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Using Digital Stories and iPads to Promote Writing Skills, Writing Self-efficacy, and Motivation to Write among 9th Grade Students

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Abstract

This study explores the use of digital storytelling as a prewriting activity to help 9th grade students plan narrative essays in English writing lessons. Students (N = 62) in three course sections taught by the same teacher completed a 10-week intervention. Each section was assigned to one of three groups according to their learning environment: a normal educational practice (NEP) group, a bulletin board system (BBS) group, and an asynchronous audio/video (AAV) group. The BBS and AAV groups created digital stories to plan their narratives while the NEP group developed written outlines.

Students' writing self-efficacy, writing motivation, writing performance, and technology self-efficacy were measured at three times during the study. The results indicated that writing performance and writing motivation were not statistically different among the three groups over time. The BBS group experienced a significant increase in writing self-efficacy over the 10-week period. Digital story scores were found to be a significant predictor of essay scores at the end of the study. However, the sample size for this particular analysis did not have adequate statistical power. Lastly, levels of students' technology self-efficacy were found to significantly predict students' writing self-efficacy at the end of the study. While no immediate writing performance gains were found in this study, as writing self-efficacy can predict writing performance, it is possible that students may have experienced performance gains over a longer intervention period.

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CHAPTER I

OVERVIEW OF THE STUDY

Introduction

Since the 1970s, educators and policy makers have been concerned with the poor writing performance of our students in United States public schools (Nagin, 2006). Beginning in 1998, the U.S. Department of Education has been using the National Assessment of Educational Progress (NAEP) test to assess writing skills of some U.S. 4th-, 8th-, and 12th-grade children in comparison to similar students in other countries. For 13 years, average national writing scores have been within the basic achievement level, a score between 120 and 172 (National Center for Education Statistics [NCES], 2013). At this level, students have only partial mastery of the knowledge and skills that are fundamental for proficient work[1]. Between 1998 and 2011, two thirds or more of the students in the 4th, 8th, and 12th grades had writing scores that were below grade-level proficiency (NCES, 2013).

Statement of the Problem

Students in public schools who do not learn to write proficiently are at a disadvantage. In school, stronger writers are more likely than weaker writers to use their writing skills to support learning in many academic areas (Graham & Perin, 2007a). Students with poor writing skills are likely to have poor grades in other academic subjects, especially in classes where writing artifacts are primarily used for assessing progress

[1] The proficient level contains scores between 173 and 210 and denotes solid academic performance in writing. The advanced level ranges from 211 to 300 and is defined as superior performance in writing.

(Graham, 2006a). The effects of not learning to write proficiently in school can also have a future impact for students. Some estimates claim that 50% of students that graduate from high school are not prepared for the writing demands of college courses (Achieve, Inc., 2005). In the workplace, writing skills are essential for employment and promotion (National Commission on Writing, 2004, 2005). Engineering and business professions require advanced writing skills for success in those careers (Zhu, 2004). Additionally, American businesses spend $3.1 billion annually for remediating the writing skills of professionals (National Commission on Writing, 2004). While these studies focused on expository writing and this study examines narrative writing, both genres require the same basic writing skills that are needed for proficiency (Graham & Perin, 2007a). While poor writing skills are not the only source of poor grades or poor achievement, it is an important factor to consider due to its reach into all academic areas.

Review of the Literature

Improving Adolescents' Writing Skills

A possible source of adolescent students' poor writing skills in U.S. public schools may be inadequacies in how writing is taught across the curriculum (Graham & Perin, 2007a; Nagin, 2006; National Commission on Writing, 2003). Kiuhara, Graham, and Hawken (2009) suggested that writing instruction is in need of reform in high schools to increase students' writing performance. Nagin (2006) recommended, "schools need to expand their writing curricula to involve students in a range of writing tasks" (p. 17). Schools need to address not only *how* writing is taught but also the standards to *what* must be learned.

The recent Common Core State Standards Initiative (CCSS) (National Governors Association Center for Best Practices, 2010) provides guidelines to schools when teaching writing. The CCSS outlines clear expectations of what students are to learn in the English language arts and mathematics. These standards were designed to be relevant to students' lives and to reflect the skills and knowledge that students need to be successful in college and have successful careers. However, the CCSS has not been empirically validated (Mathis, 2010). Also, Reed (2010) reported that universal curriculum standards do not effectively close the achievement gap. These reports are very disconcerting given the widespread use of the CCSS. Even so, the states that adopted the CCSS are using standardized tests based on the CCSS to assess student performance. Relatedly, schools in these states are moving forward to integrate the CCSS into their curricula. Teachers will need to develop English lessons that adhere to the CCSS. Pedagogical reform is one over-arching method that could help improve writing skills (Kiuhara et al, 2009).

In a meta-analysis of writing instruction studies with adolescents (students in grades 4 through 12), Graham and Perin (2007a) identified effective teaching practices that can improve the quality of writing. The most effective practice found was teaching students how to plan, edit, and revise their compositions (Cohen's d = 0.82; Grades 4-10). Additionally, Graham and Perin (2007a) identified that students should engage in pre-writing activities such as a visual representation of their ideas (Cohen's d = 0.32; Grades 4 – 9) to assist in planning their compositions. This study focused on planning activities that included visual representations of ideas to improve students' writing performance. When designing writing learning activities for students, their self-efficacy should also be considered (McLeod, 1987; Pajares & Johnson, 1996).

Writing Self-efficacy

To foster a supportive learning environment for student writing, many have argued that instructors should consider students' writing self-efficacy in the learning task (Pajares, Johnson, & Usher, 2007). Self-efficacy is defined as a person's confidence of the level of performance that he or she can achieve at a certain task (Bandura, 1997). Additionally, self-efficacy is task specific (Bandura, 1997). Writing self-efficacy can be defined as students' judgments of confidence levels they possess with various grammar, composition, usage, and mechanical skills appropriate to their grade level (Pajares, Johnson, & Usher, 2007). While the genres of expository and narrative writing have different goals, both require the same basic writing skills (and self-efficacy) that are needed for proficient writing. Individuals with high levels of self-efficacy for a task are more likely to succeed at difficult tasks than those with lower levels of self-efficacy (Bandura, 1997; Zimmerman, 2000). Individuals with low levels of self-efficacy are likely to perform poorly or not engage in the task. In a meta-analysis of self-efficacy studies, Multon, Brown, and Lent (1991) found that a learner's self-efficacy could influence their academic performance (r = 0.38) and task persistence (r = 0.34).

Pajares and Johnson (1996) found writing self-efficacy to have a strong relationship to writing performance (r = 0.60) with students entering high school. In a further examination of writing self-efficacy, Pajares, Johnson, and Usher (2007) found mastery experiences to be the strongest predictor ($\beta = 0.36$, $p < 0.0001$) of writing self-efficacy with high school students (this study also found that social persuasion was a significant predictor [$\beta = 0.18$, $p < 0.001$] while vicarious experiences and stress/anxiety were not). These findings demonstrate that certain sources of self-efficacy can affect writing (e.g.,

mastery experiences and social persuasion) while others (e.g., modeling and anxiety) may not.

In light of these results, Pajares et al. (2007) suggested that students need to gain success through authentic mastery experiences. Teachers should provide specific goals and frequent feedback to students to ensure they are developing the necessary mastery experiences. This is consistent with Graham and Perin's (2007a) recommendations that writing instruction should include supports for planning and stating clear lesson goals. Additionally, writing self-efficacy can be increased when students write for authentic audiences (Pajares et al., 2007), another recommendation by Nagin (2006).

Pajares et al. (2007) found that feedback from adults and peers about their writing were directly related to students' confidence in writing. Relatedly, Nagin (2006) recommended that peer review of writing should be a part of the writing process. Teachers should first demonstrate how to critique others' compositions. Working in groups, students should then review each other's writing with the teacher's support. Positive feedback that cultivates students' beliefs that they are writing well can increase their self-efficacy (Pajares et al., 2007). However, self-efficacy is only one component of a larger theory of learning: social cognitive theory (SCT) (Bandura, 1986).

Social Cognitive Theory

In Bandura's (1986) SCT, sociocultural processes help shape how individuals behave and construct knowledge. At the core of SCT, Bandura (1986) proposed three factors that shape how a person thinks, feels, and behaves. These factors interact with one another in a model of triadic reciprocal determinism. In this model, behavioral, personal, and environmental factors all interact with varying degrees of magnitude to affect learning

(Bandura, 1986). In this study, a behavioral factor was students' writing performance. The environmental factors were the different learning conditions of the students. For example, in this study, one group of students used a text-only collaboration environment and another group used an audio/video collaboration environment. The personal factors were students' writing self-efficacy (which includes prior writing knowledge and achievement) and writing motivation, which are also closely linked together (Zimmerman, Bandura, & Martinez-Pons, 1992).

Students who are highly intrinsically motivated are more likely to perform well at academic tasks (Schunk, Pintrich, & Meece, 2008). Setting attainable goals (Bandura, 1988; Schunk, 1991) in a classroom lesson can also contribute to an increase in academic motivation. Additionally, effective feedback on goal progress can increase self-efficacy (Schunk, 1991). These findings should be considered when forming goals and providing feedback, as these processes are integral to writing instruction (Graham & Perin, 2007). Teacher and peer models have been linked to influencing self-efficacy and motivation (Schunk 1991). Models can contribute to self-efficacy through vicarious efficacy information. Part of a student's vicarious experiences involves the social comparisons that are made with other individuals and can be strong influences on developing self-perceptions of confidence (Pajares, 2003). Further, peer models can be stronger sources of efficacy information (Pajares, 2003; Schunk et al., 2008). As mentioned earlier, group activities with adults and peers are essential for supporting mastery and vicarious experiences to support writing self-efficacy. Feedback that is positive and constructive, and validates students' progress, is more likely to promote increased self-efficacy in writing (Pajares & Johnson, 1996).

An additional factor to consider may be that technology self-efficacy is linked to writing self-efficacy when technology is used in a lesson (Girasoli, 2006). Technology self-efficacy can be defined as the confidence one has in using a computing device, such as a laptop, tablet, or workstation PC (Compeau & Higgins, 1995; Girasoli, 2006; Murphy, Coover, & Owen, 1989). In the SCT model, a student's environment can influence their self-efficacy (and vice-versa). When learning in a technology-rich environment, a student's level of technology self-efficacy may affect their academic self-efficacy (Girasoli, 2006). This may occur due to the interactions between the technology environment, the student's confidence in the academic task at hand, and the student's confidence in using the computers. This study will investigate this relationship further, to examine if students' self-efficacy in using educational technology is related to their self-efficacy in writing.

By using computers or iPads to create video stories, students can participate in an engaging planning activity that uses technology to prewrite a composition. As stated earlier, planning a written composition is the most effective instructional strategy (Graham & Perin, 2007a). Using visual representations of ideas complements the planning (Graham & Perin, 2007a). A popular classroom activity for using technology to plan or enhance compositions is digital storytelling (Grisham & Wolsley, 2006; Ohler, 2013; Sylvester & Greenidge, 2009).

Digital Storytelling

Digital storytelling is part of a movement to use multimodal assignments in the language arts. Benson (2008), Sylvester and Greenidge (2009), and Siegle (2009) have suggested that integrating visual and aural activities into literacy assignments can promote students' connections to reading and writing. Related to this research, digital stories have

been used to support reading and writing in the curriculum (DeVoss, Eidman-Aadahl, & Hicks, 2010; Robin, 2008; Sadik, 2008). A digital story is a student-created multimedia artifact that contains images and video accompanied by narration (Sylvester & Greenidge, 2009). Teachers have been using digital stories to help students plan compositions and develop writing skills. By creating a digital story, students cultivate a writing style as they author and produce the narration (DeVoss et al., 2010). Additionally, Burn and Reed (1999) suggest that digital stories can motivate and engage high school students. While digital storytelling is sometimes considered a "new literacy" (e.g., Kist, 2005; Leu, Kinzer, Coiro, & Cammack, 2004), this study focused on using multimedia as an integrated planning exercise for writing rather than stand-alone artifact to demonstrate language learning.

When creating a digital story, Devoss et al., (2010) advised that students should plan their digital artifact, much like a written assignment. Sylvester and Greenidge (2009) recommended that students first create a storyboard of key scenes with text descriptions as a guide for their digital story. Text from the storyboard later becomes the narration. When building the digital story, students can perform research to add images from the Internet, capture original pictures, and/or add original video. Students must cite any material that is not original. The images and video are then edited together on a computer with a voice-over narration added. Students should also work in groups to share their work for peer and teacher feedback and revisioning (DeVoss et al., 2010). With the digital story activity, students are prewriting, or planning, their future written composition.

Multimedia Learning

Students should ensure the multimedia is presented in a manner that is easily understandable for the viewer when creating a digital story. For example, if the images and narration are not related with each other, the viewer may have a difficult time understanding the digital story. To help ensure the images and narration are congruent, Mayer's (2009) principles of multimedia learning could guide authors with digital story creation. These principles are based on the assumptions of dual-channel coding (Baddeley, 1999; Paivio, 1986), limited capacity (Baddeley, 1999; Chandler & Sweller, 1991) and active processing theories (Mayer, 2009; Wittrock, 1989). Based on these three assumptions, Mayer's (2009) cognitive theory of multimedia learning recommends principles for creating multimedia artifacts that can effectively convey meaning in a digital story.

Supportive Feedback and Group Work with Technology

Planning, editing, and revising written work along with teacher and peer feedback are key activities in creating effective writing artifacts (Graham & Perin, 2007a). The same strategies are recommended when students develop digital stories (DeVoss et al., 2010). Positive feedback from teachers and peers on written assignments and writing for an authentic audience can increase writing self-efficacy (Pajares et al., 2007). To support feedback and group work when creating the digital stories and writing artifacts, an asynchronous audio/video (AAV) discussion program was developed for this study.

Girasoli and Hannafin (2008) proposed that a computer-mediated communication (CMC) program such as an AAV discussion application could help support scaffolding processes (e.g., teacher and peer feedback and teacher prompts). Scaffolding is a method

for supporting learning where assistance is provided to students on an as-needed basis (Wood, Bruner, & Ross, 1976). The assistance is faded as the learner's competence increases. In an AAV environment, teachers can provide students with rich feedback using diagrams, imagery, and audio rather than solely text. Girasoli and Hannafin (2008) also suggested that an AAV program could support students' mastery and vicarious experiences as audio/video messages provide opportunities for modeling and more personal feedback compared to text-based discussion programs. Additionally, an AAV program would allow students to publish their digital stories, to give an audience outside the classroom access to their videos.

Another type of CMC program commonly used to support feedback among peers in a group is the asynchronous text-based discussion bulletin board system (BBS). Girasoli and Hannafin (2008) proposed that an AAV program could better support student self-efficacy compared to a text-only CMC. In a BBS, students may become frustrated with the time it takes to type or follow threads in online discussions (An & Frick, 2006). Additionally, students with poor reading and writing skills can have difficulty participating in text-only discussions (Bowe, 2002). To date, researchers have not compared the effectiveness of AAV and BBS programs to support instructor and peer interactions and feedback for the purposes of supporting pre-writing activities among high school students. In this study, technology and pedagogy are used in concert to promote writing skills, writing self-efficacy, and writing motivation. To help high school English teachers make informed decisions about digital environments to support students' pre-writing activities, this study includes an assessment of students' use of an AAV or BBS environment to support their

pre-writing digital storytelling activities on outcomes such as writing performance, writing self-efficacy, and motivation to write.

Research Questions and Hypotheses

This study examined the ways and extent to which different pre-writing environments impact personal and behavioral factors related to writing among high school students. Specifically, this study examined the impact of 9th grade English students' participation in pre-writing digital storytelling activities using either an AAV or BBS format to support instructor and peer feedback on writing self-efficacy, writing motivation, and writing performance. The experimental groups were compared to a normal educational practice (NEP) group participating in traditional classroom pre-writing activities. See Figure 1.1 for a diagram of the relationships between the research questions, assessments and groupings, and how all factors relate to the triadic model of social cognitive theory. For example, in Figure 1.1, research question 1 (RQ_1) examined the relationship between students' writing self-efficacy, writing motivation (both personal factors), and the essay rubric score (a behavioral factor) among the comparison group, BBS group, and AAV group (all environmental factors). The following research questions (RQ_1, RQ_2, and RQ_3) and hypotheses are investigated in this study:

RQ_1: During a 10-week 9th grade English course, to what extent and in what ways does participation in one of three pre-writing conditions (i.e., outline-only, digital storytelling with BBS for group interaction, or digital storytelling with AAV for group interaction) relate to students' scores in writing self-efficacy, writing motivation, and writing performance?

H_0: There is no impact of the pre-writing conditions on 9th grade students' writing self-efficacy, writing motivation, and writing performance.

H_1: Students who create digital stories have increased writing self-efficacy, writing motivation, and writing performance over time.

H_2: Students who create digital stories with the AAV system have increased writing self-efficacy, writing motivation, and writing performance over time compared to the BBS and comparison (outline-only) groups.

RQ_2: How are the storyboard creation, digital story creation, and collaboration environment group (BBS or AAV) related to writing proficiency?

H_0: Storyboard creation, digital story creation, and the collaboration environment group do not significantly explain variance in writing proficiency.

H_1: Storyboard creation, digital story creation, and the collaboration environment group significantly explain variance in the essay rubric score.

RQ_3: To what extent is student technology self-efficacy related to writing self-efficacy?

H_0: There is no significant relationship between technology self-efficacy and writing self-efficacy in the three groups.

H_1: There is a significant relationship between technology self-efficacy and writing self-efficacy.

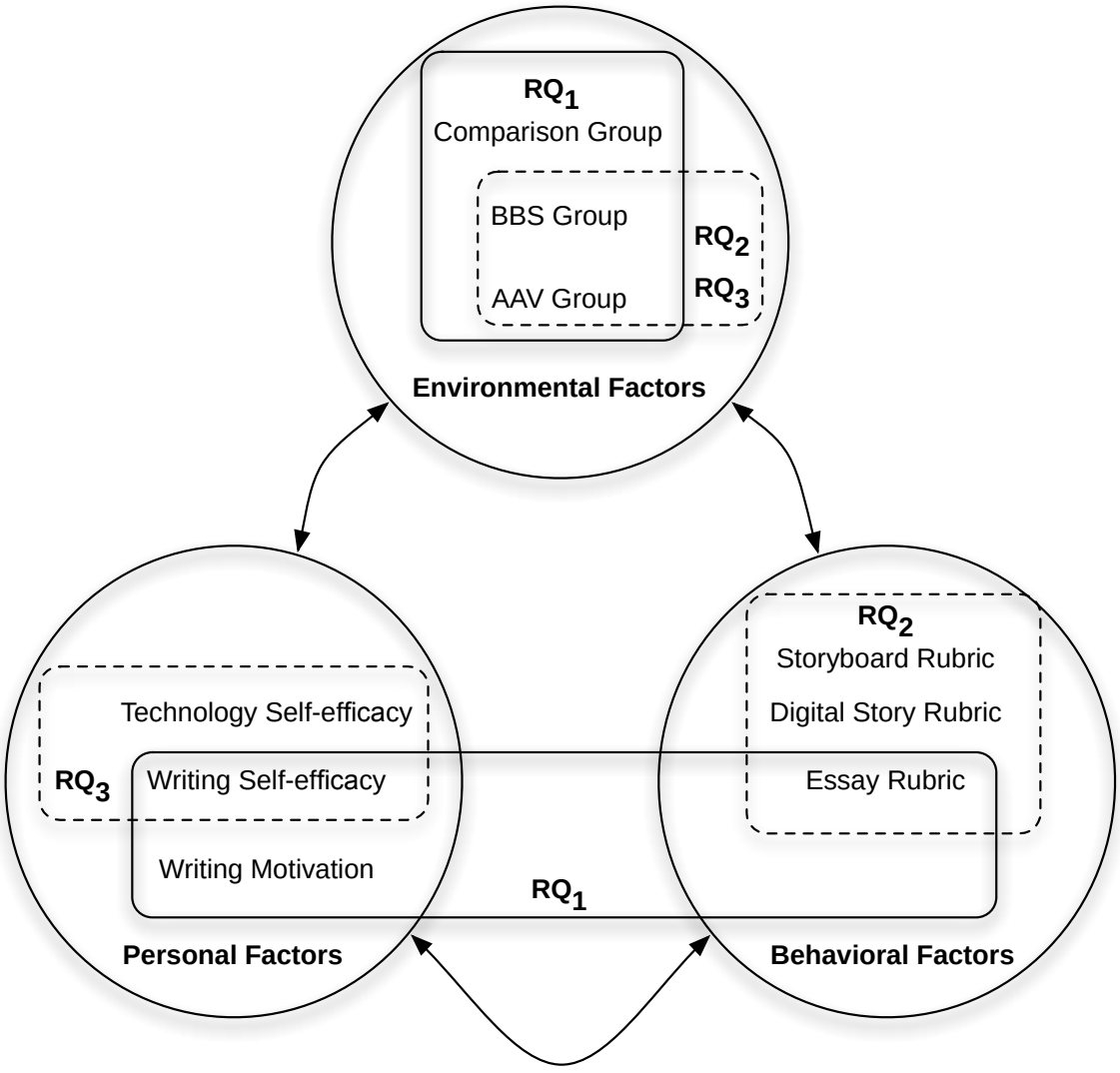


Figure 1.1. The relationship between the research questions, assessments and groupings and how these factors relate to social cognitive theory's model of triadic reciprocal determinism.

Method

Participants

Sixty-two 9th grade students in a suburban public high school participated in this study. A power level of 0.80 and an alpha level of 0.05 are generally acceptable for research studies (Cohen, 1988). Additionally, effect sizes of at least moderate levels are considered "substantively important" in educational research by the U.S. Department of Education (Institute of Education Sciences, 2013). To determine the sample sizes, G*Power 3 (Faul, Erdfelder, Lang, & Buchner, 2012) was used. For RQ_1, two different analyses were performed. To examine any differences in writing performance, a MANCOVA between the three groups was used. A minimum sample size of 36 ($f^2 = 0.25$, $\alpha = 0.05$, Power = 0.80, two-tailed) was computed for a MANOVA with the pre-moment, middle moment, and final moment essay scores as dependent variables (DVs). Students' group membership and a covariate served as the two independent variables (IVs). To analyze any differences in writing self-efficacy and writing motivation over the three time periods, a repeated measures (RM) MANCOVA was performed. For the RM-MANCOVA, a minimum sample size of 57 ($f^2 = 0.25$, $\alpha = 0.05$, Power = 0.80, two-tailed) was needed for two IVs and three DVs.

For RQ_2, a linear regression analysis was performed with storyboard scores, digital story scores, and group membership as IVs. The DV was the writing performance scores and all data were from the final moment. For the RQ_2 analysis, the minimum sample size needed was 48 ($f = 0.25$, $\alpha = 0.05$, Power = 0.80, two-tailed). With RQ_3, two analyses were used to explore this research question. Firstly, an RM-MANOVA was performed over three time periods with technology self-efficacy as the DV and the group membership as the IV. The RM-MANOVA allowed an examination of how technology self-efficacy changed over

time. A minimum sample size of 57 ($f^2 = 0.25$, $\alpha = 0.05$, Power = 0.80, two-tailed) was needed for this analysis. For the second part of the RQ_3 analysis, a linear regression examined the predictive value of technology self-efficacy and group membership to writing self-efficacy at the final moment. For this analysis, the minimum sample size needed was 48 ($f = 0.25$, $\alpha = 0.05$, Power = 0.80, two-tailed).

Three 9th grade English classes taught by the same teacher participated in this study. The participants were male and female students between the ages of 15 and 16. The first class had 19 students, the second class had 20 students, and the third class had 23 students. Each classroom was randomly assigned to one of three groups: 1) a comparison group, 2) a BBS group, and 3) an AAV group. One student was not included in the final study data due to moving out of the school's district when the study began.

Procedures

A human subjects IRB-1 form was filed with the University of Connecticut Institutional Review Board prior to any data collection. All of the activities for this study were part of the students' normal classroom lessons. All data is confidential and the items in surveys were non-controversial. All participants received a parental waiver letter and an information sheet/opt-out form. If a parent or guardian did not want their child's data to be collected, the parent or guardian could sign the opt-out section of the information sheet and return the form to the student's class. Parents and guardians were given one week before the study began to opt-out. In addition, parents, guardians, and students were notified that they could opt-out at any time without pressure or consequences. None of the students opted out of the study. If any of the students had decided to opt-out, their data

wouldn't have been collected. However, these students would have participated in the lessons, as the activities were part of normal classroom instruction.

Appendix A provides a detailed project plan of the study. On the first day of the study, students were given a writing self-efficacy, technology self-efficacy, and motivation to write survey (see Appendix B). Students were then asked to read the poem, "Invictus" by William Ernest Henley. After reading the poem, students were asked to write an essay explaining what Henley means by the poem's line, "I am the master of my fate; I am the captain of my soul." The teacher and researcher provided training to the students on how to use the iPads and applications. All students were taught how to use the iPad, the Safari web browser, and the Google Drive program for word processing. Students had 40 minutes to complete the essay on the iPad using the Google Drive (Google Docs) app.

The teacher and an independent rater evaluated this essay and all other essays with the rubric in Appendix E. This rubric was adapted from a narrative essay rubric for students in grades 9-10 and is aligned with the CCSS (Turnitin, 2012). The teacher gave feedback to the students electronically using the comments feature in Google Docs. Also, the teacher led an in-class discussion about the student compositions that were effective models and ones that needed significant revisions. During Week 3, students read a short story and the teacher led lessons and discussions on literacy components (see Appendix A). The teacher also gave a lesson on how to provide peer feedback.

