…

Very Bad	Bad	Poor	Fair	Good	Very Good
1	2	3	4	5	6

2: I felt like I learned the material during my MOST RECENT SESSION

Not At All					Very Much
1	2	3	4	5	6

3: I feel like my writing skills improved during my MOST RECENT SESSION

Not At All					Very Much
1	2	3	4	5	6

4: I enjoyed my MOST RECENT SESSION

Not At All					Very Much
1	2	3	4	5	6

5: I was bored during my MOST RECENT session

Never	Rarely	Sometimes	Often	Most of the Time	All the Time
1	2	3	4	5	6

6: I was frustrated during my MOST RECENT session

Never	Rarely	Sometimes	Often	Most of the Time	All the Time
1	2	3	4	5	6

7: I had problems with the program during my MOST RECENT session

Never	Rarely	Sometimes	Often	Most of the Time	All the Time
1	2	3	4	5	6

Please answer the following questions about how you feel about TODAY'S Writing Pal session.
8: My mood right now is...

Very negative					Very Positive
1	2	3	4	5	6

9: I am looking forward to participating in TODAY'S SESSION

Not At All					Very Much
1	2	3	4	5	6

10: I am motivated to participate in TODAY'S SESSION

Not At All					Very Much
1	2	3	4	5	6

11: I plan to do my best during TODAY'S SESSION

Not At All					Very Much
1	2	3	4	5	6

12: I plan to do better than anyone else during TODAY'S SESSION

Not At All					Very Much
1	2	3	4	5	6

Daily Game Surveys.

1: Was this challenge helpful for practicing or learning a writing strategy?

Very Helpful	Somewhat Helpful	Only a Little Helpful	Not Helpful at All
1	2	3	4

2: Was this challenge enjoyable to play?

Very Enjoyable	Somewhat Enjoyable	Only a Little Enjoyable	Not Enjoyable at All
1	2	3	4

3: Was this challenge easy or difficult to play?

Very Easy	Somewhat Easy	Somewhat Difficult	Difficult
1	2	3	4

4: Were the instructions for this challenge understandable?

Easy	Somewhat Easy	Somewhat Hard	Hard
1	2	3	4

5: Were the graphics for this challenge appealing?

Very Appealing	Appealing	Somewhat Unappealing	Unappealing
1	2	3	4

6: Did the game controls for this challenge make sense?

Completely	Mostly	Somewhat	Made no Sense
1	2	3	4

NOTES

1. The Scholastic Aptitude Test (SAT) is a standardized assessment used for most college admissions decisions in the United States

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