Students were placed into balanced groups of four students for the peer feedback activities. The students' placement was based on their rubric scores from the initial essay. Students with higher initial essay scores were grouped with students that scored lower on the initial essay. This helped ensure that students' writing abilities were balanced in each

group so that no one group is composed of all excellent or all poor writers. Kerlinger (1986) describes this kind of sampling as purposive, where the researcher deliberately creates proportional groups. While this grouping can afford effective peer support from stronger writers, high school students are likely to assign an achievement status to their peers (Lotan, 2006). This kind of status assignment could result in stronger-skilled students doing most of the work and weaker-skilled students doing less. To help counter this effect, Lotan (2006) recommended that the teacher facilitate group interactions so that all students are equally recognized for their accomplishments. In this manner, all students in the group can recognize that each member has quality contributions to the learning process.

During Week 4 and 5, all students were given a composition prompt where they had to retell a story in Homer's "The Odyssey." Students in the comparison group performed research, created an essay outline, and wrote a first draft. The teacher and students provided feedback only during classroom time. The remaining two classes were randomly assigned to the BBS group and the AAV group. Students in the BBS group were taught how to use Google Groups for text-based discussions. Students in the AAV group were given directions on how to use the AAV program for audio/video-based discussions. Students in both the BBS and AAV groups were taught how to use the Storyboard app and iMovie app for creating digital stories.

Individuals in both groups created storyboards using the Storyboard app on the iPads. The BBS students received teacher and peer feedback on their storyboards in Google Groups. The AAV students received feedback on their storyboards from their teacher and peers in the AAV system. Students in the comparison group received feedback on their

outlines in Google Docs from their teacher. After the storyboard activity was complete, the teacher and an independent rater evaluated the storyboards using the rubric in Appendix C (Winning 4 Kids, 2013).

After the storyboard activity, students in the BBS and AAV groups created digital stories based on their storyboards using the iMovie app. Students used images from the Internet, created their own images, and recorded their own video to include in the digital story. While the students were creating their digital stories, the teacher and peer group students provided feedback during the development process. At the conclusion of the digital story activity, the teacher evaluated the digital stories using a rubric (Appendix D) that has been adapted from the narrative essay rubric for students in grades 9-10 (Turnitin, 2012). While there are many rubrics for assessing digital stories on the Internet, most rubrics focus on imagery and voice rather than literacy concepts that are aligned with the CCSS (e.g., University of Houston [2011]). To create a digital story rubric that is better aligned with the CCSS literacy standards for grades 9-10, the rubric in Appendix E was modified to incorporate the visual and audio modes of digital stories.

After the pre-writing activities, the students wrote a final essay. For the students in the BBS and AAV groups, the digital stories (and preceding storyboards) served as a visual plan for the written composition. The students used Google Docs on the iPads to write the 1-2 page essays during class. The teacher and independent rater assessed the essays using the rubric in Appendix E. Additionally, the teacher gave feedback on the essays to the students using the comment facility in Google Docs. During Week 7, the students began reading Homer's "The Odyssey" and the teacher led more lessons and discussions on literacy components (see Appendix A). Week 8 through Week 10 were a repetition of Week

4 – 6 but with a different composition topic. See Appendix A for more details on the lesson plans.

To ensure fidelity of the study, the researcher visited the classroom once a week to observe the students' and teacher's behaviors. The researcher ensured the classroom tasks were aligned with the project plan in Appendix A and provided feedback to the teacher when necessary. The researcher used the rubric in Appendix F to monitor the effectiveness of the students' feedback in the BBS and AAV environments. Additionally, the researcher used the rubric in Appendix G to evaluate the teacher's feedback to the students in the online environments and with the Google Docs essays. The researcher provided guidance to the teacher if needed during the teacher/student peer feedback activities.

Analyses

In the attitudes survey, writing self-efficacy items have been taken from Shell, Murphy, and Bruning's (1989) writing self-efficacy instrument. Some items were modified to fit current times and the age group (e.g., "write an instruction manual for operating an office machine" was changed to "…operating a cell phone"). With the original scale, the authors reported a reliability of Cronbach's $\alpha = 0.90$ and, with high school students, Pajares and Johnson (1996) found a reliability of Cronbach's $\alpha = 0.91$. The technology self-efficacy items focused on iPad use and were taken from a subscale (Cronbach's $\alpha = 0.60$) of the Self-efficacy of Using iPads for Learning Survey (Girasoli, 2012). This scale was developed with high school students and has been modified to include writing and editing on an iPad for this study. The motivational items were selected from the Motivated Strategies for Learning Questionnaire's (MSLQ) intrinsic value scale (Cronbach's $\alpha = 0.87$) (Pintrich & De Groot, 1990). The MSLQ items were modified to focus on writing (e.g., "It is important for

me to learn about writing") and to be age appropriate for 9th grade students. While the MSLQ does include a self-efficacy subscale, this subscale was removed from the survey in Appendix B due to redundancy with the writing self-efficacy scale.

To explore RQ_1, two analyses were performed. Changes in writing performance at three intervals between the three (BBS, AAV, and outline-only) groups were compared with a MANCOVA. An RM-MANCOVA examined any differences with writing self-efficacy and writing motivation over time between the three groups. With both analyses, students' ACT EXPLORE English writing assessment scores served as a covariate. The ACT EXPLORE test is a nationally used assessment for gauging 8th and 9th grade students' science, math, reading, and writing skills. The English writing scale has a reliability of Cronbach's $\alpha = 0.78$ (ACT, 2014). The students in this study had taken the EXPLORE test when they were in 8th grade, as their writing assessment scores were used to aid in 9th grade English class placement. See Table 1.1 for the analysis design.

Table 1.1

Factor design for RQ_1: The essay rubric score (E), writing self-efficacy score (SE), and motivation with writing score (M) dependent variables apply to all conditions across three time periods. The independent variables are Time 1, Time 2, and Time 3.

		Time 1	**Time 2**	**Time 3**
Group	Comparison	E, SE, M	E, SE, M	E, SE, M
	BBS	E, SE, M	E, SE, M	E, SE, M
	AAV	E, SE, M	E, SE, M	E, SE, M

For RQ_2, a simple linear regression design was used in this analysis. The storyboard scores, digital story scores, collaboration group, and essay scores were assessed at the final moment. The storyboard score, digital story score, and collaboration group were the dependent variables. The essay score was the independent variable. To explore RQ_3, an RM-MANCOVA was used to analyze any differences in technology self-efficacy over time between the three groups. Then, a simple linear regression examined the predictive value of technology self-efficacy and group membership to writing self-efficacy at the final moment.

Limitations

While this study aimed to effectively assess the impact of specific instructional strategies on writing performance, there are some limitations. The following are concerns as threats to internal and external validity (Campbell & Stanley, 1963).

1. History: It is possible that some environmental events between sampling intervals may have affected the study's outcomes. For example:
    a. When the study's interaction period occurred over a school holiday, an interruption of the study may have impacted any skills or self-efficacy that students gained.
    b. If students used iPads in other classes, any unpleasant experiences with iPads in these classes may have impacted students' self-efficacy when using iPads.
2. Testing: As the students were assessed over three moments with the same survey, students may not have put as much effort into the second and third surveys due to

repetitiveness. It is also possible that students in the experimental groups might have been more sensitive to the treatments due to the questions asked in the survey.

3. Selection: All students participating in this study were a convenience sample. This limits making generalizations to the national population of 9th grade students from the study's sample. Purposeful grouping was used to assign students to balanced groups within each class for peer feedback and group work. This type of sampling can have many opportunities for error as each participant does not have an independent opportunity to be chosen (Kerlinger, 1986).
4. Diffusion of Treatments: The students in all three groups may have discussed the activities they were doing with each other. This may have led to changes in behavior if some students felt they should have been in "the other group."
5. Multiple Treatment Interference: As there were multiple treatments given to the same students in each group, it was difficult to control the effects of prior treatments.

As these variables (and other, unforeseen environmental impacts) are beyond the control of the researcher, the steps taken in the project plan (Appendix A) were intended to minimize any threats to internal and external validity.

This chapter presents a broad overview of this study. The following chapter is a review of the literature and details the background research for this study. Deeper insights into the purpose of this study as well as methods to improve writing skills in adolescents are given. The relationships between digital storytelling and students' environmental, behavioral, and personal factors are further discussed as a catalyst to address the improvement of writing in public schools.

Chapter II

REVIEW OF THE LITERATURE

The State of Writing in America's Public Schools

The National Center for Education Statistics (NCES) defines writing as "a complex, multifaceted, and purposeful act of communication that is accomplished in a variety of environments, under various constraints of time, and with a variety of language resources and technological tools" (NCES, 2012, p. 4). At the root of this definition is the action of *communication* -- writing is a method for transferring meaning from the mind of one individual to another. In elementary and high school, students write essays and reports to summarize their understanding of curricular material primarily in English, science, and social studies classes (Applebee & Langer, 2011). In subject areas where writing is a strong focus, such as English, students practice their writing skills with various methods such as developing expository, narrative, descriptive, and persuasive essays. It is through writing activities like these where teachers evaluate students' academic performance (Bangert-Drowns, Hurley, & Wilkinson, 2004). With the adoption of the Common Core State Standards (CCSS) in 87% of U.S. public schools (Gillespie, Graham, Kiuhara, & Hebert, in press), there is an emphasis on learning to write and writing to learn in the curriculum (Graham, Gillespie, & McKeown, 2013). Due to the pervasiveness of writing in the curriculum, writing is at the center stage of learning for children and adolescents in schools.

The NCES periodically assesses the condition and progress of education in U.S. elementary and secondary schools with the National Assessment of Educational Progress

(NAEP) project. In the 2011 NAEP writing assessment, approximately 50% of students in the 8th and 12th grades performed at the "basic" level and around 20% performed at the "below basic" level in U.S. public and private schools (NCES, 2012). With the basic level, students have partial mastery of the skills and knowledge needed for proficient work at each grade level (NCES, 2012). These results are a cause for concern – 70% of 8th and 12th grade students in the U.S. did not have the requisite skills to write proficiently in 2011.

While not the focus of this study, minorities are also at a disadvantage with English writing skills. As reported in the Nation's Report Card on Writing, 89% of blacks and 86% of Hispanics scored at basic or below basic writing levels (NCES, 2012). Family income can also be a factor with students' writing performance. In the Nation's Report Card, student eligibility for the National School Lunch Program (NSLP) was used as an indicator for students from lower-income families. Eighty eight percent of students who were eligible for NSLP scored at the basic or below basic levels compared to 62% of non-NSLP eligible students (NCES, 2012). Miller and McCardle (2011) suggest there is a great need to increase writing research due to the poor writing performance in U.S. schools and the importance of proficient writing skills in college and the workplace.

The Importance of Writing

In school, writing is a skill that requires the use of strategies such as planning, evaluating, and revising text to accomplish a variety of goals (Graham & Perin, 2007b). These goals can be writing an essay, a report, or an evidence-based opinion. Writing can also act as a tool for learning subject matter by extending and deepening students' knowledge (Keys, 2000; Shanahan, 2004; Sperling & Freedman, 2001). As students write a report or expository essay, they must research relevant information and link the

information to an overarching topic. As part of this process, students need to synthesize new information and existing understanding together into a written artifact.

Writing requires organizational strategies (Bangert-Drowns, Hurley, & Wilkinson, 2004). For example, in a science report, students need to ensure sentences are structured into paragraphs. Paragraphs need to be in a meaningful, sequenced order, so that one idea flows into the next. A common strategy used in narrative writing lessons with adolescents is the Freytag Pyramid or Freytag Triangle (Dobson, Michura, & Ruecker, 2010; Freytag, 1863; Herman, Jahn, & Ryan, 2012). By integrating writing exercises such as the Freytag Triangle, students can understand the importance of building frameworks to organize ideas (Bangert-Drowns, Hurley, & Wilkinson, 2004).

Writing is used for gathering, preserving, and transmitting information to a wide audience (Graham, Gillespie, & McKeown, 2013). This is especially important in an academic setting. The permanent nature of writing allows ideas to be available for review and evaluation in a learning environment (Graham, Gillespie, & McKeown, 2013). In a classroom lesson, teachers may have students write answers to exam questions or write a story to explain an idea. In this manner, teachers can evaluate the performance of students' academic skills immediately or at a later time.

Reading processes can be reciprocally linked to writing (Fitzgerald & Shanahan, 2000; Klein 1999, 2000). In a meta-analysis of writing and reading instruction, Graham and Hebert (2011) reported that comprehension of text improved when students in grades 2 – 12 wrote about material they were reading. This was also true for students writing about text in various subjects (social studies, science, language arts) or genres (narrative and expository) (Graham & Hebert, 2011). Pedagogies like "Writing to Learn" have

students write about subject matter by making connections between ideas, reflecting, analyzing, and critiquing ideas, and putting ideas into their own words for the purpose of learning (Gillespie, et al., in press). While reading is not a focus of this study, it is essential to mention its relationship to writing.

Consequences of Poor Writing Skills

Students with poor writing skills are likely to have poor grades in school, especially in classes where writing is primarily used for assessment (Graham, 2006a). Adolescents with poor literacy skills are more likely to drop out of school than peers with strong literacy skills (NCES, 2005). In addition, students that struggle with writing will find themselves at a disadvantage in school as well as post-graduation. Thirty percent of high school graduates intending on going to college were not academically prepared for first-year college courses in English composition (ACT, 2013). This lack of writing preparedness can cause learning challenges with these students as they progress through college (Graham & Perin, 2007b).

Students that don't have proficient writing skills and are entering the workplace can face challenges as well. Many careers require employees to write documentation, create presentations, and send e-mails (Graham & Perin, 2007b). Writing in the workplace can carry high stakes as client relations, legal decisions, and corporate images all depend on skillful writing (Beaufort, 2006). Additionally, writing proficiency directly affects hiring and promotion decisions (National Commission on Writing, 2004, 2005). The consequences of poor writing skills can be far-reaching when an adolescent is in school or leaves school. There is no one cause for the approximately 70% of adolescents that do not

have proficient writing skills. However, the lack of writing skills can start early in a student's academic career, before he or she reaches adolescence, and compound over time.

Sources of Poor Writing Skills

Students generally receive inadequate writing instruction before entering high school. Middle school students (grades 6 through 8) spend little time learning how to write or about writing at all (Graham, Capizzi, Harris, Hebert, & Morphy, in press). In Kiuhara, Graham, and Hawken's (2009) study, high and middle school teachers reported that students wrote infrequently and commonly wrote without composing (e.g., "filling the blanks" on a worksheet). It is difficult to surmise how students, when taught fragments of writing skills, will grow into proficient adolescent and adult writers.

In Applebee and Langer's (2011) study of 260 middle and high school classrooms across all subjects in five states, only 7.7% of students' classroom time was spent writing a paragraph or more. Applebee and Langer (2011) believe the lack of composition writing is due to the types of writing tasks in the classroom. The researchers found that teachers primarily write compositions and students complete worksheets and write chapter summaries. In the Gillespie et al. (in press) survey of 211 high school teachers, the researchers found that note taking (91%) and short answer responses (78%) were the most common writing tasks used in the classroom. Some of the least common tasks were writing a five-paragraph essay (54%), writing a narrative (42%), and blogging (11%).

Preparing teachers for writing instruction is essential, both from teacher education courses in college and in-service training (Gillespie, et al., in press). In a national survey of high school teachers' use of writing in U.S. schools, 70% of teachers indicated receiving little to no preparation from college courses (Gillespie, et al., in press). In a study by

Kiuhara et al. (2009), most high school teachers reported their college/university courses did not adequately prepare them for teaching writing. Teacher education programs at the college level need to ensure effective writing instruction is taught across all content areas (Gillespie, et al., in press).

Once teachers are placed in schools, in-service programs can help further develop teachers' writing instruction skills. In the Gillespie et al. (in press) national survey of high school teachers, 42% of teachers reported inadequate writing instruction preparation at the in-service level. High school teachers in studies by Applebee and Langer (2011) and Kiuhara, et al. (2009) indicated that writing instruction is not viewed as the responsibility of all teachers. When high schools are not preparing their teachers for writing instruction, or reinforcing writing as an important part of the curriculum, students can be at a disadvantage.

While some researchers report teacher difficulties with writing instruction, other studies have found effective methods for teaching writing in practice (e.g., Applebee & Langer, 2001; Graham & Perin, 2007a). This tends to be more of the exception than the norm (Applebee & Langer, 2011). Generally speaking, teachers' conceptions of the importance of writing have continually developed over the past 30 years. Teachers view writing as a valuable tool for assessing students' understanding and a means for contributing to the learning process (Applebee & Langer, 2011). In contrast, writing tasks in U.S. classrooms are dominated by lessons where students complete worksheets and chapter summaries confined by teacher-set boundaries, replicate formulated essays crafted to mimic the material on high-stake tests, and copy notes directly from a teacher's presentation (Applebee & Langer, 2011). To prepare students for writing assessments on

high-stake tests, teachers have students participate in isolated skill drills (Applebee & Langer, 2011), which do not significantly improve student writing (Freedman & Daiute, 2001; Nagin, 2006).

By creating student writing lessons on preparation for high-stake tests which focus on fill-in-the-blank assessment, teachers will have difficulties making room for lessons that emphasize composition writing. Schools are now facing new challenges with integrating recommendations from the CCSS in their curricula. The CCSS specifies new goals and expectations for writing in the high school curriculum to help students be career and college ready (Graham, Early, & Wilcox, in press). Schools will need to address how to prepare their teachers for effective writing instruction and develop lessons that integrate writing activities across all subject areas.

The Common Core State Standards (CCSS)

The CCSS were born out of the established No Child Left Behind (NCLB) legislation from 2001. Fifty states had 50 different curriculum standards of what students should learn along with 50 different assessment systems (Applebee, 2013). Instead of one, cohesive national vision of content learning, the NCLB left no single set of standards for instruction and assessment. The CCSS are the culmination of more than 25 years of developing school reform based on high-stakes assessments (Applebee, 2013). Additionally, the CCSS moves the focus from reading (as it was in NCLB) to writing (Applebee, 2013). In the CCSS, writing is meant to be a way in which knowledge is developed and shared.

The CCSS are a set of guidelines for the language arts and mathematics areas in kindergarten through grade 12 (National Governors Association Center for Best Practices,

2010). As a result of adopting the CCSS in schools, students in all but five states (Alaska, Minnesota, Nebraska, Texas, and Virginia) are expected to learn how to proficiently write narrative, persuasive, and informative artifacts (Graham, et al., in press). Students are also expected to plan, revise, and edit their artifacts to strengthen their writing skills. Additionally, students must perform evidence-based research, write engaging material, use digital media, and use technology to publish their writing artifacts (National Governors Association Center for Best Practices, 2010).

Due to the CCSS, students in approximately 87% of public schools in the U.S. must become proficient using writing as a tool for learning in science, social studies, language arts, and technical subjects in high school (Gillespie, et al., in press). This is an understandable challenge for our schools as 70% of 8th and 12th grade students are currently writing at below proficient levels (NCES, 2012). Additionally, students are also expected to be college and work ready by the time they graduate from high school (Gillespie, et al., in press). To address these goals, teachers need to align their classroom lessons with the CCSS for language arts and mathematics.

The CCSS and Technology

The CCSS emphasize the use of technology with writing and other content areas beginning in the elementary grades. For example, the CCSS recommend that ninth and tenth grade students use technology, including the Internet, to produce and edit individual or shared written products (CCSS.ELA-Literacy.W.9-10.6). Ninth and tenth grade students are also expected to take advantage of the affordances of technology (e.g., displaying dynamic information) when creating presentations (National Governors Association Center for Best Practices, 2010). In a study of writing instruction among 20 middle and high

schools with excellent reputations of teaching writing, Applebee and Langer (2011) found that teachers were slow to embrace technology in the classroom. When technology was used, it was primarily by the teacher and for instructional presentations. Additionally, there were isolated uses of other technologies such as wikis, blogs, and social networking. However, when teachers used these types of technologies, the pedagogy was more teacher-centric rather than having the students engaged with the technologies.

In Applebee and Langer's (2011) study, the researchers found that 80% of students in academically high-performing schools used word processing for final drafts of written documents. In comparison, the NCES (2012) found that 44% of 8th grade students nationally reported using computers for editing documents as part of classroom lessons. Students who used word processing scored slightly higher on the NAEP assessment that students who don't regularly use word processing (an increase of 6%) (NCES, 2012). For the 12th grade, 56% of students reported using computers for editing. These students scored 12% higher on the writing assessment than students who never or hardly ever use word processing tools (NCES, 2012). Graham, Harris, and MacArthur (2004) and Graham (2008) suggested that word processing could aid in improving writing performance among adolescents. While it appears that word processing can help writing performance, it is not clear as to what tasks students are doing with word processing to help with writing. The gap between teachers' current use of technology in the classroom and the CCSS expectations may cause challenges for schools' implementation of the standards.

Concerns with the CCSS

In a survey of 211 high school teachers, Gillespie, et al. (in press) reported that the majority of the teachers were not meeting the expectations embodied in the CCSS. For

example, many teachers were not teaching writing methods such as persuasion and explanation for analyzing, interpreting, and learning complex information. Additionally, teachers infrequently used digital writing tools for composing, as required by the CCSS. Gillespie, et al. (in press) believe the gap between what the teachers were doing in the classroom and the CCSS goals is primarily due to the lack of preparation from college and school districts. Porter, McMaken, Hwang, and Yang (2011) report that the gap between the states' previous curriculum standards and the CCSS is large enough to be a challenge for schools to change their curricula.

There are also concerns with lack of focus and validity with the CCSS. Porter, Smithson, Blank, and Zeidner (2007) and Beach (2010) report the CCSS lacks curriculum focus with superficial coverage of many topics and little depth. Williamson, Fitzgerald, and Stenner (2013) have questioned the rationalization for how levels of reading complexity were determined for each grade. The CCSS writing goals for each grade level can appear to be trivial as each level progresses (Applebee, 2013). For example, with standard 3a (narratives) and the 8th grade, the standard reads, "Engage and orient the reader by *establishing a context and point of view* and introducing a narrator and/or characters; *organize an event sequence that unfolds naturally and logically*." For the 9th and 10th grade, "Engage and orient the reader by *setting out a problem, situation, or observation, establishing one or multiple point(s) of view*, and introducing a narrator and/or characters; *create a smooth progression of experiences or events*" (National Governors Association Center for Best Practices, 2010). The changed text (in italics) for the same goal from grade to grade appears to be a marginal modification. Throughout the CCSS, there are similar

examples of triviality between grades for the same goals. This lack of clear differences between grades could lead to a distortion of curriculum and instruction (Applebee, 2013).

With regard to the CCSS goals, instead of supporting the development of a flexible group of strategies for writing instruction, the CCSS goals constrain educators to specific methods. Applebee (2013) suggested that the CCSS writing standards should consider an individual's motivation, knowledge, and experiences for developing a richer curriculum. Similarly, Pajares and Johnson (1996) and Pajares, Johnson, and Usher (2007) recommend that writing instruction should consider the student's self-efficacy when writing. While the CCSS may aid in providing indicators of good writing performance, the challenge lies in how to bring students to those levels.

Factors of Effective Writing Instruction

In a meta-analysis of writing instruction for adolescent students (Graham & Perin, 2007a) and a subsequent report of writing strategies for adolescents (Graham & Perin, 2007b), the authors developed 10 key elements of effective adolescent writing instruction. One of the authors' goals was to build on earlier meta-analyses of writing instruction (e.g., Bangert-Drowns, Hurley, & Wilkinson, 2004; Russell & Cook, 2008; Graham, 2006b; Graham & Harris, 2003). In their study, the researchers selected interventions that involved students between Grades 4 and 12. These students attended public and private schools and were not in special education programs. (Special education programs can be defined as classroom curriculum tailored to children with autism spectrum disorder [ASD] or that are severely emotionally disturbed.) Writing quality was the only measured outcome in Graham and Perin's (2007a) analysis. Writing quality can be defined as a reader's judgment of the overall quality of a composition that includes factor such as

vocabulary, organization, and sentence structure rated on a numerical scale (Diederich, 1966).

In Graham and Perin's (2007a) meta-analysis, they included studies where writing quality was scored reliability (i.e., inter-rater reliability was greater than 0.60 and/or trainers were taught how to score compositions). Additionally, the researchers included investigations that used an experimental or quasi-experimental design. Every study in the meta-analysis compared at least two groups of students who received differing instructional conditions. Ultimately, Graham and Perin included 123 studies in their meta-analysis.

The authors wanted to determine the most effective forms of writing instruction that produced high quality student writing from children and adolescents. In the meta-analysis, the researchers defined different forms of treatments, such as: strategy instruction, summarization, and scaffolding (e.g., prewriting, peer assistance, setting goals) (Graham & Perin, 2007a). The authors then ranked the different kinds of writing treatments based on the effect sizes (Cohen's *d*) calculated from standardized mean differences in each study. From the meta-analysis, the recommended instructional practices for writing with adolescents are listed in Table 2.1.

Table 2.1

Instructional practices that can improve the quality of adolescent students' writing (Graham & Perin, 2007a)

Rank	**Instructional Practice**	**Mean Weighted Effect Size (Cohen's *d*)**	**Grades**
1	Teach strategies for planning, editing, and revising compositions.	0.82	4-10
2	Teach strategies and procedures for summarizing reading material.	0.82	5-12
3	Develop instructional arrangements where students collaborate on planning and editing their compositions.	0.75	4-12
4	Set clear and specific goals for students.	0.70	4-8
5	Allow students to use word processing as a primary tool for writing.	0.55	4-12
6	Teach students how to write complex sentences by combining simpler sentences.	0.50	4-11
7	Provide professional development of an instructional method to teachers.	0.46	4-12
8	Involve students in writing activities that sharpen their skills of inquiry.	0.32	7-12
9	Have students perform prewriting activities to organize ideas before writing, including visual representations.	0.32	4-9
10	Provide good models of writing (relevant to the lesson) to the students.	0.25	4-12

When interpreting the effect sizes, Cohen's *d* values of 0.20 suggest a small impact, an effect size of 0.50 suggests a moderate impact, and an effect size of 0.80 or larger can be considered as a very effective impact (Lipsey & Wilson, 2001). Graham and Perin (2007a) caution that the recommendations in Table 2.1 aren't guaranteed to work in all situations. Even though the recommendations were gathered through statistical analysis of 123 research studies of writing, there are variables not accounted for as conditions can vary

between studies. Additionally, Graham and Perin have not tested or compared the recommendations listed in Table 2.1.

These instructional methods can support student writing activities that Nagin (2006) label as *writing processes.* Some examples of writing processes are prewriting, drafting, revising, and editing. The most effective writing instruction methods were teaching strategies to adolescents for planning, editing, revising, and summarizing material (d = 0.82). Examples of strategies can be general in nature such as brainstorming (e.g., Troia & Graham, 2002) or be specific in focus, such as writing a persuasive essay (Yeh, 1998) or a narrative story (Fitzgerald & Markham, 1987; Freytag, 1863).

Assessing Writing Performance

Historically, a frequent method of assessing a student's writing skills has been essay testing (Hamp-Lyons, 2002). With this method, a student writes an essay on a topic and the assessment is holistic, where the rater makes an overall judgment of the student's writing performance. Essays tend to be rated on mechanical aspects such as spelling and grammar (Rezai & Lovorn, 2010). This kind of assessment can be very subjective when there is a single rater, resulting in a lack of reliability and validity (Breland, 1983). A student's capabilities with vocabulary, grammar, punctuation, and spelling can all have a significant impact on his or her essay test results, whether positive or negative (Read, Francis, & Robson, 2005; Ross-Fisher, 2005). While this type of assessment is meant to facilitate grading time and effort, process factors (e.g., reasoning and critical thinking) and task factors (e.g., development of plot and characters) may be overlooked.

In the 21st century classroom, rubrics are a popular method for assessing writing and other academic skill domains (Rezaei & Lovorn, 2010). The use of rubrics with writing

assessment arose out of a general dissatisfaction from teachers and administrators with traditional grading methods (Rezaei & Lovorn, 2010). Rubrics are a qualitative and quantitative scoring tool for assessing a student's work. A rubric includes criteria for rating different dimensions of a student's performance as well as standards to judge each criterion. For example, using a rubric, a teacher could rate a student's narrative assignment with criteria such as exposition, organization, style, and conclusion factors. Each criterion could be rated on a numeric scale from 5 (exceptional) to 1 (inadequate) using standards for each level of performance.

Rubrics can be holistic or analytic (Jonsson & Svingby, 2007). With holistic scoring, the rater makes a general, overall judgment regarding the quality of student work. Holistic rubrics are primarily concerned with the total product rather than the individual steps a student may take to arrive at the product (Finson, 1998). Large-scale assessments tend to use holistic scoring, as it requires less effort to administer (Jonsson & Svingby, 2007). With analytic rubrics, a rater scores a student's product on multiple, separate scales. Therefore, a student's work will have multiple scores rather than just one as in holistic scoring. In the classroom, analytic scoring can be a useful tool for assessment as specific tasks are addressed. With this method, domain-related areas of improvement or competence can be identified for both the teacher and student.

Implementing rubrics does not necessarily equate to reliability and validity with scoring. Sometimes, a rater may grade a student's work based on the rater's overall impression of the work rather than following the rubric's criteria (Kohn, 2006; Lumley, 2002; Rezaei & Lovorn, 2010). However, in a meta-analysis of rubric studies, Jonsson and Svingby (2007) found that rubrics seemed to aid raters in maintaining inter-rater

reliability. Agreement between raters can be improved with training (Stuhlmann, Daniel, Dellinger, Denny, & Powers, 1999; Weigle, 1999). Topic-specific rubrics are more likely to produce dependable scores rather than generic rubrics (DeRemer, 1998; Marzano, 2002).

Some studies have found high inter-rater reliability for their rubrics (Penny, Johnson, & Gordon, 2000) while some studies have found low to moderate reliability (Rezaei & Lovorn, 2010). Jonsson and Svingby (2007) found that many studies validated their rubrics through content validity and checking for correlation with other measures. The researchers caution not to assume that every rubric is valid. A teacher or researcher should check to ensure the rubric is applicable to the learning tasks and the content domain. Johnsson and Svingby (2007) also found that rubrics have the potential to promote learning and/or improve instruction. If a student has access to a scoring rubric before working on a task, he or she can understand the expectations of the teacher in a clear and explicit manner. To increase the reliability and validity of rubrics, Rezaei and Lovrorn (2010) recommend that the rubrics should be developed locally for a specific group of students and for a specific purpose.

For this study, the teacher will be scoring students' storyboards using a rubric based on one published by Winning 4 Kids (2013) (see Appendix C). The rubric for assessing students' writing is modeled after a rubric for narrative writing with grade 9 and 10 students that integrates criteria from the CCSS (Turnitin, 2012) (see Appendix E). The rubric for digital stories is based on the Turnitin (2012) rubric, to ensure 1:1 criteria mapping between the digital stories and writing artifacts. In all cases, the rubrics are task-oriented to each activity, are appropriate for the age group of the study, and have criteria that measure relevant, specific processes.

Writing Interventions

Planning and Strategies

Planning the structure of a written composition is a critical element of the writing process (De La Paz & Graham, 2002; Graham, 2006a; Graham & Harris, 2009). Skilled writers structure their ideas, establish goals for writing, and consider the audience's needs (Bereiter & Scardamalia, 1987; Flower & Hayes, 1980). This is very similar to how a project manager plans a project. The project manager must first perform a needs analysis, define the goals or outcomes of the project based on the needs, and then organize the tasks required to complete the project and meet the goals. Children and adolescents in school, however, often do little planning with writing, particularly planning in advance (McCutchen, 1995; Scardamalia & Bereiter, 1986).

Usually, students are given a writing assignment without enough time to plan their composition (Burtis, Bereiter, Scardamalia, & Tetroe, 1983). When students do plan their writing artifacts, however, the plans are often simplified (Bereiter & Scardamalia, 1987; Berninger, Whitaker, Feng, Swanson, & Abbott, 1996; Boscolo, 1990) such as creating a list of events. For example, in Beringer et al.'s (1996) study of seventh- through ninth-grade classrooms, students typically created lists of words or ideas for planning their written compositions.

The creation of a flexible plan allows writers to store their ideas externally to ensure a low risk for losing them (De La Paz & Graham, 2002). Creating a plan before writing a composition can reduce processing overhead so students can focus on translating ideas to words (Kellogg, 1986, 1987). Students tend to approach writing by retrieving topic-appropriate information from memory and writing it down, with each preceding sentence

or phrase stimulating the next idea (McCutchen, 1988; Scardamalia & Bereiter, 1986). Using this method, students are not considering the needs of the reader or the organization of the text because they are creating their writing artifact on the fly (De La Paz & Graham, 2002).

The Self-regulated Strategy Development (SRSD) model teaches students specific strategies for planning, drafting, and revising text. Students are also taught how to regulate their writing procedures through goal setting and self-monitoring (De La Paz & Graham, 2002). Additionally, students are explicitly taught the skills and knowledge needed to write effectively. The SRSD model has six stages of instruction: *develop background knowledge, describe it, model it, memorize it, support it,* and *independent performance* (Harris & Graham, 1996). In a study of normally developing writers, De La Paz (1999) found that 22 seventh- and eighth-grade students' writing performance improved following SRSD instruction. In a similar study of 58 seventh- and eighth-graders, De La Paz and Graham (2002) found that SRSD instruction improved the students' writing skills.

Prior to students participating in the study, teachers were given an instructor's manual with scripted lesson plans. Teachers also attended two full-day workshops regarding how to deliver the SRSD method in the classroom. For each five-paragraph writing assignment, students were taught the requirements of an essay form: five paragraphs with a thesis statement and a conclusion (De La Paz & Graham, 2002). Students were also taught the definition of an expository essay. Additionally, students were taught how to self-regulate their writing processes. The self-regulation exercises were meant to help students combat poor motivation, devaluation of learning, impulsivity, low task engagement, and low productivity (De La Paz & Graham, 2002; De La Paz, Owen,

Harris, & Graham, 2000; Harris & Graham, 1996). Over a period of six weeks, students were given five prompts for their essays. De La Paz and Graham (2002) found their writing program had a positive effect on the seventh- and eighth-grade students.

Scaffolding

Scaffolding is a method for providing assistance to students as needed and fading the assistance as the learner's capability increases (Wood, Bruner, & Ross, 1976). This pedagogy has been widely used in writing instruction (Benko, 2012) – sometimes in ways that are too vague to have any impact on writing (Benko, 2012; Stone, 1998). Even so, scaffolding does have potential with improving adolescents' writing skills in the classroom by providing specific, targeted support on an individual basis (Benko, 2012).

In Wood, Bruner, and Ross's (1976) seminal study of scaffolding, the authors examined the ways a tutor assisted children (ages 3 to 5) with building blocks. The researchers determined that the scaffolding process includes four methods of supporting the children's learning. At the onset of the learning session, the tutor helped each child become *interested* in the task. Next, the tutor helped the child *understand the important components* of the task and then, with one-on-one interactions, provided *focused support* as the child progressed. Lastly, as the child became more competent with the task, the tutor *faded* his or her assistance gradually so the child could ultimately perform the task independently (Wood, Bruner, & Ross, 1976).

Langer and Applebee (1986) further defined Wood, Bruner, and Ross's (1976) definition of scaffolding as it applies to reading and writing. Langer and Applebee (1986) emphasized the importance of collaboration and goal setting between the teacher and students. Instead of directing students' goals for a lesson, teachers should work

collaboratively with students to develop shared goals with writing (Langer & Applebee, 1986).

Goal setting is an important part of the writing process, as it is highly correlated with effective writing (r = 0.70) (Graham & Perin, 2007a). Additionally, teachers should provide assessment and feedback to the student as the student progresses. In this manner, teachers are not only assessing mastery achievement at the end of a lesson. Instead, teachers are providing formative assessments to the students over the course of the lesson. This method is aligned with Wood, Bruner, and Ross's (1976) recommendation of providing focused, individual support as a student progresses.

An essential, final aspect of scaffolding is fading support as a student becomes more competent at the learning task. Teachers often forget to release control of guiding the student and allowing, at the proper time, to let the student progress at the task on his or her own (Benko, 2012). At this point in the scaffolding process, students are said to *internalize* the responsibility of the learning task (Langer & Applebee, 1986). Once internalized, the student should be able to complete the task on his or her own in the future.

Feedback and Modeling

While collaboration and fading are important to scaffolding writing lessons, feedback and modeling throughout the scaffolding process are also crucial (Benko, 2012). Providing feedback is a method of *direction maintenance*, where the teacher helps guide the student while learning the task (Wood, Bruner, & Ross, 1976). Not all feedback can provide useful direction maintenance, as some teachers may focus on surface details (such as punctuation and grammar). Instead, teachers should provide timely feedback that focuses

student attention on how to revise their writing and give students effective examples (Patthey-Chavez, Matsumura, Valdes, & Garnier, 2000).

Research on feedback and writing tends to agree on five features of feedback: summarization, specificity, explanations, scope, and affective language (Nelson & Schunn, 2009). *Summaries* condense and reorganize the feedback information into concise statements. These statements can focus on corrective action and/or emphasis of aspects of the writing artifact or the topic being discussed (Nelson & Schunn, 2009). *Specificity* is concerned with the details present within the feedback. This feature of feedback can vary along a continuum from correct/incorrect to explicit identification of problems and providing solutions (Nelson & Schunn, 2009). This kind of feedback may be more beneficial for direction maintenance, where problems in the writing artifact require correction. Kinds of feedback that are more explicit can have a greater impact on writing performance (Tseng & Tsai, 2006).

Feedback that includes *explanations* may become necessary as the complexity of the writing task increases. Explanations are statements that provide clarification of the feedback's purpose (Nelson & Schunn, 2009) and allow the reviewer to provide justifications. The *scope* of feedback can range from local to global (Nelson & Schunn, 2009). Feedback that is global tends to focus on a more holistic examination of the writing product. Localized feedback can examine writing at the sentence or word level. Lastly, feedback can contain *affective language* that identifies the emotion of the reviewer, such as kinds of criticism or praise. As will be discussed later, praise and criticism can also have an effect on students' self-efficacy.

Walter Lamb, a long-time English teacher and author, stresses the use of revisioning during the writing process (W. Lamb, personal communication, September, 2013). Revising allows students to add, cut, clarify, and reposition text to better structure their writing products. Using a computer to revise writing facilitates the process, as the word processing software allows ease of moving and editing text, as well as correcting spelling. Through this process, this kind of feedback about structure rather than surface details could effectively facilitate transfer of writing skills to future learning situations (Benko, 2012). When supporting a student through the writing process to raise his or her level of writing competence, a transformation of the writer occurs, from student to author, increasing the confidence in one's self of writing (W. Lamb, personal communication, September, 2013).

The CCSS recommends that students use technology to edit shared writing documents (CCSS.ELA-Literacy.W.9-10.6). Digital spaces could provide scaffolding opportunities through the use of wikis, discussion forums, and social websites. Doerr-Stevens, Beach, and Boeser (2011) examined a method for using online role-playing sites to support students while they developed ideas for an augmentative paper. The authors found that this environment can support multiple perspectives and help students consider alternative arguments. An online environment also allows for support outside of the school walls, as a teacher can continue to provide feedback after school hours and asynchronously.

Modeling is often recommended in the writing classroom (Benko, 2012) and, when effective, can impact writing performance (d = 0.25) (Graham & Perin, 2007a). Gallaher (2011) argued that teachers are the most competent writer in their own classrooms and

can be an excellent source of modeling good writing. By sharing their own writing examples with students, students may have more positive attitudes to learning writing (Benko, 2012; Kittle, 2008; Street, 2005). Models should be used to help focus the attention of students on important components. In this manner, students are guided in their support to reduce the risk of students losing focus on what needs to be learned. Exemplars of writing can be used to model process, structure, and different types of writing (e.g., argumentative and narrative) (Benko, 2012).

Peer Feedback

Including students in the feedback process can have benefits and shortcomings when learning to write. Peer feedback can be defined as formative peer assessment where students provide qualitative comments to other students on their work (Gielen, Peeters, Dochy, Onghena, & Struyven, 2010). Comments can include feedback on strengths, weaknesses, and/or tips for improvements (Falchikov, 1996). The peer assessor can benefit from the processes by learning different methods to accomplish the lesson's goals (Topping, 1998). Not all feedback improves performance (see Bangert-Drowns, Kulik, Kulik, & Morgan, 1991; Kluger & DeNisi, 1996). However, feedback can have a positive influence on learning when students are taught how to properly assist their peers.

Gibbs and Simpson (2004) suggest several conditions where feedback can have a positive influence on learning. Feedback should be: sufficient in frequency and detail, focused on the learning task, timely, appropriate, and acted upon by the reviewed student. With undergraduate students between the ages of 18 and 21, Nelson and Schunn (2009) found that the most effective kind of peer feedback with writing performance were those that contained solutions. More specifically, a writer was able to better understand

feedback when offered a solution provided with location of the issue and a summary (Nelson & Schunn, 2009). The authors cautioned that providing this kind of feedback could be very difficult to produce if the reviewing peer is a novice writer.

With 6th grade students, Olson (1990) found that peer feedback appeared to help students write better rough drafts. However, peer feedback did not consistently aid in improving writing content between rough and final drafts. In high school (and especially in ninth grade), students are most likely at the novice writing level as lessons focus on grammar and structure. Due to these conditions, peer feedback in writing activities may have difficulties at the high school level.

Relatedly, Graham and Perin (2007a) found in their meta-analysis of writing studies that any kind of feedback did not impact the quality of student's writing in grades 5 – 12. The researchers believe that due to the large variance in the kinds of feedback studies (e.g., teacher feedback, student feedback, etc.) and lack of control conditions led to inconclusive evidence. However, Graham and Perin's (2007a) meta-analysis found that *peer assistance* with planning, drafting, or revising compositions in grades 4 through 12 had a large positive effect size ($d = 0.75$). This finding may suggest that collaborative environments that aid with the writing process may have a greater impact than giving performance feedback alone.

Technology-based Interventions

In the NCES's definition of writing, the authors include the use of "technological tools" as part of the writing process. As mentioned earlier, technology is not widely used across the writing curriculum in U.S. middle and high schools. In Applebee and Langer's (2011) study of middle and high school classrooms, approximately 42% of high school

students composed their writing frequently on a computer. In English classes for both middle and high schools, approximately 10% of teachers have their students integrate video, audio, or graphics into their writing. The researchers also found that only 24% of teachers had students perform collaborative work with their writing, such as group work or peer review. Additionally, high school teachers infrequently employ technology in writing activities and have students participate in report and argument writing tasks (Gillespie, et al., in press).

In national surveys of writing practices in elementary and middle schools, Graham, Harris, MacArthur, and Fink-Chorzempa (2003) and Kiuhara, Graham, and Hawken (2009) found that word processing was an infrequently used tool in the classroom. Using a word processor can effectively help developing writers (Graham, Harris, & MacArthur, 2004). In a meta-analysis comparing the writing performance of students who handwrote or used word processing, word processing had an average effect size of $d = 0.55$ (Graham & Perin, 2007a) for students in Grades 4-12. For struggling writers, word processing had an average effect size of $d = 0.70$. While the meta-analysis did not explain why word processing was more effective than handwriting, Graham (2008) suggests that word processing supports writing tasks that can lend to better writing performance. These tasks can be revising and editing, spell checking, and peer revising (Graham, 2008; MacArthur, Schwartz, & Graham, 1991). While many studies of technology and writing focus on the use of word processing, there are other uses of media with computers to support the writing process.

Digital Storytelling

Prewriting is a planning activity that helps the writer generate and organize ideas to be developed into a writing artifact (Nagin, 2006). Methods can be discussion, brainstorming, drawing, and role-playing. One method of prewriting by using technology is the creation of digital stories. Digital stories are multimedia artifacts that combine images (such as photographs or drawings) with narration created by the student (Sylvester & Greenidge, 2009). Students create digital stories by using a computer with video editing software. This type of assignment can be used to support reading and writing activities with adolescents in the classroom (DeVoss, et al., 2010; Robin, 2008; Sadik, 2008).

Digital storytelling activities have been used to support struggling writers in elementary and high school by engaging them and providing an alternate mode for expressing themselves (Sylvester & Greenidge, 2009). With adolescents, digital story activities can assist with engagement and motivation to participate (Grisham & Wolsley, 2006; Ohler, 2013). Not all students learn best through text-only methods of instruction. Visual learners and multi-modal learners can benefit from lessons that include digital storytelling (Mayall & Robinson, 2009). Digital story activities have also been used to prepare students for college and developing English skills for English language learners at the college level (McLellan, 2006).

Kinds of Digital Stories

The digital storytelling movement has its origins in the early 1990s with the Center for Digital Storytelling (CDS) in Berkeley, California (McLellan, 2006; Robin, 2008). The CDS promoted digital storytelling through workshops and consulting and continues to do so at present. A typical CDS workshop has participants use digital media tools (like Apple

iMovie and Adobe Premiere) to create short three-to-five minutes long digital movies. These movies contain a recorded narrative, a soundtrack, still images, and sometimes moving images. The goal of these movies is to encourage participants to create digital stories of a personal nature (McLellan, 2006).

There are a few variations of digital stories that students can create. Students can create personal narratives (Bull & Kajder, 2004; Davis, 2002) as well as adaptations of literature read in class to demonstrate comprehension and interpretation of the text (Ware, 2006; Young & Kajder, 2009). Digital storytelling lessons can include book trailers, digital essays, and documentaries (Kajder, 2008). Teachers can use digital storytelling activities to have students create persuasive essays or news reports based on information read in class (Tobin, 2012).

Creating Digital Stories

There are varying methods for creating a digital story (e.g., DeVoss et al., 2010; Robin 2008; Sylvester & Greenidge, 2009), however, there are a few common steps shared by the recommendations in the literature. Students should first plan their digital story by creating a storyboard. A storyboard is a planning document used by filmmakers to illustrate the shots that are needed to complete the scenes of a movie (Tobin, 2012). For each scene in a storyboard, a sketch or a picture is created and accompanied with a short, descriptive text. The storyboard serves as a guiding framework for the students to keep them on track when creating their digital story (Tobin, 2012). Preparation for the digital story is a key factor for ensuring an effective product (Robin & McNeil, 2012).

Freytag's Triangle (Dobson, Michura, & Ruecker, 2010; Freytag, 1863; Herman, Jahn, & Ryan, 2012; Wheeler, 2014) can be used as a story map for students when developing a digital story and creating a storyboard (see Figure 2.1).

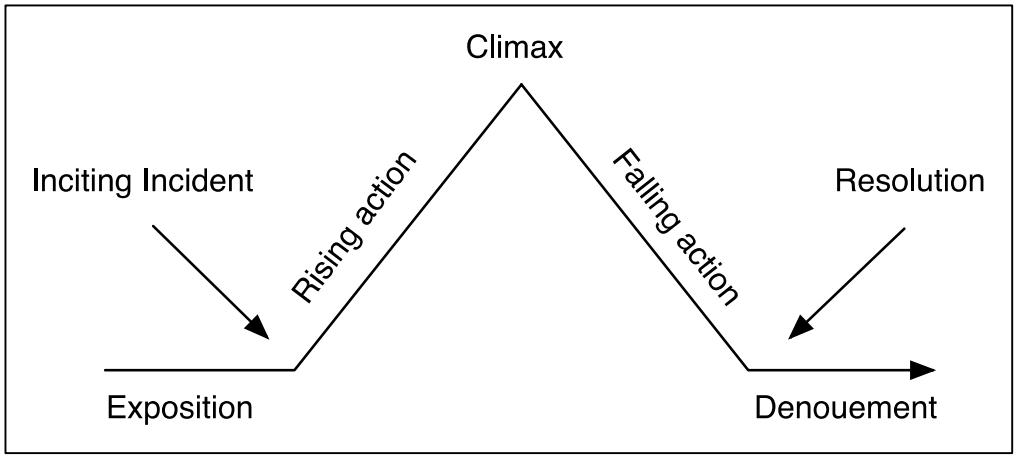


Figure 2.1. Freytag's Triangle -- a map of events in a story (adapted from Wheeler [2014]).

Freytag's triangle was developed in consideration of the ancient Greek and Shakespearean tragedy (Dobson, Michura, & Ruecker, 2010) and can be used as a framework with narrative writing exercises in the classroom. This story map can also be used by a student when designing a digital story (Ohler, 2013). In the *exposition*, the author introduces the setting and the characters in a story. An *inciting incident* or conflict occurs between a protagonist (main character or hero) and an antagonist (the main rival character) after the exposition. A series of events (the *rising action*) then builds up to the climax. The *climax* is the turning point of events for the characters in the story. During the *falling action*, the conflict between the protagonist and antagonist unravels, usually with the protagonist either winning or losing against the antagonist (the *resolution*). Lastly, in the *denouement*, any other conflicts are resolved and the story comes to a conclusion (Wheeler, 2014).

To develop the digital stories after completing the storyboards, students need access to a computer with video editing software, such as Apple iMovie or Windows Movie Maker. Microsoft PowerPoint can also be used as slides can contain audio narration. The accompanying text in a storyboard serves as the narration in the digital story. To enhance the storytelling experience, students can act out the scenes in a digital story rather than providing only a narration of static images (Ohler, 2013). Ohler (2013) believes that giving students an opportunity to act dramatically in positive ways can be beneficial as loud behaviors are usually frowned upon in the classroom.

Once the digital stories are completed, students can present their products to the classroom or share the story only with the teacher. To evaluate the storyboard and digital story, teachers can use rubrics (Tobin, 2012; University of Houston, 2011; Winning 4 Kids, 2013). For this study, to better align the digital story assessment with the narrative story structure and the CCSS, a rubric was developed based the Turnitin (2012) narrative essay rubric and the University of Houston (2011) digital story rubric (see Appendix E). Digital storytelling activities can be individual or group-based (Tobin, 2012). As a group activity, effective feedback and peer review are necessary for enhancing the quality of students' digital stories.

Principles of Multimedia Learning

Mayer (2009) defines multimedia instruction as "the presentation of material using both words and pictures, with the intention of promoting learning" (p. 5). Based on theories of dual-channel coding (Baddeley, 1999; Paivio, 1986), limited capacity (Baddeley, 1999; Chandler & Sweller, 1991), and active processing (Mayer, 2009; Wittrock, 1989), Mayer (2009) proposed principles to guide the creation of multimedia instruction. These

principles help ensure there is less risk for conflict when auditory and visual information is processed in the human mind.

When creating a digital story, students should consider Mayer's (2009) principals to aid in effectively conveying their stories in their videos. For example, multimedia that displays meaningful images with a narration can facilitate knowledge transfer (Mayer, 2009). Having students provide a narration with their digital stories should be a requirement rather than an option. Also, a narration of pictures, graphs, charts, or diagrams are more likely to be effective for presenting information compared to a video of a person talking. This principle is essential as digital stories should not solely be a video of a student speaking a story.

Mayer (2009) also recommends that minimal text should be used in the multimedia product. Words that are embedded in the video might cause conflict between the narration information (audio channel) and reading the words (visual channel). However, words that are used as cues (or any symbol, such as an arrow) to highlight essential material can facilitate learning. When students create digital stories, students should be mindful to use words on-screen only for cueing a viewer's attention to information.

If a video clip that delivers content is in a "conversation style" or framed as a story, a person can learn the content more easily (Mayer, 2009). This principle is at the heart of digital storytelling as learners are telling a story. By ensuring students follow some or all of Mayer's (2009) principals, it is possible their digital stories will be more meaningful to their peers and teacher.

Links Between Research on Digital Storytelling and the CCSS

The technological tools and skills required by students to create digital stories can be labeled as *21st Century Literacy, 21st Century Skills, Digital Age Literacies,* and *New Literacies* (Brown, Bryan, & Brown, 2005; Jakes, 2006; Leu, Kinzer, Coiro, & Cammack, 2004; Partnership for 21st Century Skills, 2004). New Literacies can be defined as skills and strategies that individuals use to adapt to rapidly changing communication and information technologies (Leu, et al., 2004). These processes focus on how a person expresses him or herself linguistically through the use of technology such as blogs, video conferencing, BBSes, or video games. Additionally, these skills can include the ability to find, evaluate, and synthesize information as well as collaborate and have a global perspective (Robin, 2008). While this study recognizes that digital storytelling can fall under the definition of "New Literacies," the emphasis of this study is evaluating the effectiveness of digital stories as a prewriting activity to plan writing in the classroom. In this study, digital stories are viewed as a *scaffolding tool* to support literacy in writing rather than a literacy skill itself.

Most of the scholarly articles about digital storytelling that were reviewed tended to be qualitative in nature (e.g., Kajder, 2004; McLellan, 2006; Robin, 2008; Robin & McNeil, 2012; Sylvester & Greenidge, 2009; Tobin, 2012). These articles, in particular, discussed the benefits of how digital storytelling can support literacy in the classroom. However, there appears to be a lack of statistical research of how digital storytelling can impact academics and disagreement for how to investigate its impact (Robin & McNeil, 2012). Many researchers agree that teachers can instruct more effectively in the classroom when lessons are based on theoretically grounded frameworks (e.g., Pierson, 2001; Mishra &

Koehler, 2007; Robin & McNeil, 2012). It is possible that writing lessons that incorporate digital stories might be effective if properly grounded in learning theory.

Digital story lessons can satisfy CCSS goals for literacy with the 9th and 10th grades. For example, CCSS.ELA-Literacy.SL.9-10.5 requires students to, "make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest" (National Governors Association Center for Best Practices, 2010, Presentation of Knowledge and Ideas section). The CCSS also requires students in the 9th and 10th grades to introduce a narrator and/or characters and create a progression of events or experiences. These goals and more can be accomplished through digital storytelling (for more goals related to digital storytelling, see Appendix A).

Motivation to Write

Researchers argue that more attention is needed on the social-cognitive factors that can influence writing (e.g., Bergin & LaFave, 1998; Bruning & Horn, 2000; Duijnhouwer, Prins, & Stokking, 2011; Kellogg & Whiteford, 2009). Research on writing development has included motivational factors (Bruning & Horn, 2000; Hidi & Boscolo, 2006; Pajares & Valiante, 2001), socio-cultural factors (Prior, 2006), and self-efficacy (Pajares & Valiante, 2006; Zimmerman, et al., 1992). Motivation can have far-reaching implications as students learn and continue to write. Motivation to write is a metacognitive capability where an individual holds positive views, is engaged, and has low anxiety and stress with writing (Bruning & Horn, 2000). Additionally, motivated writers can deploy various writing process strategies as their audiences change (Bruning & Horn, 2000). Motivation can be related to writing competence (Wigfield, Eccles, & Pintrich, 1996) through one's confidence

in writing, writing support, and writing environment (Bruning & Horn, 2000). Writing motivation can have reciprocal links to self-efficacy through an individual's confidence and environment with writing as well (Pajares, 2003; Pajares & Valiante, 2006).

Motivation, in general, can be defined as the "process whereby goal-directed activity is instigated and sustained" (Schunk, Pintrich, & Meece, 2008, p. 4). In these terms, motivation is a *process* rather than a product. There are two types of motivation: intrinsic and extrinsic. When individuals engage in an activity out of pure enjoyment, the motivation is intrinsic. People who engage in activities due to a desirable outcome such as a reward or avoidance of punishment can be considered as extrinsic motivation (Schunk, et al., 2008). Motivation to write is about the cognitive processes that can affect how a student performs when writing. Motivation can also be related to other processes that affect writing performance, such as competence and self-efficacy. Motivation involves *goals* that provide a direction for action as well as *activity*, physical or mental (Schunk, et al., 2008). For a writing lesson, a teacher might provide attainable goals for each task that a student must expend effort in order to complete the overall lesson. For a narrative essay, initial goals might be for the student to learn the strategies for writing a narrative, determine the characters and setting, and create a plan for the essay. Motivation influences learning and performance. Reciprocally, what a student learns and how he or she performs can affect motivation (Pintrich, 2003; Schunk, 1995).

Developing the motivation to write in students requires an understanding of the sources that can contribute to and sustain motivation. Bruning and Horn (2000) recommend four factors of motivation-enhancing conditions for writing. These are: *nurturing positive beliefs about writing, fostering student engagement, providing a*

supportive context, and *creating a positive emotional environment.* Bruning and Horn (2000) report that a student's motivation to write is closely related to his or her confidence in writing. This relationship has its roots in research on writing self-efficacy, where one's belief in writing competence can be strongly related to his or her writing performance (Pajares, 2003; Pajares, et al., 2007; Pajares & Valiante, 2006; Zimmerman et al., 1992). Students that have high levels of writing self-efficacy tend to have lower anxiety, higher tolerance for frustration, and greater persistence with writing tasks (Bruning & Horn, 2000). In this sense, self-efficacy and motivation have a reciprocal relationship, where one can influence the other (Bruning & Horn, 2000; Pajares & Valiante, 2001; Pajares & Valiante, 2006).

A teacher's enthusiasm and actions towards writing in the classroom can effect how students perceive writing (Bruning & Horn, 2000). Teachers need to choose writing assignments that are appropriately challenging and engaging to foster motivation (Guthrie & McCann, 1997; Lepper & Hodell, 1989). An important component of supporting student engagement with writing is teacher guidance and feedback to students. Teachers should model and/or provide capable models of what needs to be written. By doing so, students can be motivated to participate in the assignments (Schunk, 1991). Effective models can be positively correlated with writing performance (r = 0.32) (Graham & Perin, 2007a). While demonstrating what students *should* write by focusing on the structure of writing rather than surface details, teachers can provide the right kinds of models (Benko, 2012).

Goals and Motivation

Teachers should set authentic goals, as students tend to view writing activities as assignments rather than a meaningful experience linked to their lives (Bruning & Horn, 2000). By making writing assignments authentic and part of the "real world" (i.e., related to students' lives in and outside of school), students' interest in the writing activities could increase (Bruning & Horn, 2000). Authentic and real world writing activities can be tasks that involve the use of literacy for enjoyment and communication. This is in contrast to tasks where writing skills are used for some unspecified future use (Hiebert, 1994). Authentic tasks such as allowing students to express their voice, write about what interests them, and write for a real audience can contribute to motivation (Bruning & Horn, 2000).

Goal setting is a key motivational process with regard to social cognitive theory (Bandura, 1997; Locke & Latham, 1990, 2002; Schunk, 1989). Goals that are proximal, moderately difficult, and specific can provide the greatest motivational benefits (Schunk, Pintrich, & Meece, 2008). In a writing assignment, if a teacher provides only general and broad goals that do not sufficiently challenge individuals, the students may not put in the optimal effort to complete the learning tasks. A common pedagogy for teachers in the classrooms is *differentiation,* where teachers tailor the lesson tasks and goals to the abilities of the individual or group. When differentiating, a teacher may teach the same content different ways to ensure a student is successful at completing the lesson and reaching classroom learning goals. In this manner, teachers need to develop goals that students can accomplish while trying to meet curricular goals such as understanding the components of an expository essay.

Goals that students set for themselves can also boost motivation (Locke & Latham, 1990). In academic lessons, teachers should try to incorporate ways students can set their own goals to help increase students' motivation. While it is possible that students can set very easy goals for themselves, it's important that teachers understand that goals should have an adequate level of challenge and may need to guide the students in goal creation.

Achievement goals and academic performance have been an area of focus with research on motivation (e.g., Kaplan & Maehr, 2007; Lee, Sheldon, & Turban, 2003; Pekrun, Elliot, & Maier, 2009; Urdan, 2004) and can be extended to writing tasks (Pajares & Valiente, 2006). *Achievement goals* are competency aims that individuals strive for in academic settings (Pekrun, Elliot, & Maier, 2009). Within the domain of achievement goals are performance-based goals, performance-approach goals, and performance-avoid goals. Performance-based goals represent the concern students have with mastering material. Performance-approach goals are aims where students want to perform well to demonstrate their ability. Performance-avoid goals represent concerns students have with wanting to do well to avoid demonstrating a lack of ability (Pajares & Valiente, 2006).

Performance-based goals in writing are positively related to writing self-efficacy, or the confidence a student has in their writing performance. Performance-avoid goals are negatively related while performance-approach goals appear to be unrelated to writing self-efficacy with girls but positively related to self-efficacy with boys (Pajares & Valiente, 2006). These findings shed some light on the relationship between motivation, self-efficacy, and goals as they relate to writing. Overall, it is probably best for teachers to develop performance-based goals that are manageable by the students in the classroom to support writing motivation and self-efficacy.

Feedback and Motivation

Motivation, self-efficacy, and writing competence can increase when students are provided with *process goals* (Pajares & Valiente, 2006). These are strategies that students can use during the writing process. When teachers link process goals with feedback, writing competence increases more than using feedback alone and strategy use increases (Schunk & Swartz, 1993). Teachers that provide effective guidance and feedback can have a significant impact on the development of confidence, strategies, and writing performance (Pajares & Johnson, 1996; Skinner, Wellborn, & Connell, 1990). When teachers set multiple goals in a writing assignment, they are helping students break the assignment into manageable parts. By doing so, the demands of complex tasks can be reduced and students can monitor their progress and experience proximal gains (Bruning & Horn, 2000). Coupling feedback with the cycles of goal setting is necessary to promote self-monitoring and self-regulation (Cervone, 1993). Student interest is also a factor teachers need to consider when creating goals and developing their writing lesson plans.

Motivation and Interest

Interest can affect motivation through persistence (Pajares & Valiente, 2006) and goals that students set for themselves (Csikszentmihalyi & Rathunde, 1993). *Interest* refers to the willful engagement and enjoyment of an activity (Schraw & Lehman, 2001). There are two kinds of interest that are generally researched: *personal* and *situational interest* (Urdan & Turner, 2005). Personal interest is a self-disposition that is more stable towards a specific domain or activity. It can be a general liking of a content area, personal enjoyment, and sometimes understanding the importance or significance of the learning activity (Schiefele, Krapp, & Winteler, 1992). Situational interest can change with time and

tends to be temporary and situation-specific (Schunk, Pintrich, & Meece, 2008). It is possible for the environment to generate situational interest. For example, the use of technology in a writing lesson could act as a source for situational interest. Situational interest can also be further maintained as long as the student's attention is held in the task (Hidi, 2000).

Interest affects motivation by affecting the levels of attention students commit as well as how long students persist at tasks (Hidi, 1990). Pintrich and DeGroot (1990) found that middle-school children who believed they were engaged in interesting tasks were more strategic with their writing. In a research study with 9th grade students, Benton, Corkill, Sharp, Downey, and Khramtsova (1995) found that students with high levels of interest and high levels of topic knowledge wrote narrative essays that were logical and well organized. Conversely, the researchers found that students who had relatively less interest and less topic knowledge generated ideas that were less relevant. As teachers create writing assignments, they should consider students' interests and try to integrate them into the lessons.

Motivation and Emotions

Emotions are intense, short-lived phenomena that usually have a specific cause (Forgas, 2000). Types of emotions can be fear, pity, anger, shame, pride, and guilt (Schunk, Pintrich, & Meece, 2008). Emotions can affect motivation by influencing the kinds of cognitive strategies that students might use (Forgas, 2000). Negative emotions such as fear, boredom, and sadness might decrease intrinsic motivation for a task while fear might increase extrinsic motivation (Schunk, Pintrich, & Meece, 2008). In this light, it is

important for teachers to create a positive emotional environment for students in any academic domain.

In a positive writing environment, teachers should pay careful attention to what students are doing and students should treat each others' ideas with respect (Oldfather, 1993). Additionally, giving students a significant measure of control during the writing assignment can contribute to positive attitudes (Bruning & Horn, 2000). Allowing students to have a voice and write about something that interests them or that is meaningful to them affords a certain degree of control. By recognizing student's interests, creating adequate goals, and providing effective feedback, a writing lesson can support students' motivation through Bruning and Horn's (2000) recommendations. As mentioned earlier, there is a reciprocal link between motivation and self-efficacy. While motivation tends to be domain-specific, self-efficacy is task-specific (Pajares & Valiente, 2006).

Self-efficacy

Social Cognitive Theory

Bandura (1986) describes social cognitive theory (SCT) as favoring a model of *reciprocal determinism*, where an individual's learning can be shaped by personal, behavior, and environmental factors (see Figure 2.2). These three factors influence each other bi-directionally with changing magnitudes, ultimately shaping how the learner builds understanding. Time is also a factor. Influences and effects don't necessarily happen simultaneously; it may take time between the occurrence of a causal factor and an effect (Bandura, 1997).

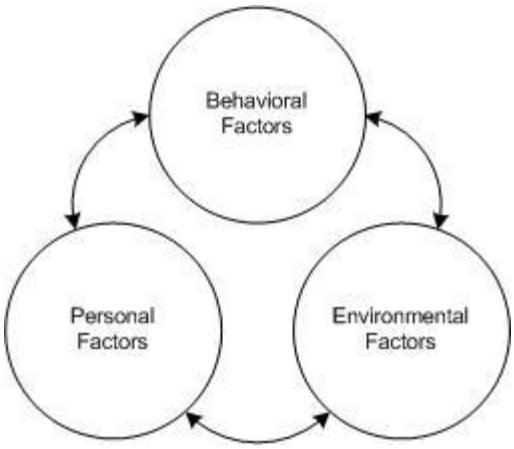


Figure 2.2. Bandura's (1986) model of triadic reciprocal determinism.

People are both producers of and products of social systems. Human activity creates social structures to guide and organize human affairs (Bandura, 1997). People who are efficacious know how to take advantage of opportunities within a social structure. Conversely, people who are inefficacious are likely to be discouraged when presented with obstacles in social systems (Bandura, 1997). It is within these systems that people, as agents, are influenced by and influence their environment, personal, and behavioral factors.

SCT rejects a dualistic view of the self (as agents and objects), as is popular in the field of personality research (Bandura, 1997). Instead of a human being both an agent and an object, SCT views a person as being an individual that can shift perspectives between being an agent or an object. Instead of transforming from one role to another, as in the dualist view, a person can exhibit self-reflection and self-influence simultaneously when transacting with their environment (Bandura, 1997). SCT also differs from the behaviorist view of psychology. Instead of humans being reactive and living in isolation, as is postulated in behaviorism, humans contribute to what they do and what they become. Social structures (i.e., the environment), personal structures, and behavioral structures all interact within a unified causal structure.

In SCT, self-reflection – as a personal factor – is a metacognitive ability which allows a person to gain understanding, evaluate and alter their own thinking (Bandura, 1989). Of the types of self-reflection that a learner can engage to affect their perception, understanding, and environment, *self-efficacy* has been studied as a pervasive and central construct (Bandura, 1989). Self-efficacy should not be confused with *self-esteem*. Self-efficacy is concerned with judgments of personal capability. Self-esteem is more aligned with judgments of self-worth.

Sources of Self-efficacy

Self-efficacy is a component of social cognitive theory, fitting in as a personal factor in the reciprocal determinism model. Bandura (1997) defines self-efficacy as the confidence one has in the level of performance he or she can attain at a task. Self-efficacy beliefs can determine how people think, feel, behave, and motivate themselves. While there are many factors that influence human behavior, Bandura (1997) identifies self-efficacy as a key mechanism that influences both task performance and cognitive development. Individuals with a strong sense of self-efficacy will view difficult tasks as challenges that can be dealt with rather than insurmountable obstacles to be avoided.

There are four main factors that influence efficacy: mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states (Bandura, 1997). *Mastery experiences*, the strongest source of self-efficacy, occurs when a person believes they have the understanding of what it takes to succeed at a task. *Vicarious experiences*, such as a teacher or peer modeling a task during instruction, can have an effect on a learner's self-efficacy. While a teacher may more likely model in the classroom, a peer model is more effective in increasing a learner's self-efficacy (Schunk, Pintrich, & Meece,

2008). Personal capabilities are easier for people to judge for activities that demonstrate one's adequacy of performance in a task (Bandura, 1997).

Verbal or *social persuasion*, the third source of self-efficacy, deals with being *told* you can or cannot accomplish a certain task. It can be easier for one to sustain his or her sense of self-efficacy when significant others express faith in his or her capabilities. Conversely, a person may lower his or her sense of self-efficacy when significant others express their doubts in one's task abilities (Bandura, 1997). A mediating factor is the credibility of the person giving the feedback (Zimmerman, 2000). The last source of self-efficacy deals with one's *physiological and affective states*. If a person is at a reduced stress level in their environment, or in a good mood, they will have increased self-efficacy with the task at hand. People can learn faster if the mood they are in is congruent with the things they are learning (Bandura, 1997). Similar to state-dependent learning theory, people can recall memories better when they are in the same mood as when they learned the items (Bandura, 1997).

Self-efficacy has also been shown to sustain motivation and improve skill development, and that it can predict academic performance (Oliver & Shapiro, 1993; Multon, Brown, & Lent, 1991; Schunk, 1991). Research on self-efficacy has found that it is an important factor of motivation across many domains (Gully, Incalcaterra, Joshi, & Beaubien, 2002; Multon et al., 1991; Stajkovic & Luthans, 1998). If an individual has a high level of academic self-efficacy in a task (a personal factor), their task motivation (a behavioral factor) should change with the same magnitude and direction.

Academic Self-efficacy

Academic self-efficacy is concerned with a student's perceptions of their academic capabilities. Commonly, academic self-efficacy is viewed at a domain level (e.g., English, math, science) rather than with domain tasks (e.g., grammar, spelling, penmanship). In school, there are many influences that can potentially affect adolescents' academic self-efficacy. Competition between peers, teachers' grading practices, school transitions, and teachers' attention can all affect self-efficacy (Schunk & Meece, 2006). For example, feedback from a teacher about a student's progress can raise or lower his or her self-efficacy. With children and adolescents are in the early stages of a learning task, they will place more credibility on attributional feedback that links causes and effects. For example, a positive self-effacious form of attributional feedback could be, "You did very well with your writing homework because you practiced frequently." Later, as students' skills improve, ability feedback (e.g., "You are very good with writing narratives.") can have a stronger influence on self-efficacy (Schunk, 1995).

The influence of peers can be very powerful among adolescents because peers significantly contribute to their views of themselves and their socialization. As adolescents develop, their primary sources of socialization shift from parents and caregivers to peers (Schunk & Meece, 2006). In this light, a peer model can have a greater impact than an adult on a student's self-efficacy (Schunk, et al., 2008). This can have a positive impact when students work in small groups (e.g., two to three students). For example, a teacher should place a student that has a high level of academic self-efficacy and is viewed as a capable model with students that need to perform better. In this arrangement, the lower-performing students might have a better chance reaching their academic goals through

peer influences on self-efficacy. This type of grouping can be labeled as *purposeful grouping* (Kerlinger, 1986).

With regard to models in academic settings, as students begin to learn a task, *coping models* may raise self-efficacy better than *mastery models* (Schunk & Pajares, 2002). An individual that initially has difficulty with a task but works diligently by applying strategies and gradually improves employs a coping model (Schunk & Pajares, 2002). Mastery models have high levels of performance on a task at the beginning of a learning activity. Students that have trouble learning especially tend to perceive coping models as similar in competence. In turn, the observing students may have a higher sense of academic self-efficacy when viewing this kind of model (Schunk, 1995).

Goal setting can also be a powerful influence on academic self-efficacy (Zimmerman, Bandura, & Martinez-Pons, 1992). Learning goals that are short-term, specific, and viewed by students as challenging yet attainable can increase students' self-efficacy. Conversely, goals that are long-term, general, and not viewed as being attainable can lower students' self-efficacy (Schunk & Pajares, 2002). While students are working on academic tasks, they compare their progress to their goals. It is students' perception of progress that can either raise or lower their sense of self-efficacy in the task. Feedback can also be a strong source of self-efficacy information. *Performance feedback* informs students of goal progress, sustains motivation, and can strengthen self-efficacy (Schunk & Meece, 2006). *Attributional feedback* links students' outcomes with one or more perceived causes (attributions) (Schunk & Meece, 2006).

When measuring academic self-efficacy, questionnaire items should be comprised of different task level processes, as self-efficacy is multi-dimensional and task-specific

(Bandura, 1997). Self-efficacy beliefs are domain specific and refer to perceptions of capabilities of a task (Pajares, 1996). Survey items should measure tasks of different levels of difficulty within a domain and have individuals rate their levels of confidence in those tasks (Bandura, 2006; Schunk & Meece, 2006). As mentioned earlier, self-efficacy beliefs are sensitive to environmental conditions (e.g., within-classroom, within-school), and personal factors (e.g., motivational level, anxiety level) (Schunk & Meece, 2006). When measuring a student's academic self-efficacy, one should understand that these factors could impact a student's beliefs and should be considered.

Self-efficacy can have predictive value with regard to students' performance (Bandura, 1997; Pajares, 1996; Schunk, 1995). Lent, Brown, and Gore (1997) found that self-efficacy "...contributed most strongly to the prediction of grades in [undergraduate] math-related courses" (p. 313). Researchers have examined the sources of self-efficacy that Bandura (1997) theorized and their relationship to academic performance. In a review of research literature on academic self-efficacy, Pajares (1996) found that cognitive skills, modeling effects, attributional feedback, and goal setting all influenced self-efficacy beliefs. In turn, these self-efficacy beliefs can influence academic performance. In a study of entering middle school students, Usher and Pajares (2006) found that students' mastery experiences ($\beta = 0.34$, $p < 0.0001$), social persuasions ($\beta = 0.16$, $p < 0.05$), and physiological state ($\beta = -0.62$, $p < 0.05$) predicted academic self-efficacy. These results provide support that for adolescents, it is possible that some of Bandura's (1997) sources of self-efficacy do indeed affect a student's self-efficacy.

In a meta-analysis of academic self-efficacy studies, Multon et al. (1991) found that, "...self efficacy beliefs account for approximately 14% of the variance in students' academic

performance and approximately 12% of the variance in their academic persistence" (p. 34). With these findings, self-efficacy can be viewed as having a medium effect on these constructs (Cohen, 1988). From these data, it is obvious that measuring self-efficacy can be an effective indicator of how a student is performing within a domain and an environment and how he or she will perform. In this study, a focus is students' performance when they are writing. To measure the impact of self-efficacy on writing, one must consider a student's writing self-effficacy.

Writing Self-efficacy

Traditionally, research on student writing has focused on writing skills or instructional practices (e.g., Faigley, 1990; Graham & Harris, 2009; Graham & Perin, 2007a; Hairston, 1990). Over the past thirty years, however, a number of researchers have focused on the mediating processes between students' cognitive skills and the manner in which they read and write. To examine these processes, researchers have explored the relationship between writing self-efficacy and writing performance (e.g., Bruning & Horn, 2000; Klassen, 2001; Pajares, 2003; Pajares & Valiante, 2006; Zimmerman & Bandura, 1994; Zimmerman & Risemberg, 1997). Writing self-efficacy beliefs are also related to writing anxiety, expected outcomes, depth of processing, and grade goals (Pajares, 2003).

Self-efficacy is a *mediating* mechanism of personal agency. Personal agency can be defined as the choices students make, the effort they give, their persistence and perseverance they expend when confronted with obstacles, as well as their emotional reactions and thoughts they experience (Pajares, 2003). Self-efficacy can mediate an individual's personal agency between prior influences and subsequent behavior (Bandura, 1986). For example, when a student has a strong sense of confidence in writing, he or she

may have greater interest in and attention to writing. The student may also have greater perseverance and resiliency to obstacles when working on a writing activity.

Pajares and Johnson (1996) found that writing self-efficacy can correlate with (r = 0.60) and predict writing performance with students entering high school. When covariates such as previous writing experience and writing aptitude are included in statistical models, writing self-efficacy can still predict writing outcomes (Pajares, 2003). However, when analyzing writing self-efficacy and controlling for factors such as writing aptitude, teachers' ratings of student writing, or previous writing performance, researchers should be cautious when interpreting the results. Bandura (1997) observed that self-regulatory and motivational factors could influence both prior and later performance attainments. When controlling for previous achievement, latent factors such as self-efficacy may have impacted the previous achievement scores. While these confounding influences may be difficult to separate, they should be considered when results from analyses are interpreted (Pajares, 2003).

Sources of Writing Self-efficacy

Congruent with research on self-efficacy, Pajares et al. (2007) found that mastery experiences are the strongest predictor of writing self-efficacy with high school students ($\beta = 0.36$, $p < 0.0001$). Across all age levels (i.e., elementary, middle, and high school) mastery experiences significantly predicted writing self-efficacy ($\beta = 0.49$, $p < 0.0001$). To support mastery in writing, Pajares et al. (2007) suggest that students should participate in authentic writing tasks. Additionally, the researchers recommend that students should experience genuine successes with their work in order to raise their mastery levels. Pajares et al. (2007) caution that teachers should help students interpret their writing

experiences in more adaptive ways. In this manner, teachers can help ensure students do not set insurmountable expectations that could contribute to difficultly with understanding mastery goals. Teachers can accomplish this by maintaining a high level of interaction with their students and help teach students how to be effective self-evaluators (Pajares, et al., 2007).

Interestingly, in the Pajares et al. (2007) study, vicarious experiences and anxiety/stress did not significantly contribute to writing self-efficacy for high school students. It is possible that the high school environment of the students did not impact these two sources of self-efficacy. Additionally, it is possible that the items for measuring these constructs were not accurate indicators on the questionnaire.

Social persuasion (e.g., feedback), was found to be a significant predictor of writing self-efficacy with high school students ($\beta = 0.18$, $p < 0.001$) (Pajares, et al., 2007). This finding provides support for a link between feedback and writing performance that is mediated by writing self-efficacy. While there are many different forms of feedback, it is important to note that teachers' feedback to students' writing needs to be precise and appropriate. Teacher feedback that focuses on structure rather than surface details (Benko, 2012) and is timely (Patthey-Chavez, et al., 2000) can improve academic performance. In order for feedback to be helpful, teachers need to understand what kinds of feedback are beneficial and how it can affect students' confidence in writing.

Assessing Writing Self-efficacy

When constructing a writing self-efficacy assessment, researchers must ensure the items are task-specific and focus on performance capabilities (Bandura, 1997; Pajares & Valiante, 2006; Zimmerman, 2000). The researchers must also consider the demands of

each task. For example, when assessing the self-efficacy of writing an essay, items should measure students' confidence in writing sentences and organizing paragraphs to clearly express ideas. Writing paragraphs may require more cognitive demands than writing sentences. By including items that measure simple and complex tasks, a researcher can develop a well-rounded assessment (Pajares & Valiante, 2006).

Items that measure self-efficacy should be worded in terms of *can* rather than *will*. "Can" is a judgment of capability while "will" is a statement of intention (Pajares & Valiante, 2006). For example, an item could be, "How confident are you with writing a letter to a friend or family member?" The student should then rate their confidence along a 0 to 10 or 0 to 100 Likert-scale continuum (Bandura, 2006; Pajares & Valiante, 2006). While a 5-interval scale could be used, Bandura (2006) cautions that efficacy scales that use a few steps should be avoided because they are less reliable and less sensitive.

When comparing writing self-efficacy scores to performance scores, the performance data should be closely related to belief being assessed. Students do not judge themselves equally efficacious across different types of writing domains (e.g., social studies, science, English) (Pajares & Valiante, 2006). For example, when examining writing self-efficacy of a task in English class, performance scores from assignments in the English class instead of a social studies class should be considered. Ultimately, researchers should make informed and empirically sound decisions when creating self-efficacy scales. The domain, task, and environment should all be linked together holistically to ensure validity and reliability in the measures.

In this study, writing self-efficacy was assessed with Shell, et al.'s (1989) instrument. Pajares and Johnson (1996) found a reliability of Cronbach's $\alpha = 0.91$ with this survey. For

this study, some of the items were modified for appropriateness with high school students (e.g, "write an instruction manual for operating an office machine" was changed to "…operating a cell phone"). While self-efficacy is task specific, there is some generalization that can occur across domains when the tasks are related. In Shell, et al.'s (1989) writing self-efficacy subscale, confidence with writing skills across genres (e.g., narrative, expository) is assessed. In this manner, students' writing self-efficacy was measured in a broad sense to gauge the impact of creating digital stories.

Motivational Relationships

Writing self-efficacy is usually associated with motivational variables such as self-efficacy for self-regulation and goals (Pajares, 2003). Students' self-efficacy for self-regulation, or one's confidence to use self-regulated learning strategies, has been positively correlated with writing competence (Harris & Graham, 1992; Schunk & Zimmerman, 1994; Zimmerman & Risemberg, 1997). Students develop beliefs about their capabilities because of how they perceive to be successful in their self-regulatory strategies (Bandura & Schunk, 1981). Confidence in self-regulatory strategies has also been linked to higher intrinsic motivation (Pintrich & De Groot, 1990).

Students' writing competence and confidence can increase when they are given process goals (Pajares, 2003). Process goals are specific strategies that students can use to improve their writing (Pajares, 2003). For example, asking students to develop the characters, setting, plot, and conflict are all process goals when developing a narrative. When feedback is linked with process goals, writing self-efficacy improves more than using process goals alone when writing a narrative ($F[3, 35] = 3.35$) (Schunk & Swartz, 1993).

Gender, Age, and Race Differences

While not a focus of this study, gender differences in writing self-efficacy have been examined in the literature. Typically, girls report stronger writing self-efficacy than boys through middle school (Pajares & Valiante, 1997, 2001) as well as in high school (Pajares, et al., 2007). Pajares and Johnson (1996) found that boys in the 9th grade had stronger writing self-efficacy beliefs than did girls. Bruning and Horn (2000) observed that girls experience a drop in perceptions of academic competence and motivation as they reach high school. However, girls tend to outperform boys in writing assignments (Pajares, 2003). Additionally, girls usually report perceiving themselves as better writers than boys in their class at both the elementary and middle school levels (Pajares, Miller, & Johnson, 1999; Pajares & Valiante, 1999).

With respect to a student's age, students' writing task self-efficacy can increase as they progress from grade 4 to grade 10 (Shell, Colvin, & Bruning, 1995). Examples of writing tasks in the Shell et al. (1995) study are: writing a letter to a friend, writing a report, and writing a book summary. With regard to writing component self-efficacy (e.g., self-efficacy of writing grammar such as use of prefixes, punctuation, and pluralization), the researchers found no difference between students in grades 4, 7, and 10. This finding demonstrates that writing self-efficacy may be more task-specific rather than component-specific, as theorized by Bandura (1986). The increase in writing self-efficacy from the lower to higher grades may be due to an increase in learned writing skills (Pajares, 2003). In a related study, Pajares and Valiante (1999) found that middle school students in their first year reported stronger writing self-efficacy than students in grades 7 and 8. This is

counter to the findings in Shell et al.'s (1995). It is possible that, depending on the learning environment, students' writing self-efficacy can increase or decrease across grades.

With regard to race and ethnicity, Pajares and Johnson (1996) found that Hispanic high school students had lower levels of writing self-efficacy than non-Hispanic white students. While the cause of low writing self-efficacy with Hispanics has not been investigated, it is a phenomenon that teachers need to be mindful of in the classroom. This study did not research differences with gender and race and writing self-efficacy. However, adolescents, as an age group, were the primary focus.

Writing Self-efficacy and Digital Storytelling

Research on the effects of digital storytelling on writing self-efficacy is lacking. Recently, Xu, Park, and Baek (2011) examined the effects of digital storytelling with Korean students, ages 20 to 22, on writing self-efficacy. To measure writing self-efficacy, the researchers used Pajares and Valiante's (2001) writing self-efficacy questionnaire. The researchers placed the students in two groups: a comparison digital storytelling group and a virtual digital storytelling group. In the comparison group, students created a digital story by collecting images and stitching them together with narration using Windows Movie Maker. In the virtual group, students navigated a virtual world, Second Life, taking pictures of scenes and using those scenes in their digital story. The scenes were presented in sequential order within the virtual world instead of using Windows Movie Maker as the comparison group did. With both groups, they wrote their essays, based on their digital stories, while they created their digital stories. Xu et al. (2011) found that students who created the digital stories in Second Life had higher levels of self-efficacy ($t[31]= 2.31$, $p <$

0.05). While this study compared two different modes of digital storytelling, it's worth mentioning the kind of impact digital storytelling can have on writing self-efficacy.

When examining any relationships between digital storytelling and writing, measuring students' self-efficacy can be an effective method for determining how students' beliefs are mediating their writing. As self-efficacy is closely related to motivational constructs, it is essential to measure students' motivation when writing as well. As students learn to write, teachers should provide them with challenging tasks and meaningful activities. Creating content-rich digital stories to help students plan their writing assignments may help boost students' writing self-efficacy and motivation to write. Teachers should also support students' efforts with encouragement and cultivate their confidence (Pajares, 2003). By assessing students' writing self-efficacy and motivational beliefs, teachers and researchers can have better insight into students' confidence levels.

Technology Self-efficacy

Technology self-efficacy, or the confidence an individual has when using technology, is a construct that has been researched in technology-enhanced learning environments. This type of self-efficacy has been examined in various settings with students, such as hypermedia (Liu, 2004), online learning (Joo, Bong, & Choi, 2000; Wang & Newlin, 2002; Wang, Shannon, & Ross, 2013), and Internet use (Brown, et al., 2003). Computer self-efficacy is a form of technology self-efficacy that is concerned with an individual's confidence in his or her ability to use a computer (Compeau & Higgins, 1995; Murphy, Coover, & Owen, 1989).

In Moos and Azevedo's (2009) review of computer self-efficacy, the researchers suggested a few themes between learners and computer-based learning environments

(CBLEs). Learners' behavioral factors (e.g., prior exposure to CBLEs [Houle, 1996] and frequency of use of CBLEs [Salanova, Grau, & Cifre, 2000]) can be positively correlated to computer self-efficacy. Psychological factors (e.g., positive attitude [Torkzadeh & Van Dyke, 2002] and curiosity [Wang & Newlin, 2002]) can be positively related to computer self-efficacy as well. Moos and Azevedo (2009) report that computer self-efficacy is related to learning outcomes with CBLEs and can change over time as students acquire skills and knowledge (Mitchell, Hopper, & Daniel, 1994; Thompson, Meriac, & Cope, 2002). Moos and Azevedo (2009) caution that research on computer self-efficacy is limited and these findings should only tentatively considered. The authors recommend that more research is needed between learning processes, CBLEs, and computer self-efficacy.

In this study, iPads were used as students created digital stories and wrote their essays. It is possible that a student's technology self-efficacy can be linked to his or her academic self-efficacy (Girasoli, 2006). Related to Bandura's (1986) model of SCT, this could occur if the environmental factors positively affect the personal factors (e.g., self-efficacy), which, in turn, positively affects the behavioral factors (e.g., academic performance). As mentioned earlier, it is possible for computer self-efficacy to be related to learning outcomes (Moos & Azevedo, 2009). This linkage between technology and academic self-efficacy could also occur when the skills from these two domains are co-developed (Bong, 1997; Pajares, 1996).

To measure technology self-efficacy with iPads, a subscale from the Self-efficacy of Using iPads for Learning Survey (Girasoli, 2012) will be used in this study. This subscale (Cronbach's $\alpha = 0.60$) measures an individual's self-efficacy when using an iPad. Tasks that vary in difficulty (such as taking a picture, typing an essay, and editing a composition) are

assessed to make up the subscale. As this subscale has a low level of reliability (Cronbach's alpha should by 0.8 or larger for a scale to be considered reliable [Cortina, 1993]), caution should be given when interpreting this score. To effectively use a technology-enhanced learning environment, it must support learning processes that are essential for increasing self-efficacy.

Supporting Modeling, Feedback, and Peer Review Tasks

In the traditional classroom, teachers tend to instruct students using didactic methods rather than student-centered learning pedagogies (Hannafin & Land, 2000; Papert, 1987). Applebee and Langer (1986) and Graham and Perin (2007a) emphasize that in order for writing instruction to improve, the learning has to be more student-centered (such as scaffolded instruction). Implementing student-centered problem solving can be challenging due to the pressures of school-wide CCSS alignment, competing curriculum, as well as limited time and resources (Cuban, Kirkpatrick, & Peck, 2001; Davis & Krajcik, 2005; Ertmer, 2005; Kim & Hannafin, 2011).

Scaffolding has been difficult to implement in traditional classrooms due to these factors (Kim & Hannafin, 2011). However, the use of technology can create affordances that can facilitate student-centered learning. Technology can be used to make scaffolding tasks (e.g., writing, reading, correcting, assistance, collaboration, and feedback) asynchronous. By doing so, time can be better managed by allowing delayed responses for reactive tasks that tend to be immediate due to the learning environment. Since learning tasks can be spaced apart, the teacher has opportunities to complete other instructional tasks and devote more time to reactive tasks (i.e., feedback).

Scaffolding within a technology-enhanced classroom includes cognitive and social supports designed to augment student inquiry processes when problem solving (Kim & Hannafin, 2011). Using digital stories as a pre-writing activity, there is a need for asynchronous feedback and scaffolded supports. Teacher feedback is essential for digital story lessons (DeVoss et al., 2010). With video, teachers need to view, pause, reflect, and provide feedback. These processes could take more time for a teacher compared to writing feedback on a paper essay.

With writing tasks, effective instruction should include teacher scaffolding of the learning processes (Langer & Applebee, 1986). Writing instruction should also include timely and focused feedback (Graham & Perin, 2007a; Patthey-Chavez, et al., 2000) and effective models (Benko, 2012; Graham & Perin, 2007a). Peer assistance (rather than peer feedback) can also have a positive impact on students' writing activities (Graham & Perin, 2007a). By having an asynchronous learning environment, teachers and students could potentially have more time to complete these tasks.

These kinds of instructional activities can also be linked to sources of self-efficacy. Modeling is a form of vicarious experiences and feedback is a form of social persuasion (Bandura, 1997). Scaffolding and peer assistance are both methods that can increase students' mastery experiences, the strongest source of self-efficacy (Bandura, 1997). Creating digital stories as a pre-writing activity requires students to learn within a technology-enhanced environment. Reciprocally, teachers and student peers must be able to view and give feedback to students on the digital stories.

The same holds true for the narrative essays that the students created in this study. As the students used Google Docs to create their essays in the classroom and at home, the

teacher was able to keep track of the students' changes. Also, the teacher used the Google Docs feedback utility to insert text feedback in-line to help scaffold the students' learning. To aid a teacher in providing effective forms of scaffolding, as well as methods to increase students' self-efficacy, the use of an asynchronous audio-visual (AAV) program could facilitate these processes.

Girasoli and Hannafin (2008) proposed that an AAV learning environment could support scaffolding, vicarious experiences, and social persuasion. This kind of software can be classified as a technology-enhanced learning environment (TELE). TELEs are technology-based systems for supporting learning and instruction where students acquire knowledge or skills, usually with the help of teachers, facilitators, and/or support tools (Wang & Hannafin, 2005). In this type of technology-rich environment, student learning can be scaffolded and student academic self-efficacy could be supported.

As students are creating digital stories in the form of videos, an AAV learning environment is best suited for the student-created artifacts. In this study, after the students created their digital stories, one group posted their videos to the AAV. The teacher and students were then able to view the digital stories for evaluation, assistance, and feedback. To test the effectiveness of using an AAV as a learning environment, another group used a BBS for text-based feedback and assistance rather than video-based.

In a computer-based learning environment, online text-based discussions can have challenges. Bowe (2002) found that students with poor reading and writing skills could have difficulty when participating in text-only discussions. To compound this issue, An and Frick's (2006) study of undergraduate usage of computer mediated communications (CMC) reported that students can become frustrated when learning in a CMC environment.

Taking more time to type (than speaking face to face) and following long threads in an online discussion were factors that contributed to students' frustrations with CMC (An & Frick, 2006). In a technology-rich environment where students are frequently required to read, write, and use a keyboard, some students may be left behind. The use of digital stories as learning artifacts and an AAV environment for collaboration could help alternatively evaluate and support students that might become frustrated when using a CMC.

Researchers have found positive relationships between student's academic self-efficacy and achievement outcomes in Internet-based learning environments (Moos & Azevedo, 2009; Sins, van Joolingen, Savelsbergh, & van Hout-Wolters, 2008; Wang & Newlin, 2002; Yukselturk & Bulut, 2007). In an Internet-based environment, students are learning at a distance using web-based technologies. In this study, students' self-efficacy on academic and technology levels will be assessed and compared to their academic performance. In this manner, the relationships between the students' environmental factors, personal factors, and behavioral factors can be examined.

Summary

To review, there is a need for changing the instruction of writing in our public schools. Seventy percent of 8th and 12th grade students are not writing at a proficient level (NCES, 2012). These students are at a disadvantage when they continue on to college or a career after high school due to the writing demands of these areas (Beaufort, 2006; Graham & Perin, 2007b). With the recent adoption of the CCSS, schools are facing challenges to change their curriculum to meet the needs of increased demands for writing and the integration of technology into the classroom.

To better support effective writing instruction, teachers should be adequately prepared (Gillespie, et al., in press). Additionally, teachers need to incorporate successful strategies for learning writing such as planning (through prewriting), collaboration activities, and goal setting (Graham & Perin, 2007a) using technology (National Governors Association Center for Best Practices, 2010). Supports for increasing student motivation with writing (Applebee, 2013) and writing self-efficacy (Pajares, Johnson, & Usher, 2007) should be integrated into writing lessons. By having students create digital stories as a prewriting activity in a collaborative, supportive environment is one method that could improve students' writing performance, motivation, and self-efficacy.

As there is little empirical evidence on the impact of digital storytelling activities in the classroom (Robin & McNeil, 2012), this study aims to contribute to the research on this topic. Factors of writing performance, motivation to write, and writing self-efficacy will be supported through the digital story lessons and measured at different moments through the study. The next chapter will focus on the study's research methodology.

CHAPTER III

RESEARCH METHODOLOGY

Introduction

To examine the impact of digital story creation on a narrative writing curricular unit in the 9th grade, this study's design was structured within the framework of Bandura's (1986, 1997) social cognitive theory. To address RQ_1, two different analyses were performed. A (3 within X 3 between) MANCOVA assessed any differences in students' writing performance within the pre-, middle, and final essay scores and between the BBS, AAV, and outline-only groups. The students' EXPLORE writing score was the covariate.

The ACT EXPLORE English Test measures students' "…understanding of the conventions of standard written English (punctuation, grammar and usage, and sentence structure) and of rhetorical skills (strategy, organization, and style)" (ACT, 2014, p. 5). The test has 40 items and students are given 30 minutes to complete it. This assessment was administered to the students when they were in the 8th grade to aid in 9th grade English course placement. For the test, students read four prose passages and answered multiple-choice questions after each passage. The questions referred to underlined portions of each passage and the multiple choice items presented alternatives to the underlined text. Students needed to choose the best alternative or decide that the underlined portion didn't need to be changed. The EXPLORE English writing assessment has a reliability of Cronbach's $\alpha = 0.78$ (ACT, 2014).

For the second analysis, a (2 within X 3 between) repeated measures MANCOVA (RM-MANCOVA) was performed with the data. The students' writing self-efficacy and

writing motivation were measured over three moments. Included in the analysis were measuring the differences between the groups (BBS, AAV, and outline-only conditions). Again, the 8th grade ACT EXPLORE English score was the covariate. Looking through the lens of Bandura's (1986, 1997) social cognitive theory, writing performance, in this case, was a behavioral factor. Writing self-efficacy and writing motivation were both personal factors. The environmental factors are the BBS, AAV, and outline-only conditions.

For RQ_2, students' behavioral and environmental factors were examined with a linear regression design using the final moment data. With this analysis, only the groups that created digital stories were included. The linear regression analysis aided in analyzing if the students' collaboration environment (BBS or AAV), their storyboard, and digital story scores predicted their essay writing performance. Lastly, with RQ_3, an RM-MANCOVA examined the change in technology self-efficacy over time between the three groups. Additionally, a simple linear regression measured the predictive value of technology self-efficacy and group membership to writing self-efficacy.

Participants

In this study, 62 9th grade students participated from a suburban public high school. The students were a convenience sample, as the subjects were from the researcher's place of employment. Students were between the ages of 15 and 16, male and female, and enrolled in a regular education freshman-level English course. One student was omitted from the study due to transferring out of the school. The study's procedures were integrated into the teacher's normal lessons and included topics the teacher would normally discuss (such as passages from Greek mythology).

As three groups were needed for this study, three English classes taught by the same teacher participated. Each class was randomly assigned to a group: a normal educational practice group (NEP) as a comparison group (N = 23), a BBS group (N = 19), and an AAV group (N = 20). The NEP group wrote outlines as a pre-writing activity and did not have any discussion exercises online. The BBS and AAV groups both created digital stories as prewriting activities. Differentially, the BBS group used online text-based discussions while the AAV group used an online audio/video discussion application.

A power analysis using G*Power 3 (Faul, Erdfelder, Lang, & Buchner, 2012) aided in determining sample size estimates for each research question. Appendix I outlines the sample sizes needed for small, moderate, and large effect sizes with regard to RQ_1, RQ_2, and RQ_3. The sample for this study is 62, exceeding the minimum sample sizes for RQ_1's MANCOVA (minimum N=36) ($f^2 = 0.25$, $\alpha = 0.05$, Power = 0.80, two tailed) and RM-MANCOVA (minimum N=57) ($f^2 = 0.25$, $\alpha = 0.05$, Power = 0.80, two tailed). As RQ_2 only examines the BBS and AAV groups, there was a sample size of N=41. The minimum sample size needed is 48 ($f = 0.25$, $\alpha = 0.05$, Power = 0.80, two tailed), deeming the number of participants inadequate. With RQ_3, a minimum sample size of N=57 ($f^2 = 0.25$, $\alpha = 0.05$, Power = 0.80, two tailed) was needed for the RM-MANOVA analysis. Lastly, a minimum sample size of 48 ($f = 0.25$, $\alpha = 0.05$, Power = 0.80, two tailed) was needed for the linear regression analysis. As the total sample size was 62, there were an adequate number of participants for RQ_3.

To ensure that delivery of content was consistent across all groups, class sections taught by the same teacher were chosen for the study. This condition limited the sample size to 62 due to the sizes of the sections. Teachers at the participating school typically

teach four to five sections of classes. As this study was comparing three groups (BBS, AAV, or outline-only), it was convenient to assign one class section to a group condition. Typically, a class section has approximately 20 students. By selecting only three sections, the overall sample size was limited to 62. To gather data for these research questions, various measures were used.

Instrumentation

To explore students' levels of writing self-efficacy, motivation to write, and technology self-efficacy, three subscales were used (see Appendix B). On the survey, students were asked to first write their student identification number, their name, the date, and the channel (school period). The student identification number was used to match data from the other performance measures. The name, date, and channel (school period) items were used to confirm the student identification number, the group, and the time of the survey.

Measuring Writing Self-efficacy

A modified version of Shell, Murphy, and Bruning's (1989) instrument was used to assess students' writing self-efficacy. With the original scale, the researchers reported a reliability of Cronbach's $\alpha = 0.90$ and, with high school students, Pajares and Johnson (1996) reported a reliability of Cronbach's $\alpha = 0.91$. Of the 16 items in Shell, Murphy, and Bruning's (1989) writing self-efficacy subscale, 11 items were used for measurement in this study. This subscale was reduced as such to ensure the total items in the study's survey were not lengthy. Generally, individuals are less likely to complete a survey if the questionnaire takes a large amount of time to complete (Converse & Presser, 1986). Reducing the number of items in a subscale can also have drawbacks, as the scale's

reliability might be limited. Part of the analysis in the next chapter will include an exploratory factor analysis that estimates the reliability for each subscale.

With the writing self-efficacy subscale, each item used the same stem, "How confident are you that you can…" and respondents rated their confidence from a scale of 0 ("cannot do at all") to 5 ("moderately certain can do") to 10 ("highly certain can do"). Some items from the original subscale were updated to include objects that might be more familiar to current 9th grade students (see Table 3.1).

Table 3.1

Changes to the writing self-efficacy subscale items from Shell, Murphy, and Bruning's (1989) scale to the current study's scale. Words in italics reflect those that were changed.

Original Subscale Item	Modified Subscale Item	Rationale
Compose an article for *a popular magazine such as Newsweek*.	Compose an article for *the school newspaper*.	Students may not be familiar with Newsweek, so a more familiar publication was used.
List instructions for how to play *a card game*.	List instructions for how to play *a game*.	Students may not necessarily play card games (and more often play video games) so the "game" was left to be more generic.
Write an instruction manual for operating *an office machine*.	Write an instruction manual for operating *a cell phone*.	Students may be more familiar with using a cell phone rather than an "office machine."

Measuring Motivation to Write

Items from the intrinsic value subscale of the MSLQ (Pintrich & De Groot, 1990) were used when measuring the motivation to write. The authors reported a reliability of

Cronbach's α = 0.87 for this scale. All nine items of the MSLQ intrinsic value subscale were used in this study. These items were modified to focus on writing to ensure specificity of the task. Each item shares the same stem, "How true is it that…" and the participant was asked to rate how true each item was from 0 ("not at all true of me") to 5 ("moderately true of me") to 10 ("very true of me"). Table 3.2 outlines how each item was changed.

Table 3.2

Changes to the intrinsic value subscale of the MSLQ (Pintrich & De Groot, 1990) to fit the writing domain for this study.

Original Subscale Item	**Modified Subscale Item**
Even when I do poorly on a test I try to learn from my mistakes.	Even when I do poorly on a writing test I try to learn from my mistakes.
I like what I am learning in this class.	I like what I am learning about writing in this class.
I think I will be able to use what I learn in this class in other classes.	I think I will be able to use what I learn about writing in this class in other classes.
I prefer class work that is challenging so I can learn new things.	I prefer writing assignments that are challenging so I can learn new things.
I often choose paper topics I will learn something from even if they require more work.	I often choose essay topics I will learn something from even if they require more work.
I think that what I am learning in this class is useful for me to know.	I think that what I am learning about writing in this class is useful for me to know.
It is important for me to learn what is being taught in this class.	It is important for me to learn about writing.
I think that what we are learning in this class is interesting.	I think that what we are learning about writing in this class is interesting.
Understanding this subject is important to me.	I understand that writing is important to me.

Measuring Technology Self-efficacy

The technology self-efficacy subscale from the *Self-efficacy of Using iPads for Learning Survey* (Girasoli, 2012) was used in this study. This subscale has eight items and a reliability of Cronbach's $\alpha = 0.60$. These items were developed for measuring high school students' confidence when using iPads. All items share the common stem, "How confident are you that you can…" and used a Likert scaled response of 0 ("cannot do at all") to 5 ("moderately certain can do") to 10 ("highly certain can do"). This subscale's items were randomly mixed with the writing self-efficacy items since they share the same stem. In all, the writing self-efficacy, writing motivation, and technology self-efficacy survey totaled 28 items.

Assessing Students' Storyboards, Digital Stories, and Essays

Before creating the digital stories and writing the subsequent essays, students in the BBS and AAV groups needed to create a storyboard. This storyboard helped students plan their digital story and was a component of the digital story activity. To measure students' performance with their storyboards for RQ_2, a rubric published by Winning 4 Kids (2013) was used. This rubric has a four-point scale (from *exceptional* [4] to *inadequate* [1]) for five criteria: choice of scenes, characters, setting and props, captions, and spelling, punctuation, and grammar (see Appendix C for the complete rubric). After students created their storyboards, they continued on to create their digital story videos.

To measure how students performed with creating their digital stories, a rubric was developed based on a narrative essay rubric for 9^{th} and 10^{th} grade students (see Appendix D). There are many digital story rubrics available, however, these rubrics tend to focus on imagery and voice rather than literacy concepts (e.g., University of Houston [2011]).

Additionally, these rubrics lacked the breadth and depth needed for assessing narratives that incorporate goals from the CCSS. The Turnitin (2012) rubric for narrative essays is CCSS-based, designed for 9th and 10th grade writing, and has the requisite criteria for a narrative story. This rubric was modified for digital story assessment by replacing the word "text" with "digital story." For example, the indicator, "The *text* orients the reader by setting out a conflict…" was changed to "The *digital story* orients the reader by setting out a conflict…"

The Turnitin (2012) rubric has five indicators of performance, from *exceptional* [5] to *inadequate* [1]. There are five criteria that address each of the main factors of a narrative story: the exposition, narrative techniques and development, organization and cohesion, style and conventions, and the conclusion. To score the students' essays, the original Turnitin (2012) narrative essay rubric was used (see Appendix E). By using the same rubric for the essays and digital stories (thought slightly modified for the digital stories), a closer alignment of criteria and scoring was accomplished.

Procedures

Before applying for IRB approval with the University of Connecticut, a letter of support was procured from the Director of Curriculum at the high school. This letter was included with the parental waiver and return slip (Appendix H) when the IRB-1 was filed. After the IRB-1 was approved, the project plan in Appendix A was followed. Over the course of the study, the researcher visited each class once a week to ensure fidelity with the study.

During the first week of the study, the teacher distributed the waiver and information sheet to all potential student participants. At the beginning of the second

week, the teacher collected all parental waiver forms. There were no opt-out forms filed and all parents signed the waiver forms. Students and parents/guardians were given the option to opt-out of the study at any time and no student chose to do so over the course of the study. The teacher gave all signed forms to the student researcher for record keeping.

Baseline of Writing Performance

After all forms were collected, a baseline of data was needed. The teacher administered the writing self-efficacy, technology self-efficacy, and motivation to write survey (Appendix B) at the beginning of the second week. After completing the survey, the students were then assessed on their narrative writing ability. As part of the writing assessment, students read the poem, "Invictus" by William Ernest Henley. Students were instructed to annotate the poem as they read it to mark any words or phrases that were unfamiliar. After reading the poem, students had to research the unfamiliar words and phrases to discover their meanings. Then, students wrote a one to two page essay.

Students had to describe in their opinion the meaning of poem's closing line, "I am the master of my fate; I am the captain of my soul." They were also prompted to consider why it's important for humans to find their individuality. For essay guidelines, students were asked to accomplish the following goals:

- Develop a topic sentence and introductory paragraph.
- Include three main reasons to support the topic sentence in the introductory paragraph.
- Create a total of three body paragraphs.
- Create a concluding paragraph.
- Ensure the essay has a total of five separate paragraphs.

To write the essays, each student used a school-owned iPad with the Google Drive app. The Google Drive app allows students to create documents in Google Docs and edit them.

All students were asked to share their essays with the teacher and the researcher for evaluation purposes.

The teacher and researcher demonstrated how to use the iPads and Google Docs. To evaluate the essays, the teacher was trained on how to use the rubric in Appendix E. The teacher read each essay, provided feedback (as appropriate) with Google Doc's comment facility, and recorded the score for each student on a Google spreadsheet shared with the researcher. To ensure the teacher was providing appropriate feedback during the study, the researcher used the rubric in Appendix G to evaluate the teacher's comments. The teacher had an exceptional rating with his feedback on average across all students.

After all the essays were completed, the teacher scored the essays using the rubric in Appendix E. (Please see the last section of this chapter for the procedure of how another rater scored all essays. This procedure and subsequent inter-rater agreement analysis helped with strengthening the essays scores to ensure there was limited teacher biasing.) After the baseline data were recorded, the teacher and researcher began the next phase of the study: the prewriting activities.

Creating the Outlines and Storyboards

After grading the students' essays, the teacher placed the students into groups of three to four students. For each class, this equated to five discussion groups. These groups were used for discussion and peer assistance and feedback during the pre-writing activities. Each group was balanced based on how each student performed for the first essay activity. In this manner, groups were purposive (Kerlinger, 1986) to ensure proportional groups based on writing performance. During group activities, the teacher facilitated group interactions to ensure all students were equally recognized for their

accomplishments. This can help counter stronger-skills students doing most of the work in proportional groups (Lotan, 2006). For the third week, the teacher led discussions with the class on (based on CCSS standards of writing):

- Plot and conflict
- Character and characterization
- Use of words and phrases to tell details
- Reading comprehension
- Elements of literature
- How to give peer feedback and provide peer assistance

The teacher also presented effective student models of writing for classroom discussion using the web version of Google Docs. The teacher projected these models on the screen in the classroom with a projector and a computer. The researcher shared the rubrics used for grading the storyboards, digital stories, and essays with the students via Google Drive.

At the start of week 4, students in all classes were asked by the teacher to research a Greek myth and develop a written narrative of how the myth unfolds. Randomly, one class was assigned to a normal educational practice (NEP) group, another class was assigned to the BBS group, and the third class was assigned to the AAV group. The NEP group was not given any additional technology training as they would continue to use Google Docs on the iPads. The BBS group was taught how to use Google Groups with the Safari app for text-based discussions. The researcher created five discussion groups in Google Groups for student and teacher sharing and feedback. Students in the AAV group were taught how to use the AAV program, "Prism." The researcher created five discussion groups in Prism for student and teacher sharing and feedback.

Students in the NEP group created an outline for the prewriting activity. In the BBS and AAV groups, students were instructed on how to use the Storyboard app for creating

storyboards. Additionally, students were instructed on how to use Mayer's (2009) principles of multimedia learning when designing their scenes. For example, students were advised to:

- Ensure that only the essential words and pictures are included in a scene (*coherence principle*).
- Use arrows in scenes to indicate action (*signaling principle*).
- Only use text when needed (*redundancy principle*) and ensure that corresponding words and pictures are presented near each other and on the screen (*spatial contiguity principle*) and simultaneously (*temporal contiguity principle*).

Students in the BBS group were shown how to export their storyboards for sharing. These students had to export each storyboard slide as a graphic image file. Then, each student had to create a new post in his or her respective group in Google Groups and upload the storyboard images. With the AAV group, these students were shown how to use iMovie. These students imported the storyboard slide images into iMovie. After creating a video of the storyboard slides in sequence and narrating the descriptions for each slide, the AAV students uploaded the video to Prism for sharing within their collaboration groups in each class and with the teacher.

Students in all groups were given the following goals when creating their outline (NEP group) or storyboards (BBS and AAV groups):

1. Name the god or goddess who is the centerpiece of your story.
2. What natural phenomena does the story attempt to explain?
3. List the major characters that are involved (please keep the number limited to no more than four characters).
4. List the major conflicts that you'll be depicting (external and/or internal).
5. Break down the myth into the five components of a story (Freytag's Triangle). For each component, list a minimum of three separate incidents.

Students in the NEP group shared their outlines in class with each other (in their discussion groups) and the teacher for discussion and refinement. The teacher used the comments

function in Google Docs to provide feedback on outlines. After completing their storyboards, students in the BBS group posted their storyboards to Google Groups. With the storyboard images, students provided a text description for each scene within their Google Groups post. Students gave each other text feedback on the storyboards in Google Groups within their discussion groups. The teacher also gave text feedback about the students' storyboards within Google Groups.

Students in the BBS group modified their storyboards as needed with the feedback. During the feedback stages, the researcher used the rubrics in Appendix F and Appendix G to ensure the students and teacher were providing quality feedback. These rubrics were also shared with the students and teacher ahead of time (via Google Drive). Additionally, the teacher asked the students to be positive and constructive with their feedback. The students' feedback was, on average, on the exceptional level based on the rubric from Appendix F. However, feedback within the discussion groups varied from no feedback to only one or two peers providing feedback. While the feedback was not analyzed in this study, it is presented in this chapter to give the reader an idea of the kinds of feedback provided by the students. Some examples of feedback are:

> Good job with the drawings! I liked how you drew Medusa but in the last slide you said that she lived in a cave with blind monsters, so if you could I would draw those monsters in the cave on the last slide. Also, by any chance, could you name the certain place in Greece shown on the second slide? I think that would help. Overall I think you did great but if you want to add in little written narrations or details you could use the text option just so that the viewers can read them clearly.

and:

> I followed through the story and we're able to understand most if it, but by any chance have you thought of adding a bit more text to the scenes. Just we can understand it fully without having to look at the description of some shots.

The teacher did not provide feedback to the students' posts in Google Groups due to time limitations.

While it is surprising that the teacher gave no feedback in Google Groups, it is understandable that the teacher had difficulty finding time to do so. In addition to the three English courses taught by the teacher that participated in this study, the teacher also had two other courses to manage. The teacher had to balance teaching, grading, and giving after school help to students in addition to the demands of this study. With regard to the students' poor quality of feedback within the smaller groups, it is possible that students did not fully understand how to give adequate feedback. Concerns about the teacher's and students' feedback were communicated to the teacher after the first digital story activity was finished.

After completing the storyboard videos, students in the AAV group uploaded their videos to the Prism web-based program for discussion. Working in their discussion groups, students viewed the storyboard videos in Prism and provided feedback. Individuals provided feedback by recording a video of themselves and uploading the feedback video as a reply to a storyboard video. Using the rubric in Appendix F, the students provided video feedback that was between developing and exceptional. Similar to the BBS group, not all students provided feedback within the discussion groups and the

teacher did not post video feedback. Examples of student feedback are, "I really liked your storyboard. It was interesting and easy to follow" and "some of the sound effects were a little loud so I couldn't hear your voice. I really liked the backgrounds, though." At the conclusion of the storyboard activities, the teacher evaluated the storyboards using the rubric in Appendix C and recorded the scores in a Google spreadsheet.

Creating the Digital Stories

After the storyboard activities, students in the BBS group were taught how to use iMovie so they could develop their digital stories. Students in the BBS and AAV groups then used iMovie to create their digital stories based on their storyboards. To create the digital story videos, each student took on the role as director for their story. The other students in each director's discussion group served as the actors. For each scene, the director would review the actions and dialogue and prep the actors as to what was needed. The director then used the Camera app on the iPad to film the action.

To give the students places to film their scenes, a few different locations at the high school were secured. The five groups for each class had to be spread out to different areas to ensure the audio was clear. For example, some students shot their scenes outdoors while others recorded video in conference rooms. For props, students used cardboard boxes (as a chariot in one case) and a projection screen with a picture of a forest as a background in another story. When editing the video together using iMovie, the director had the option to include still images from the iPad's camera or download images from the Internet (using Google's image search). The director also added narration when needed.

Upon completing their digital stories, students in the BBS group presented their digital story videos in class using the classroom projector. The teacher and students

provided feedback in class. Students in the AAV group posted their digital stories to the Prism program. The students then viewed each other's digital stories and provided feedback within Prism. Using the rubric in Appendix F, the researcher found that the students gave between developing and exceptional feedback. The teacher also viewed the digital stories within Prism but did not provide feedback.

All digital stories were graded using the rubric in Appendix D. After the digital story activities, the BBS and AAV groups used their digital stories as a planning guide for their written narrative essay.

Writing the Essay

The rubric for assessing a narrative essay (Appendix E) was shared with all students through Google Drive. Students were asked to write a one to two page essay based on their outline (NEP group) or digital story (BBS and AAV groups). All students composed their essays in Google Docs during class and the teacher provided feedback using the comment facility. The teacher's feedback was at the exceptional level, using the rubric in Appendix F. The feedback was constructive, clear, and direct with regard to mechanics, organization, and style.

Using the projector in the classroom for each class, the teacher reviewed essays that were exemplary and gave students opportunities to revise their essays if needed. Lastly, the teacher graded all of the students' essays using the rubric in Appendix E and entered the scores into a Google spreadsheet that was shared with the researcher. Once all students had completed the narrative essay exercise, the teacher administered the writing self-efficacy, technology self-efficacy, and motivation to write survey (see Appendix B).

The Second Digital Story Project

At the onset of week seven, students began reading Homer's *The Odyssey* in class and at home. The researcher also created new discussion groups in Google Groups (for the BBS group) and in Prism (for the AAV group) for the new activities. During class, the teacher led discussions on:

- Theme
- Figurative language
- Foreshadowing and suspense
- Review of literary skills from the third week

After reading *The Odyssey*, students were asked to create a new narrative, retelling a story in *The Odyssey*, using the following guidelines:

1. Name the adventure or episode from *The Odyssey* that is the centerpiece of your story.
2. List the major characters that are involved (please keep the number limited to no more than four characters).
3. List the major conflicts that you'll be depicting (external and/or internal).
4. Break down the myth into the five components of a story (Freytag's Triangle). For each component, list a minimum of three separate incidents.

Students in the NEP group developed their written outline in Google Docs based on these goals. With the BBS and AAV students, the teacher displayed exemplars of effective storyboards from the previous lesson using the projector in the classroom. The teacher also reminded the students about the factors of effective feedback and encouraged the students to provide feedback to their peers. The BBS and AAV students then began developing their storyboards based on the above guidelines.

Once the storyboards were completed, the BBS students uploaded them to Google Groups for review and discussion. Students in the BBS group did provide peer feedback that was better than the first digital story exercise, although the feedback was at the

developing level. Also, on average, about half of each group's members would provide feedback. For example, some of the feedback comments were "very good job it is very clear, the pictures are boring but that's not important" and "nicely done, but more color would be nice."

The AAV students created narrated slide shows of their storyboards using iMovie and uploaded them to Prism for discussion. In contrast to the BBS group, almost all students in each peer group provided feedback. On average, the feedback was between developing and exceptional. Examples of developing feedback are "you should make your text bigger," "I think that your storyboard was very well done," and "I liked your storyboard." Examples of exceptional feedback are, "there were some spots in your video that were very quiet. You could have added some sound effects to take care of those spots and it would have made things really great," and "I liked your storyboard, the scenes were very dramatic. I think on the first two slides you could cut it down a little bit so they're not as long." At the conclusion of the storyboard activity, the teacher graded the storyboards based on the rubric in Appendix C. Students in the NEP group developed their outlines during this time and discussed them in the classroom with their peers and the teacher.

After the storyboards were complete, students in the BBS and AAV groups created their digital stories in iMovie using their storyboards as guides. As in the fifth week, the students acted as directors for their stories with the discussion group members as actors. Once the digital stories were complete, students in the BBS group presented their stories in class using the classroom's projector. Students in the AAV group uploaded their stories to Prism for viewing and feedback. The teacher graded the digital stories using the rubric in Appendix D.

During the last week of the study, students in all groups were tasked with writing a narrative essay based on their outlines (NEP group) or digital story (BBS and AAV groups). The students wrote these essays using Google Docs on the iPads and the teacher provided feedback to the students within the text using the comments facility. Students were given the option of revising their essays based on the teacher's feedback if they desired. The teacher then graded the essays using the rubric in Appendix E once all students had finished writing their essays. Lastly, the teacher administered the writing self-efficacy, technology self-efficacy, and motivation to write survey (Appendix B) for a third moment in time.

Inter-rater Agreement Procedure

After the 10-week interaction, all essays from the three groups were printed for evaluation by a second rater. As a side note, this method of evaluation was slightly different than the teacher's. The teacher had electronically evaluated students' essays using the Google Docs facility and recorded their grades in a spreadsheet. Comparably, the second rater read the essays on paper and wrote the scores on the papers. The researcher then entered the second rater's essay scores into a spreadsheet for later importing into SPSS.

In the following chapter, intra-class correlations (ICC) are calculated to determine the inter-rater reliability between the two raters. From the ICC analysis between the two raters and the essay scores, the raters were found to be very close in agreement. Due to this finding, a second rater did not score the storyboards and digital stories as it was reasoned the second rater would have a similar agreement. When the research questions are addressed in the following chapter, the essay scores are used to gauge any student

writing performance gains. The storyboard and digital story scores are used to investigate any mediating processes that might contribute to writing performance.

All Google Groups discussions were printed on paper for evaluation purposes. All essays were printed on paper for later evaluation as well. All completed surveys were sorted into the appropriate groups (e.g., NEP, BBS, and AAV). The teacher provided the researcher with his grades on the storyboards, digital stories, and essays for data analysis. At this time, the second 9th grade English teacher scored all of the essays from the three groups. After the scoring was complete, the data were analyzed for addressing the research questions. The analyses and results are presented in the next chapter.

CHAPTER IV

RESULTS

Introduction

The first step of the data analyses process was to screen the data to check the integrity of the information. As two raters scored the essay data, intra-class correlations were calculated to ensure agreement between them. Data were then checked for distribution, missing data, and normality estimates. These are issues that may affect the data analyses assumptions and therefore the results and interpretations of the following analyses.

To assess and enhance the reliabilities with the subscales used in the survey, an exploratory factor analysis was performed on the survey data. The first research question, which addresses the changes in writing performance, writing self-efficacy, and writing motivation over time, employed MANCOVA and RM-MANCOVA methods. For the second research question, the relationship between students' storyboard creation, digital story creation, collaboration group, and writing proficiency was examined with a linear regression analysis. Lastly, the relationship between student technology self-efficacy and writing self-efficacy for the third research question was explored with an RM-MANOVA and a linear regression analysis.

Data Screening

To check for potential inaccuracies of data entry, frequencies were computed on the variables to ensure that no values were out of range. Data on all variables were found to be within their specified response ranges. To gauge the reliability of essay evaluation, two

raters scored the pre, middle, and final essays for all groups. Inter-rater agreements with the essay scores were assessed using a two-way random, consistency, average-measures intra-class correlation (ICC) procedure (McGraw & Wong, 1996). The pre-test essay scores resulted in an ICC that was in the excellent range ($ICC = 0.76$, $p < 0.001$) (Cicchetti, 1994). Additionally, the mid-test scores where in the good range ($ICC = 0.67$, $p < 0.001$) and the final test scores were in the fair range ($ICC = 0.40$, $p < 0.05$) (Cicchetti, 1994). Due to these ratings, the agreement between raters was deemed acceptable and the two raters' essays scores were averaged for each case. This averaged score was then used for all subsequent analyses.

Missing data points are instances where a case's value for an item (i.e., a participant's score for an individual survey item) is not available. With regard to missing data, Tabachnick and Fidell (2001) recommend that items with fewer than 5% of missing case data should use the "mean substitution" method. However, Meyers, et al. (2006) advise caution when using the mean substitution method. While the mean of a distribution can be the best single estimate of a population, the mean can still have a certain margin of error (i.e., +/- 1.96 standard error units). Using a mean substitution method can narrow the variance and one cannot assume that the missing values are randomly distributed (Meyers, et al., 2006). For cases where more than 5% of data are missing, these cases should be ignored through "pairwise deletion" in the analysis (Tabachnick & Fidell, 2001). Tabachnick and Fidell (2001) also recommend that data more than three standard deviations from the mean should be considered as outliers and substituted with the series mean.

After an initial review of the data, five participants were missing more than 5% of data points due to frequent absences from class. These five participants' data were removed from the study data, reducing the overall sample size to 57. After the removal of these students, all cases had less than 5% of missing data (see Appendix J). The mean substitution method was used to replace any missing data points. The means and standard deviations of the data after adjustments are presented in Appendix K.

To achieve meaningful results with multivariate analyses, the data must first be tested for normality, linearity, and homoscedasticity. If the data fail these tests, the statistical results may become distorted or biased (Hair, Anderson, Tatham, & Black, 1998; Keppel, 1991; Tabachnik & Fidell, 2001). To check for normality of a distribution, Stevens (2002) recommends using the Shapiro-Wilk test as it can be a powerful measure for detecting departures from normality. If the test's significance (p) for a variable is less than is 0.001, there is a possible univariate normality violation (Meyers, et al., 2006). Data from the initial checks for normality can be found in Appendix L.

After examining all variables with the Shapiro-Wilk test, 68% of the pre-moment, 57% of the middle-moment, and 75% of the final moment survey items were not normally distributed. Additionally, all essay, storyboard, and movie scores were not normally distributed. To induce normality, Tabachnick and Fidell (2001) recommend an attempt to transform the data. Efforts to transform the variable's data should progress from square root, to logarithm, and finally to an inverse square root for more severe cases (Tabachnick & Fidell, 2001). All three methods were attempted and could not increase the Shapiro-Wilk significance to $p > 0.001$ for the items that appeared to be not normally distributed. (For the survey items, this was 19 out of 28 items for the pre-moment survey data, 16 out of 28

items for the middle-moment survey data, and 21 out of 28 items for the final moment data.) As these items could not be transformed into a normal distribution, they were not modified. The subsequent analyses take into account the non-normality of these items (i.e., by using a PAF extraction method in the factor analysis in the next section).

Factor Analysis and Subscale Reliabilities

To examine if the affective variables could be reduced from the series of item responses into subscales, an exploratory factor analysis (EFA) was performed on the writing self-efficacy, writing motivation, and technology self-efficacy data at the first (pre) moment. As these three factors were hypothesized to be present, three factors were forced in the analysis. As the sample size was 57, Comrey and Lee (1992) advise that the sampling adequacy could be at the "very poor" to "poor" level. (A "fair" level of sampling for a factor analysis is 200 and generally recommended for a factor analysis study [Meyers, et al., 2006].) Due to the sample size, the factor analysis results should be interpreted with caution. For the extraction method, principal axis factoring (PAF) was chosen. Fabrigar, Wegener, MacCallum, and Strahan (1999) recommend using the PAF method if the data are generally non-normally distributed, as was described in the previous section.

A promax (oblique) rotation was chosen, as orthogonal rotations (e.g., varimax, quartimax) are generally chosen when the factors are expected to be uncorrelated. In the social sciences, factors are commonly expected to have some correlation, as human behaviors can be comprised of interrelated processes (Costello & Osborne, 2005). Oblique rotations like the promax rotation allow for the expectation that some factors are correlated (Costello & Osborne, 2005). In this study, it is assumed that the writing self-

efficacy and writing motivation factors were correlated (Pajares, 2003; Pajares & Valiante, 2006).

After analyzing the data, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.66. This suggested a moderate degree of common variance within the sample (Beavers, et al., 2013). Bartlett's Test of Sphericity was significant ($X^2 = 1060.15$, df = 378, $p < 0.001$). This suggested that the observed correlation matrix was statistically different from a singular matrix, confirming that linear combinations exist (Pett, Lackey, & Sullivan, 2003). Therefore, the factor analysis was able to proceed (Meyers, et al., 2006).

When examining the resulting three factors, the first factor (writing self-efficacy) accounted for 29% of the variance. The second factor, writing motivation, accounted for 10% of the variance. The third factor, technology self-efficacy, accounted for 7% of the variance in the data. Garson (2010) and Pett, et al. (2003) suggested that 75% - 90% of the variance should be accounted for in a factor analysis. However, others (e.g., Beavers, et al., 2013) have recommended that accounting for 50% of the overall variance in a factor analysis is adequate. In this study, the three factors explained 46% of the total variance, approaching the recommended 50% by Beavers, et al. (2013).

Continuing the factor analysis, the pattern matrix was then examined for factor loadings. Any item that loaded greater than 0.4 on one factor was retained (Tabachnick & Fidell, 2001). With the structure matrix, any factor that correlated higher than 0.5 with more than one factor was deleted. See Appendix M for the pattern matrix and the structure matrix. Items 2, 5, 9, 11, and 16 were removed due to not loading greater than 0.4 on the pattern matrix. Items 20 and 27 were removed due to being correlated highly ($r > 0.5$) on more than one factor.

With each subscale, a Cronbach's alpha reliability estimate was calculated using the pre-test data. A reliability coefficient of Cronbach's $\alpha = 0.80$ is considered acceptable for experimental research (Cronbach, 1951). Additionally, Gable and Wolf (1993) state that scales which measure affective domains are considered to be stable when they have reliabilities greater than a Cronbach's alpha of 0.70. For the writing self-efficacy scale, Cronbach's alpha was 0.84. With the writing motivation scale, Cronbach's alpha was 0.88. (During the reliability analysis, item 17 was dropped because the inclusion of item 17 neither increased nor decreased the reliability estimate.) Lastly, for the technology self-efficacy scale, Cronbach's alpha was 0.75. The subscales, items, reliabilities, means, and standard deviations for the pre-test sampling are listed in Table 4.1.

Table 4.1

The reliabilities, means, and standard deviations for each subscale from the pre-moment data among all experimental groups (BBS, AAV, and outline-only).

Dimension (Subscale)	**Number of Items**	**Retained Items**	**Cronbach's Alpha (α)**	**Mean**	**Standard Deviation**
Writing Self-efficacy	10	1,4,6,10,15,18,19, 23,24,28	0.88	6.75	1.74
Writing Motivation	4	21,22,25,26	0.86	7.85	2.07
Technology Self-efficacy	6	3,7,8,12,13,14	0.75	8.87	1.25

Means and Standard Deviations of Variables

To create a subscale score for each participant at each moment, scores on the retained items for each subscale were averaged together. For example, to create a writing motivation score for a subject, the mean of the subject's scores on survey items 21, 22, 25,

and 26 was calculated. Table 4.2 outlines the means and standard deviations of the three factors at the three moments. Table 4.3 displays the means and standard deviations of the storyboard, movie, and essay scores.

Table 4.2

Factor means (M) and standard deviations (SD) for the BBS group (N = 18), AAV group (N = 18) and the outline-only group (N = 21) at the different moments with Writing Self-efficacy (WSE), Writing Motivation (WM), and Technology Self-efficacy (TSE).

Moment and Factor	**BBS**		**AAV**		**Outline**	
	(M)	**(SD)**	**(M)**	**(SD)**	**(M)**	**(SD)**
Pre-WSE	6.19	2.01	7.07	1.58	6.95	1.47
Mid-WSE	6.94	1.58	6.44	1.42	6.88	1.64
Final-WSE	7.61	1.41	7.19	1.30	6.87	1.30
Pre-WM	7.77	2.28	7.99	2.02	7.81	1.91
Mid-WM	7.40	2.23	7.35	1.87	7.73	1.72
Final-WM	7.79	2.12	7.70	1.40	7.74	1.30
Pre-TSE	8.35	1.50	8.92	1.33	9.25	0.64
Mid-TSE	9.34	0.95	9.65	0.86	9.22	0.81
Final-TSE	9.27	1.47	9.81	0.32	9.00	1.38

Table 4.3

Means (M) and standard deviations (SD) for the storyboard, movie, and essay scores at the pre-, middle, and final moments for the BBS group (N = 18), AAV group (N = 18), and the outline-only group (N = 21).

Measure	**BBS**		**AAV**		**Outline**	
	(M)	**(SD)**	**(M)**	**(SD)**	**(M)**	**(SD)**
Pre-essay	17.36	5.75	17.94	5.15	17.85	3.26
Mid-storyboard	15.44	5.69	17.67	4.54	n/a	n/a
Mid-movie	17.06	4.36	22.33	1.78	n/a	n/a
Mid-essay	17.42	6.11	20.08	2.56	19.00	3.12
Final Storyboard	15.37	4.50	17.49	4.73	n/a	n/a
Final Movie	20.62	5.64	21.32	5.54	n/a	n/a
Final Essay	16.44	6.71	17.60	5.75	18.48	3.25

Research Question 1 (RQ_1)

For the analyses in Research Question 1, students' 8th grade EXPLORE scores (ACT, 2014) were used as a covariate. The ACT EXPLORE test is a nationally used assessment for measuring 8th and 9th grade students' science, math, reading, and writing skills. The English writing scale has a reliability estimate of Cronbach's $\alpha = 0.78$ (ACT, 2014). The students in this study had taken the EXPLORE test when they were in 8th grade and their writing assessment scores were used to aid in 9th grade English class placement. The EXPLORE scores can range from 0 (very low proficiency in English) to 40 (excellent proficiency in English) for college readiness standards (ACT, 2014). Table 4.4 presents the means and standard deviations of the EXPLORE scores for this study's sample. There was no significant difference with EXPLORE score means between the three groups ($F = 1.55$, $p = 0.22$).

Table 4.4

The means and standard deviations of the ACT EXPLORE scores for all three groups.

Group	N	Mean	SD
BBS	18	27.44	7.41
AAV	18	30.89	5.60
Outline-only	21	28.90	4.54
Total	57	29.07	5.96

For this study, the following research question, null hypothesis, and alternate hypotheses were proposed:

During a 10-week 9th grade English course, to what extent and in what ways does participation in one of three pre-writing conditions (i.e., outline-only, digital storytelling with BBS for group interaction, or digital storytelling with AAV for group interaction) relate to students' scores in writing self-efficacy, writing motivation, and writing performance?

- *H_0: There is no impact of the pre-writing conditions on 9th grade students' writing self-efficacy, writing motivation, and writing performance.*
- *H_1: Students who create digital stories have increased writing self-efficacy, writing motivation, and writing performance over time.*
- *H_2: Students who create digital stories with the AAV system have increased writing self-efficacy, writing motivation, and writing performance over time compared to the BBS and comparison (outline-only) groups.*

To address RQ_1 and the hypotheses, two separate statistical analyses were conducted. First, a MANCOVA was used to estimate the effects of the three different groups (BBS, AAV, and outline-only conditions) on the pre-, middle, and final essay scores between the groups. This particular analysis examined only the writing performance component of RQ_1. The pre-, middle, and final essays were the dependent variables (DVs), the group condition was the independent variable (IV), and the 8th grade EXPLORE writing scores served as a covariate. The ACT EXPLORE English writing assessment was administered to the students in the 8th grade and provided a standardized measure for previous writing performance.

A MANCOVA is appropriate for this analysis as it affords the measurement of multiple dependent variables and provides some control over the overall Type I error rate and the alpha level (Meyers, et al., 2006). The MANCOVA includes a covariate in the analysis -- a variable that potentially correlates with a dependent variable. In the case of a

MANCOVA, the covariate predicts as much of the dependent variable as possible so the remaining variance can be explained by the independent variable(s) (Meyers, et al., 2006). Meyers, et al. (2006) also recommend that the covariate should correlate highly with the dependent variable(s). In this study, students' 8th grade EXPLORE writing scores correlated strongly (Cohen, 1998) with the final essay scores ($r = 0.51$, $p < 0.001$) and moderately (Cohen, 1998) with the pre-essay scores ($r = 0.43$, $p < 0.001$). However, the EXPLORE scores did not correlate with the middle essay scores ($r = 0.17$, $p = 0.20$).

For this analysis, the sample size was 57 subjects. From the earlier power analysis, the minimum sample size should be 36 ($f^2 = 0.25$, $\alpha = 0.05$, Power = 0.80, two-tailed). In the MANCOVA analysis, Box's Test of Equality of Covariance Matrices was not significant (Box's $M = 32.23$, $p = 0.003$), indicating that the DV covariance matrices can be considered equal across the levels of the IV and covariate. When Box's *M* is not significant ($p > 0.001$), the analysis can proceed (Meyers, et al., 2006). Bartlett's Test of Sphericity was statistically significant (approximate chi square = 20.23, $p < 0.001$), indicating significant correlation between the DVs to proceed with the analysis. Wilks' Lambda is typically used to test for significant differences between groups on the dependent variables in a MANOVA or MANCOVA (Meyers, et al., 2006). When measuring Wilks' Lambda for overall effects between the BBS, AAV, and outline-only groups on writing performance, there was no significant difference ($F[6,104] = 1.08$, $p = 0.38$). Due to this finding, no further analysis was performed on the factors. See Appendix N for the tables of multivariate tests.

To further analyze the data for RQ_1 and examine any changes in writing self-efficacy and writing motivation, a repeated measures (RM) MANCOVA was used. An RM-MANCOVA is generally employed when the dependent variables are commensurate and need to be

measured over time (Meyers, et al., 2006). In this analysis, the DVs were writing self-efficacy and writing motivation at the pre-test (time 1), middle moment (time 2), and final moment (time 3). The IV was the group condition (BBS, AAV, and outline-only) and the covariate was the 8th grade EXPLORE writing scores. The EXPLORE English scores were chosen as a covariate because they statistically significantly correlated with some of the writing self-efficacy and writing motivation scores. The EXPLORE scores correlated with writing self-efficacy at the pre- ($r = 0.33$, $p < 0.05$) and final ($r = 0.45$, $p < 0.01$) moments. Additionally, the EXPLORE scores correlated with writing motivation at the final moment ($r = 0.27$, $p < 0.05$). However, the scores did not significantly correlate with writing self-efficacy at the middle moment ($r = 0.17$, $p = 0.19$) and writing motivation at the pre- ($r = 0.18$, $p = 0.19$) and middle ($r = 0.11$, $p = 0.43$) moments. The number of subjects was the same as the earlier MANCOVA analysis, 57, and had sufficient statistical power ($f^2 = 0.25$, $\alpha = 0.05$, Power = 0.80, two-tailed).

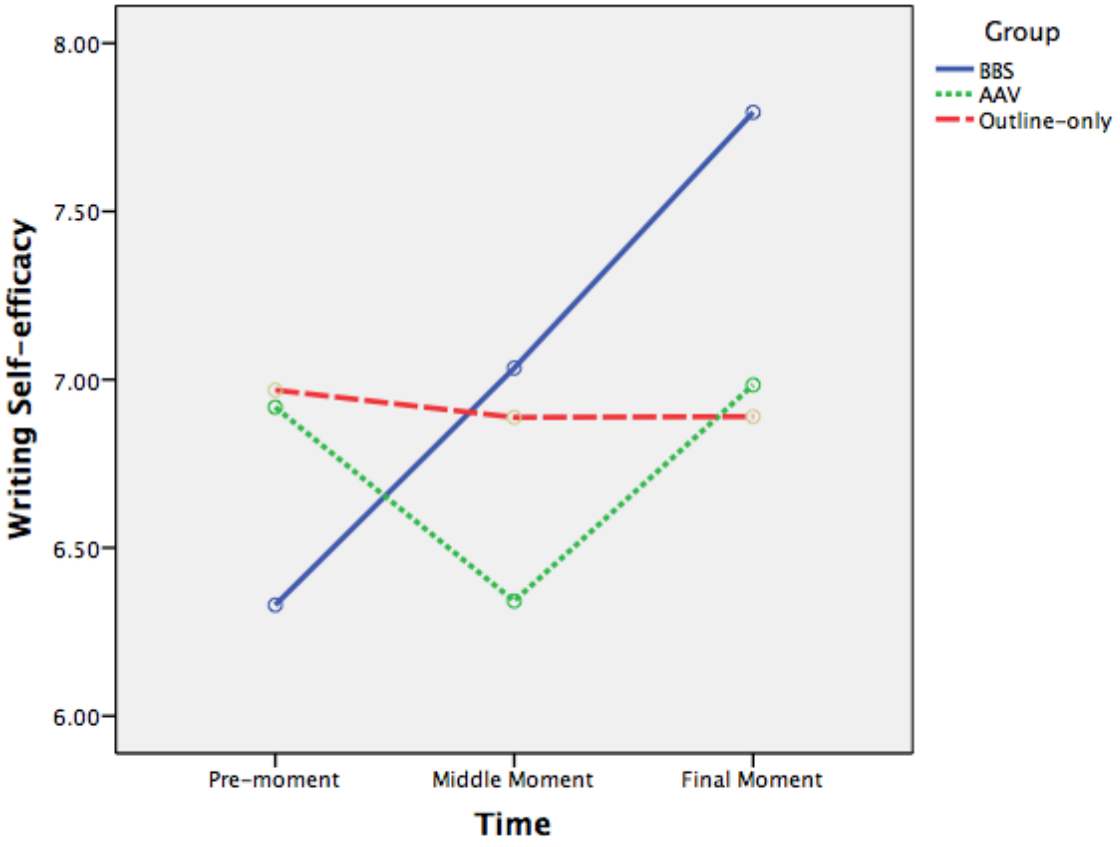
Before examining the multivariate tests, the data were examined for homogeneity and sphericity. Box's Test was not significant (Box's $M = 64.91$, $p = 0.1$), indicating that the DV covariance matrices were not equal and the analysis could proceed. Mauchly's Test of Sphericity (Mauchly, 1940) can be used to simultaneously determine if two assumptions are met before interpreting the *F* statistic in a repeated measures analysis. The Mauchly statistic tests if the DV variance-covariance matrices are homogenous (equal). Additionally, this statistic determines wither the correlations between the within-subjects levels are comparable. If Mauchly's Test of Sphericity is not statistically significant ($p > 0.05$), then sphericty can be assumed and the corresponding factors' F-statistics can be

interpreted. If Mauchly's Test is statistically significant ($p < 0.05$), then the Greenhouse-Geisser F-statistic must be used when interpreting F-statistics (Meyers, et al., 2006).

RQ_1 Findings

For this RM-MANCOVA analysis, Mauchly's Test of Sphericity was significant for writing self-efficacy (approximate chi-square = 7.28, $p = 0.026$). Since sphericity cannot be assumed, the Greenhouse-Geisser F-statistic was used. There was a significant interaction between writing self-efficacy over time and group levels ($F[3.54,93.75] = 6.07$, $p < 0.001$). Of note, there was no significant interaction between the covariate and writing self-efficacy ($F[1.70,93.75) = 2.30$, $p = 0.113$). See Figure 4.1 for a graph of the estimated marginal means of writing self-efficacy over time among the comparison groups. When examining Figure 4.1, it appears that writing self-efficacy increases over time in the BBS group compared to the AAV and outline-only groups.

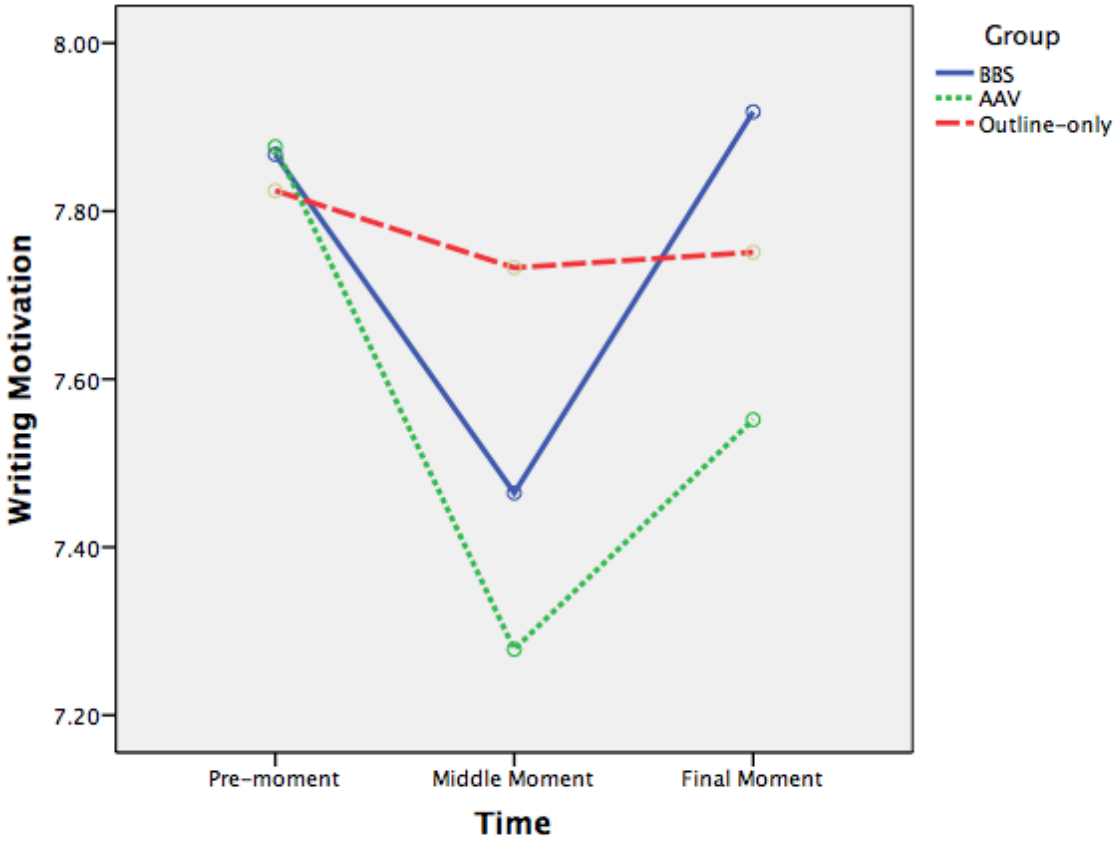
Figure 4.1. Estimated marginal means of writing self-efficacy over time (within-subjects) and among the BBS, AAV, and outline-only groups (between-subjects) (F[3.54,93.75] = 6.07, p < 0.001).



With writing motivation and the three groups, Mauchly's Test was not significant (approximate chi-square = 4.00, p = 0.13), indicating that sphericity can be assumed. Upon further examination of the data, writing motivation did not have significant group effects over time (F[2,106] = 0.53, p = 0.71). Additionally, writing motivation did not have significant effects with the covariate (F[2,106] = 0.87, p = 0.42). Interpreting these results, there is not a significant change in writing motivation over time. See Figure 4.2 for a graph

of the estimated marginal means of writing motivation over time among the comparison groups. While the difference in writing motivation between groups was not significant, this factor appears to decrease at the middle moment for both the BBS and AAV groups. The outline-only group, however, appears to stay relatively stable over time.

Figure 4.2. Estimated marginal means of writing motivation over time (within-subjects) and among the BBS, AAV, and outline-only groups (between-subjects) ($F[2,106] = 0.53$, $p = 0.71$).



Changes in Writing Self-efficacy

As there were significant effects between writing self-efficacy over time and the group condition, post-hoc tests were needed to explore the effects of any noticeable interactions. When an RM-MANCOVA demonstrates significant effects, as did writing self-efficacy over time in this study, there is not enough information in the F-value to determine the individual variables' magnitude and direction of effects. To do so, post-hoc tests must be conducted to compare the variables' means with independent t-tests. Using matrix algebra, the independent *t* post-hoc tests compared the writing self-efficacy means between the groups.

As the BBS group's writing self-efficacy appears to increase over time compared to the AAV and outline-only groups in Figure 4.1, contrasts were calculated between the groups' means at the different moments. Table 4.5 outlines the independent t-test values between the BBS group and the other two groups over time. The t values from the post-hoc tests assume the significance level of the RM-MANCOVA that compared the writing self-efficacy means over time between the groups ($F[3.54,93.75] = 6.07$, $p < 0.001$). From these contrasts (and the graph in Figure 4.1), the BBS group had the greatest increase in writing self-efficacy at the final moment compared to the AAV group ($t = 2.02$, $SE = 0.40$, $p < 0.001$) and the outline-only group ($t = 2.39$, $SE = 0.38$, $p < 0.001$).

Table 4.5

Contrasts between groups at the different time levels for writing self-efficacy with independent t-tests.

Comparison	Time	T-test (t)	Standard Error (SE)	Significance (p)
BBS vs. AAV	Pre-moment	-1.05	0.56	< 0.001
BBS vs. Outline-only	Pre-moment	-1.21	0.53	< 0.001
BBS vs. AAV	Middle Moment	1.32	0.53	< 0.001
BBS vs. Outline-only	Middle Moment	0.29	0.49	< 0.001
BBS vs. AAV	Final Moment	2.02	0.40	< 0.001
BBS vs. Outline-only	Final Moment	2.39	0.38	< 0.001

From these data, H_0 was rejected, as the BBS group's writing self-efficacy had significantly increased by the conclusion of the 10-week period when using digital stories as a pre-writing activity. However, there was not a significant difference between the groups with respect to writing motivation and using digital stories as a prewriting activity. Additionally, there was no significant difference in writing performance over time between the BBS, AAV, and outline-only groups. With respect to H_1, the hypothesis that all students who created digital stories have increased writing self-efficacy, writing motivation, and writing performance over time was rejected as well. Only the students in the BBS group had significantly increased writing self-efficacy. Overall, none of the groups had an increase in writing motivation and writing performance over time.

With regard to H_2, students in the AAV group did not demonstrate significantly increased writing self-efficacy, writing motivation, and writing performance over time compared to the BBS and outline-only groups. As stated earlier, the only significant finding was that the BBS group had increased writing self-efficacy over time compared to the AAV and outline-only groups. The next research question examines only the groups that created

digital stories, and explores the predictive value of digital story scores and collaboration group on the essay scores.

Research Question 2 (RQ_2)

The following research question, null hypothesis, and alternate hypothesis were proposed for this study:

How are the storyboard creation, digital story creation, and collaboration environment group (BBS or AAV) related to writing proficiency?

- *H_0: Storyboard creation, digital story creation, and the collaboration environment group do not significantly explain variance in writing proficiency.*
- *H_1: Storyboard creation, digital story creation, and the collaboration environment group significantly explain variance in the essay rubric score.*

For this analysis, only the BBS and AAV groups were examined and the outline-only group was not included. Due to the omission of the outline-only group, the sample size was reduced to 36. To examine the performance scores at the end of the study, only the final moment data for the storyboard scores, digital story scores, and essay scores were used for this analysis.

To examine RQ_2, a linear regression was performed on the final moment data, with the final essay score as the DV and the collaboration group (BBS or AAV), storyboard score, and digital story ("movie") score as the IVs. As only two out of the three groups were included in this analysis, the sample size was 36. As the earlier power analysis recommended a minimum sample size of 48 for a linear regression with three predictors ($f = 0.15$, $\alpha = 0.05$, Power = 0.80, two-tailed), caution must be exercised when interpreting the results of this analysis.

To initially examine the data before the linear regression analysis, a bivariate correlation analysis was run on the final essay, storyboard, and movie data from the final moment. By checking the correlations initially, a researcher can gauge the relationships between the DV and IVs (Meyers, et al., 2006). The storyboard scores were highly correlated with the essay scores ($r = 0.7$, $p < 0.01$) and the digital story scores ($r = 0.8$, $p < 0.01$). The digital story scores were highly correlated with the essay scores as well ($r = 0.8$, $p < 0.01$).

RQ_2 Findings

The data were then examined with a simple linear regression analysis. The group, storyboard, and digital story IVs were entered stepwise for the analysis. The first block contained the final digital story variable, as it had the highest correlation with the final essay variable. The second block added the final storyboard variable. For the third block, the group variable was added as dummy coded variables. During the analysis, SPSS excluded the storyboard and group variables, as they were not significant predictors of the final essay variable. See Table 4.6 for a list of the excluded variables and related data.

Table 4.6

Variables that were excluded from the regression model.

Coefficients	β	t	Significance (p)	Partial Correlation
Storyboard (Final Moment)	0.14	0.77	0.45	0.13
BBS Group vs. AAV Group	0.04	0.41	0.68	0.07

After excluding these variables and only including the digital story variable, the regression model accounted for 62% of the variability of the final essay scores ($R^2 = 0.62$, p

< 0.001). The regression equation was statistically significant ($F[1,34] = 54.79$, $p < 0.001$), justifying the examination of the regression coefficients (Meyers, et al., 2006). The constant was not significant ($\beta = -1.44$, $p = 0.58$). However, the digital story variable was a significant predictor of final essay score ($\beta = 0.88$, $p < 0.001$). Table 4.7 lists the coefficients for the regression model with only the digital story variable.

Table 4.7

Coefficients for the RQ_2 regression model where the only independent variable is the digital story score at the final moment.

Coefficients	**β**	**t**	**Significance (p)**	**95% Confidence Intervals**	
				Lower	**Upper**
Constant	-1.44	-0.56	0.58	-6.68	3.79
Digital Story (Final Moment)	0.88	7.40	< 0.001	0.64	1.12

From these results, H_0 was not rejected as the storyboard scores, digital story scores, and collaboration group membership together did not significantly predict the essay score at the final moment. While H_1 was rejected due to all independent variables not predicting the final essay score in the same regression equation, there is an alternate finding. When the digital story variable at the final moment is the only IV in the regression equation, it significantly predicted the final essay grade ($\beta = 0.88$, $p < 0.001$). These results must be interpreted with caution as the sample size ($N = 36$) was not at the minimum size for adequate power (minimum $N = 48$). For the next research question, the relationship between students' technology self-efficacy and writing self-efficacy is examined among all groups at the final moment.

Research Question 3 (RQ_3)

For RQ_3, the following question was proposed with a null and alternate hypothesis: *To what extent is student technology self-efficacy related to writing self-efficacy?*

- *H_0: There is no significant relationship between technology self-efficacy and writing self-efficacy in the three groups.*
- *H_1: There is a significant relationship between technology self-efficacy and writing self-efficacy.*

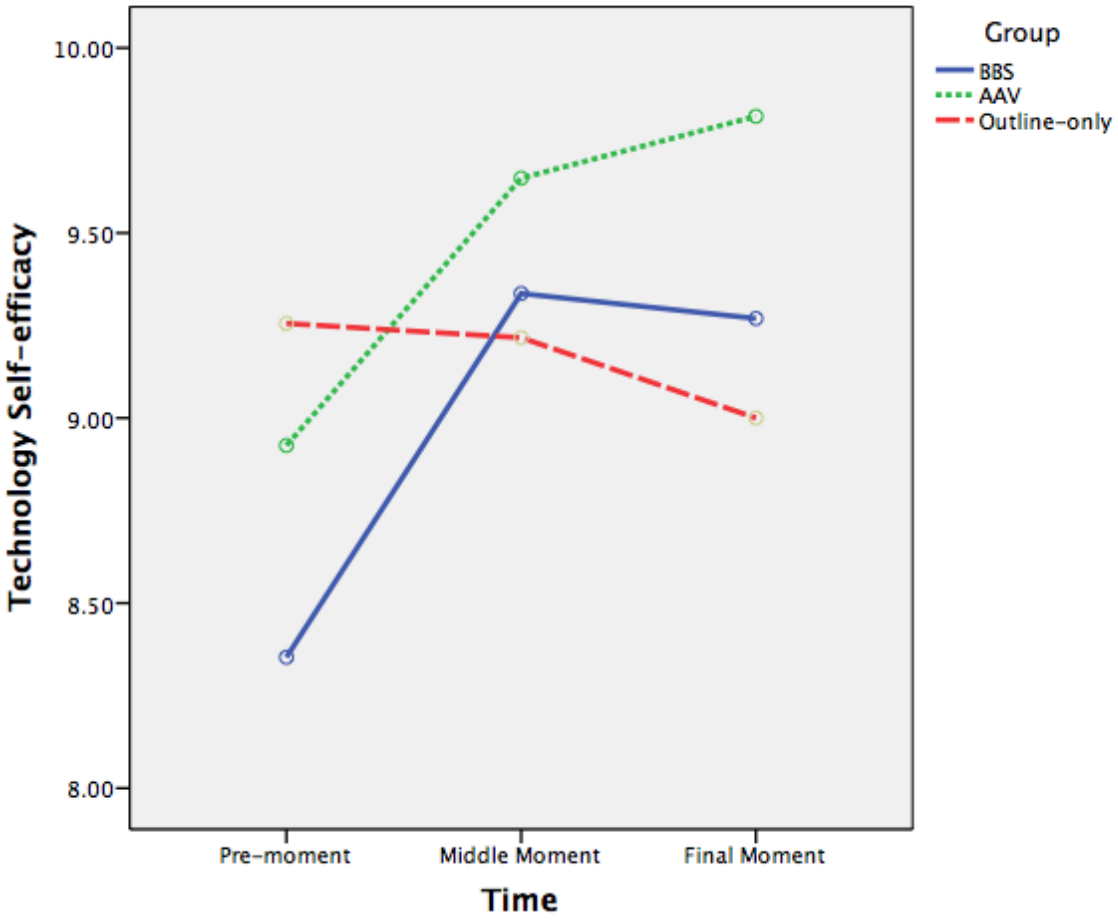
With RQ_1, it was found that students' writing self-efficacy significantly increased over time for the students in the BBS group. To get a better picture of how students' technology self-efficacy changed over time, a RM-MANOVA was conducted. The DV was technology self-efficacy at the pre-, middle, and final moments and the IV was the group variable. The sample size was 57, considered adequate for an RM-MANOVA with one IV ($f^2 = 0.25$, $\alpha = 0.05$, Power = 0.80, two-tailed).

The data were initially tested for homogeneity and sphericity resulting in a significant Box's M (Box's $M = 80.21$, $p < 0.001$), indicating that the covariance matrices of the dependent variables may be equal across all groups. While this finding might question the robustness of the F statistic, Tabachnick and Fidell (2001) stated that Box's *M* is very sensitive and if significant, can be ignored if the sample sizes are almost equal. As the sample sizes of the three groups are not significantly different ($F = 1.55$, $p = 0.22$), Box's *M* can be ignored.

Mauchly's Test of Sphericity was not significant (approximate chi-square = 2.16, $p = 0.34$), indicating that the F values can be interpreted from the analysis. There was a significant interaction of technology self-efficacy over time between the three groups

(F[4,106] = 3.79, p < 0.01). When examining the marginal means of technology self-efficacy between the groups over time (see Figure 4.3), the BBS and AAV group appeared to have increased technology self-efficacy while the outline-only group appears to slightly decrease over time. See Appendix N for the table of multivariate tests.

Figure 4.3. Estimated marginal means of technology self-efficacy over time between the BBS, AAV, and outline-only groups (F[4,106] = 3.79, p < 0.01).



To further interpret the F-statistic results, post-hoc tests with independent t-tests were conducted. Three contrasts between the groups were created. Data from the three

points in time were averaged together within each group. The means of the BBS group was compared to the means of the AAV and outline-only groups ($t = -1.31$, $SE = 0.25$, $p < 0.01$). The means of the AAV group was compared to the means of the BBS and outline-only groups ($t = 1.58$, $SE = 0.25$, $p < 0.01$). Lastly, the means of outline-only group was compared to the means of the BBS and AAV groups ($t = -0.28$, $SE = 0.24$, $p < 0.01$). As the RM-MANOVA was statistically significant at the $p < 0.01$ level, the t values in the post-hoc tests assume the RM-MANOVA's significance level ($F[4,106] = 3.79$, $p < 0.01$). From these results, it appears that the greatest differences with technology self-efficacy over time occurred with the AAV and the BBS groups compared to the outline-only group.

For further post-hoc tests, contrasts to compare the AAV and BBS groups with the outline-only group were calculated at the final moment. Comparing the BBS group to the outline only group, there was a mean difference of $t = 0.70$, $SE = 0.38$, $p < 0.01$. The comparison of means between the AAV group and the outline only group resulted with $t = 2.13$, $SE = 0.38$, $p < 0.01$. The AAV group and the BBS group had a mean difference with technology self-efficacy of $t = -1.37$, $SE = 0.40$, $p < 0.01$. From these results, it appears that the AAV group had a larger difference in means compared to the BBS group and the outline-only group. While RQ_3 does not aim to investigate changes in students' technology self-efficacy over time, it is beneficial to know how student's self-efficacy changed over the course of the study. As RQ_3 aims to investigate the relationship between technology self-efficacy and writing self-efficacy, these findings shed light on levels of technology self-efficacy over the course of the study and at the final moment.

To initially measure the relationship between technology self-efficacy and writing self-efficacy, data were examined using a bivariate correlation analysis. A common

bivariate correlation statistic is the Pearson *r*, as it indexes the extent of a linear relationship between two quantitatively measured variables (Meyers, et al., 2006). Cases were arranged pairwise, so that the data from each variable was paired for each subject (Meyers, et al., 2006). Technology self-efficacy and writing self-efficacy scores across all three groups were paired at the pre-, middle, and final moments (N = 57). All pairings were moderately correlated (Cohen, 1998) and increased over time both in correlation and significance. Table 4.8 lists the correlations at these moments.

Table 4.8

Correlations between Technology Self-efficacy (TSE) and Writing Self-efficacy (WSE) at the pre-, middle, and final moments.

Pair	**Correlation (*r*)**	**Significance (p)**
(Pre) TSE and WSE	0.29	< 0.05
(Middle) TSE and WSE	0.35	< 0.01
(Final) TSE and WSE	0.42	< 0.001

To further analyze the relationship between technology and self-efficacy, a simple linear regression was performed. The sample size is adequate for this analysis as it should be a minimum of 48 for a simple linear regression with three predictors ($f = 0.15$, $\alpha = 0.05$, Power = 0.80, two-tailed). Since the correlation between technology self-efficacy and writing self-efficacy appeared to be the strongest and most significant at the final moment, data at this time point was used in the regression equation. For this analysis, the DV was writing self-efficacy at the final moment. The predictors (IVs) were added in a stepwise

manner, with technology self-efficacy at the final moment as the first predictor. Next, the group variable (dummy coded as two variables) was added to the regression equation as a second block.

RQ_3 Findings

With the first regression model where technology self-efficacy was the only predictor, 18% of the variance was explained ($R^2 = 0.18$, $p < 0.01$). The regression equation significantly accounted for the relationship between the variables ($F[1,55] = 12.10$, $p < 0.01$). Further, technology self-efficacy significantly predicted writing self-efficacy ($\beta = 0.47$, $p < 0.01$). For the second regression model where the group variables were added, the variance did not significantly increase (R^2 change = 0.04, $p = 0.18$). The group variables were not investigated further as group membership did not have an additional effect on the regression equation. See Table 4.9 for the regression coefficients of the first model (technology self-efficacy only) and Table 4.10 for the regression model with the group variables.

Table 4.9

The regression model with technology self-efficacy at the final moment as the only predictor.

Coefficients	β	t	Significance (p)	95% Confidence Intervals	
				Lower	Upper
Constant	2.83	2.23	0.03	0.28	5.37
Technology Self-efficacy (Final Moment)	0.47	3.48	< 0.001	0.20	0.74

Table 4.10

The regression model with technology self-efficacy and the group variables as the predictors. (No significant change in R^2 [p = 0.18] from the model in Table 4.9.)

Coefficients	β	t	Significance (p)	95% Confidence Intervals	
				Lower	Upper
Constant	2.50	1.96	0.03	0.28	5.37
Technology Self-efficacy (Final Moment)	0.49	3.51	< 0.001	0.21	0.76
BBS Group vs. Outline-only Group	0.61	1.55	0.13	-0.18	1.40
AAV Group vs. Outline-only Group	-0.08	-0.19	0.85	-0.89	0.74

Due to these results, H_0 was rejected and H_1 was not rejected. From the correlation data, the relationship between technology self-efficacy and writing self-efficacy appeared to increase over time due to the use of the technology. From the regression results, it appeared that technology self-efficacy significantly predicts writing self-efficacy when the group condition is excluded from the regression model. This suggests that, independently of how students collaborated or participated in the digital story activity, there is a close relationship between technology self-efficacy and writing self-efficacy when students are using technology in a writing lesson.

Summary

From these results, there was no significant difference in writing performance among the three groups (BBS, AAV, and outline-only), suggesting that using digital stories as a pre-writing activity does not improve writing performance within a 10-week period. However, students that participated in the digital story activities in the BBS collaboration

group had a significant increase in their writing self-efficacy ($F[3.54,93.75] = 6.07$, $p < 0.001$). With regard to writing motivation, there was no significant difference between the three groups.

When examining the storyboard and digital story components of the interaction, the storyboard score (at the final moment) and collaboration group were not significant predictors of the final essay score. The digital story score was a significant predictor of the final essay score ($\beta = 0.88$, $p < 0.001$), however, caution should be used when interpreting this result as the sample size was not adequate. With regard to the relationship between technology self-efficacy and writing self-efficacy, the correlation between the two factors increased over time among all groups, especially at the end of the study ($r = 0.42$, $p < 0.001$). Further, it appears that technology self-efficacy predicted a student's level of writing self-efficacy at the end of the study ($\beta = 0.47$, $p < 0.01$). This finding is independent of whether or not a student participated in a digital story activity. In the next chapter, these results will be related to existing research and any implications will be discussed.

CHAPTER V

DISCUSSION AND CONCLUSIONS

Introduction

This study examined the impact of digital storytelling as a planning activity for developing narrative writing skills among 9th grade students. Three English classes taught by the same teacher participated. Each class was assigned to an experimental group: an outline-only group, a BBS (bulletin board system) group, and an AAV (asynchronous audio/visual) group. The BBS and AAV groups created digital stories as a prewriting planning activity while the outline-only group did not. Each group used different methods to support collaboration, discussions, and teacher/peer feedback. While the outline-only group collaborated solely in class, the BBS group collaborated using a web-based text and static image discussion forum (i.e., Google Groups). The AAV group used a web-based asynchronous audio/visual (i.e., video conferencing) collaboration program.

To help promote gains in writing performance, this study was developed on both epistemological and pedagogical foundations as presented in chapter one. In chapter two, Bandura's (1986) social cognitive theory was presented as a way to investigate relationships between the various factors that may affect learning to write. Social cognitive theory encompasses three main factors with reciprocal interactions: behavioral factors, personal factors, and environmental factors. These three factors can affect each other in varying degrees of magnitude and direction and can contribute to human learning.

Writing self-efficacy (Pajares, 2003; Pajares & Valiante, 2006; Pajares, et al., 2007) and writing motivation (Pajares, 2003) as personal factors can affect students' writing

performance. Instructional methods can increase these variables and, in turn, contribute to improved writing performance. Writing self-efficacy and writing motivation were supported through modeling and feedback in different collaboration environments and were measured in this study. Behavioral factors, such as aligning performance goals to the Common Core State Standards (CCSS) and scaffolding student learning, were also considered and measured with students' storyboard and essay scores. Lastly, the collaboration setting, the technology used in the study, and how students planned their writing artifacts all contributed to the learner's environmental factors. Initially, students' personal, behavioral, and environmental factors were examined in conditions where students used either digital stories or written outlines as a prewriting activity.

Research Question 1

The first research question examined the relationships digital storytelling and the collaborative environment could have on students' writing performance (a behavioral factor), writing self-efficacy, and writing motivation (both personal factors). In this study, digital storytelling was defined as a planning activity designed to help students organize their writing of a narrative essay. Planning, as a prewriting activity, can be a highly effective method for improving students' writing performance (Graham & Perin, 2007a). Graham and Perin (2007a) also reported that visual representations to help organize writing also aids in developing writing skills. Students who created digital stories either collaborated in a BBS environment or in an AAV environment. These kinds of collaborative and supportive environments, in addition to classroom discussion, are considered environmental factors (Bandura, 1986) in this study. Students were placed into three different groups to gauge the effects of these collaborative environments with and without

digital storytelling. Three 9th grade English classes taught by the same teacher served as the comparative groups.

Each class was given a different prewriting condition. The first class created digital stories to plan their writing and used Google Groups (the "BBS" group) for sharing their digital stories and giving peer feedback. The second group (the "AAV" group) also created digital stories but used an audio/visual collaborative environment (the Prism program). The outline-only group did not create digital stories but typed outlines in Google Docs to plan their narrative essays. Additionally, the third class collaborated face-to-face within the classroom instead of using a software application to support the sharing of ideas and receiving peer feedback. All classes used Google Docs to type their essays and receive teacher feedback on their writing.

Writing Performance and Digital Stories

Researchers have suggested that digital storytelling can help adolescent students learn the language arts in the classroom by promoting students' connections to reading and writing (Benson, 2008; Sylvester & Greenidge, 2009; Siegle, 2009). These authors also recommended that students who learn better through visual and auditory modes may benefit from digital storytelling activities. Others have suggested that digital story activities can help motivate and engage high school students to participate in writing activities (Burn & Reed, 1999). However, these studies have not provided empirical evidence to support these assertions. In the research literature, there is an overall lack of evidence demonstrating writing performance gains with elementary through high school students when using digital storytelling activities (Robin & McNeil, 2012).

While there may not be strong connections in the research literature between digital storytelling and learning to write among adolescents, it is still possible to use digital storytelling exercises in specific ways to promote writing skills. The integration of a visual planning exercise into a writing lesson could better assist students with writing than a non-visual planning exercise alone (Graham & Perin, 2007a). The inclusion of Mayer's (2009) principles of multimedia learning into the digital story lessons (as in this study) can aid with creating videos that effectively convey the meaning of the stories.

Over the course of the study, students' essay scores were measured at three time points between the three groups: a pre-moment (before the digital story activities), a middle moment (after the first digital story and essay writing), and a final moment (after the second and last digital story and essay writing activity). These scores were compared between the three groups to measure any differences. Some have argued that digital storytelling as a visual prewriting planning activity should increase writing performance over time (e.g., Benson, 2008; Graham & Perin, 2007a; Sylvester & Greenidge, 2009; Siegle, 2009). However, there were no significant differences with students' essay scores between the three groups ($F[6,104] = 1.08$, $p = 0.38$) at the end of the study, suggesting that digital stories (and the collaboration condition) did not have a significant effect on students' writing performance over a 10-week period.

In this study, the collaborative groups (BBS, AAV, and outline-only [i.e., discussions within the classroom]) were viewed as supportive environments that could scaffold learning to write. Scaffolding within a technology-enhanced learning environment (TELE) provides social and cognitive supports as students solve problems (Kim & Hannafin, 2011). The different technology collaboration environments were designed to help scaffold

students' digital stories by supporting their writing and facilitating teacher and student feedback. Teacher feedback is essential for digital story creation (DeVoss et al., 2010) and writing (Graham & Perin, 2007a). However, in this study, the teacher did not have time to provide students with feedback on their storyboards and digital stories in the collaboration environments. Instead, the teacher provided feedback on the digital stories only in the classroom. Additionally, the teacher gave feedback on students' writing within Google Docs using the comment facility. A future study on this topic should encourage the teacher to provide feedback within the TELE.

In the BBS and AAV groups, the students provided peer feedback rather than assistance on each other's storyboards and digital stories in the collaboration environments. This feedback varied in quality and consistency. Graham and Perin (2007a) cautioned that writing research lacks consistent evidence where peer feedback can help improve writing skills. Nelson and Schunn (2009) stated that adolescents more often do not have mastery skills in writing and therefore have trouble providing adequate performance feedback to their peers. Graham and Perin (2007a) recommended that, instead of feedback, peer assistance can be an effective instructional process to include to improve writing skills (Cohen's $d = 0.75$). Future studies on writing should focus on peer assistance rather than peer feedback. It is possible that students' varied quality and quantity of feedback affected the results.

Another confounding factor that likely contributed to the lack of statistical significance was the change of inter-rater agreement over time. Two people (the students' teacher and an outside rater) scored all of the essays. The pre-test scores had an intra-class correlation (ICC) in the excellent range (ICC = 0.76, $p < 0.001$). The middle moment

essay scores had an ICC in the good range (ICC = 0.67, $p < 0.001$) and the final moment essay scores were in the fair range (ICC = 0.40, $p < 0.05$). Essay scores for each student were averaged together from the raters' scores. The decrease in agreement, especially at the final moment, could have contributed to a lack of statistically significant difference between groups' essay scores. As the raters' scores diverged, so did the assessment preciseness of students' writing performance. While writing performance did not significantly change over time between the groups, writing self-efficacy, a contributing personal factor to writing performance, did improve.

Writing Self-efficacy and Digital Stories

As writing self-efficacy and writing motivation can affect (and in the case of self-efficacy predict) writing performance (Pajares, 2003; Pajares & Valiante, 2006; Pajares, et al., 2007), these two factors were measured to address the first research question. Since the students in the two digital story classes collaborated differently, they were treated as separate groups. The writing self-efficacy of students in the BBS group significantly increased over time compared to the AAV and outline-only groups ($F[3.54,93.75] = 6.07$, $p < 0.001$). This finding suggests that the kind of collaborative environment paired with the digital story activity can have a positive affect on students' writing self-efficacy. Pajares et al. (2007) found that students' mastery experiences with writing and the quality of feedback on their writing can both be significant predictors of writing self-efficacy. Girasoli and Hannafin (2008) proposed that an AAV learning environment could better support feedback and modeling (compared to a text-based BBS environment) to increase academic self-efficacy.

However, in this study, the AAV collaborative environment did not contribute to increasing students' writing self-efficacy while the BBS environment did. As mentioned earlier, the BBS and AAV environments were meant to facilitate feedback and scaffolding supports for the students with their digital story activities. Feedback and modeling, both sources of self-efficacy, can contribute to students' writing self-efficacy (Pajares, 2003; Pajares & Valiante, 2006; Pajares, et al., 2007). The AAV environment was expected to increase students' writing self-efficacy (Girasoli & Hannafin, 2008) but did not. It is possible that feedback on digital stories is better facilitated in a BBS environment, rather than an AAV environment.

Olson (1990) found that peer feedback with writing, while helpful, did not consistently aid in improving writing between drafts. Relatedly, Graham and Perin (2007a) found a lack of consistent findings with regard to peer feedback and writing. Adolescents can have a difficult time providing effective feedback that includes solutions if they do not have the mastery experiences needed for identifying solutions (Nelson & Schunn, 2009). The lack of teacher feedback and ineffective peer feedback may have contributed to the AAV environment not providing the kind of results as expected.

A major difference between the AAV and BBS environments was the amount of writing that students had to perform. Students in the BBS group had to post their storyboards along with text descriptions of each scene. These students also had to provide written feedback to each other in the BBS environment. In contrast, students in the AAV group did not have to write text descriptions of each scene when posting to the AAV. The scene descriptions were instead provided as an audio narration. Also, students in the AAV group did not have to give feedback in writing to each other – as an alternative, students

recorded a video message. As self-efficacy is task specific, and writing self-efficacy (not digital story self-efficacy) was being measured, it is probable that the additional writing activities of the BBS group contributed to their statistically significant increase in writing self-efficacy. As students gain mastery experiences with writing, there should also be gains with their writing self-efficacy (Pajares, 2003; Pajares & Valiante, 2006; Pajares, et al., 2007).

There was also a dip in writing self-efficacy with the AAV group at the middle moment. As mentioned before, these students did not perform as many writing activities as the students in the BBS group. The students in the AAV group had to create more audio/visual artifacts than the students in the BBS group due to the storyboard and discussion activities. It is possible that the increased video production and reduced writing activity contributed to the momentary drop in writing self-efficacy. An AAV discussion could contribute to academic self-efficacy by facilitating vicarious experiences and social persuasion (Girasoli & Hannafin, 2008). However, an AAV environment may not be beneficial for supporting writing self-efficacy within a digital story activity.

While it can't be said that a digital story activity alone can increase students' writing self-efficacy, it appears that the kind of collaborative environment can increase (or decrease) the effectiveness of the digital story lessons. In this study, the BBS group experienced higher levels of writing self-efficacy by creating digital stories and discussing them in Google Groups. As writing self-efficacy can predict writing performance (Pajares & Johnson, 1996), it is possible that if the digital story activities continued for a longer duration, there may have been an increase in writing performance at a later time with the BBS group.

Writing Motivation and Writing Performance

Students' writing motivation and writing performance did not significantly change over time in all groups. This finding contradicts some researchers' assertions that digital storytelling can increase writing motivation (Burn & Reed, 1999; Grisham & Wolsley, 2006; Ohler, 2013). When examining the surface details of Figure 4.2, it appears that students in the BBS and AAV groups experienced a dip in writing motivation after beginning the digital story activities. The outline-only group appears to have experienced an almost steady level of writing motivation over time. As reviewed earlier, Bruning and Horn (2000) recommend four factors that can contribute to motivation in writing. These are: nurturing positive beliefs about writing, fostering student engagement, providing a supportive context, and creating a positive emotional environment.

The teacher provided feedback that supports students experiencing a reduction in engagement at the middle moment. He remarked that that the digital story activities took longer than the students wanted. He also mentioned that the students felt a lot more work was required than they expected for creating the storyboards, filming the digital stories, and consequently editing the stories. When the second digital story activity began, the teacher said that students were a little exasperated and some didn't want to do the activity immediately again. The teacher recommended that the digital story activities could be made shorter and mixed with other prewriting activities – maybe by having outline-only planning activities interspersed with digital story activities.

From the researcher's point of view, there were a few concerns with the storyboard component of the digital story activity. For both the BBS and AAV groups, students created their storyboards using the Storyboard app. This required students to develop each scene

by choosing from a library of characters and backgrounds. As students needed to choose a storyboard element that was appropriate, extra time was needed for the student to research and choose each element. Sometimes, the student had to research an appropriate backdrop image from the Internet using the Safari app. This also added to the time needed to develop the storyboards.

The students in the BBS group had to export each scene as an image, post the scenes (as static pictures) in Google Groups, and then type accompanying text to describe each scene. The smaller student groups in the BBS class then provided feedback on each other's storyboard in Google Groups. Students in the AAV class required more time to post their storyboards. Not only did they have to export their scenes as images, they also had to create mini-digital stories with these images. Students created videos with their scenes and provided narration instead of typing the scene descriptions, as the BBS group did in Google Groups. Within each smaller student group in the AAV class, students shared their storyboard videos with each other for video feedback in the Prism program.

For future studies, the storyboard component should be shortened to a more manageable period of time. Instead of one week to work on storyboards, students should spend two classroom periods on the activity. Using the Storyboard app appeared to contribute to the length of time needed to complete the storyboards. The app was oftentimes challenging to use. The AAV group had to spend more time and effort on their storyboards, as they had to create a narrated slideshow of their scenes. As an alternative, students could create the scenes using a paper and pencil method to draw the storyboard elements and write the scene descriptions (Tobin, 2012). By using the pencil-and-paper method, students could develop a storyboard at home after the first classroom lesson and

subsequently review and revise the storyboards during the second lesson. By using these methods, the storyboard activity could occupy a shorter interaction with the students.

It is possible that the time required of the activities, the teacher's perceived lack of engagement by the students, and lack of novelty between the activities contributed to the lack of a statistically significant change in students' writing motivation. Student engagement is an important factor that contributes to writing motivation (Bruning & Horn, 2000). The appearance of a reduction in motivation with the BBS and AAV groups at the middle moment (in Figure 4.2) might be a result of the students' reaction to the amount of work needed to complete the digital story activity compared to writing an outline alone (as normally performed). Also, the BBS and AAV groups' writing motivation seems to be in an upward trend by the final moment. Further, the BBS group appears to have a higher level of writing motivation than the AAV group at the final moment. As students' writing motivation and writing self-efficacy can be interrelated (Bruning & Horn, 2000; Pajares & Valiante, 2001; Pajares & Valiante, 2006), the BBS group's increased motivation is most likely related to the BBS group's significant increase in writing self-efficacy. It is possible that a longer interaction with digital story lessons may produce a statistically significant increase in writing motivation with the BBS group.

Research Question 2

For the second research question, the storyboard scores, digital story scores, and the TELE group (BBS and AAV) were examined to explore if any of these variables predicted writing performance. Only data from the students in the two digital story groups were examined, as the research question's focus was on the processes involved between digital story creation and writing the essays. Due to the smaller sample size of including

only two out of the three classes (N = 36), the statistical power was below the recommended threshold (minimum N = 48). Therefore, the results must be interpreted with caution. Data from the final moment was used to measure the impact of the complete 10-week interaction.

Collaboration Group as a Predictor

From the results, group membership was not a significant predictor of an essay score ($\beta = 0.14$, $p = 0.45$). This is to be expected, as there was no significant difference between all three groups with respect to writing performance over time ($F[6,104] = 1.08$, $p = 0.38$) from the previous research question's analysis. These two findings suggest that students in the BBS and AAV groups had not experienced a statistically significant difference in writing performance after the 10-week period.

As explained earlier, the purpose of the BBS and AAV technologies were meant for supporting students' writing self-efficacy. As writing self-efficacy can predict writing performance (Pajares & Johnson, 1996), and the BBS group had a higher level of writing self-efficacy, it is possible that the group variable would predict writing performance at a later time. This would be dependent upon, of course, if the digital story activities continued to increase students' writing self-efficacy. Since the group variable did not significantly contribute to the overall regression equation, it was removed from the analysis. Next, the storyboard performance variable was examined for its contribution to the digital storytelling process.

Storyboard Performance as a Predictor

Similar to the group variable, a student's storyboard score did not predict his or her essay score ($\beta = 0.04$, $p = 0.68$). This may be due to the varying forms and methods of

storyboard creation between the two groups as discussed earlier. While a storyboard activity is recommended as a method for planning the digital story (Robin & McNeil, 2012; Tobin, 2012), it is possible that the storyboarding methods used in this study weren't effective. As discussed in the first research question, extra time and effort to create storyboards could have contributed to students' decreased writing motivation. Additionally, the teacher did not provide feedback on the students' storyboards. This may have led to students creating storyboards that were not adequate plans for their digital stories. The lack of significance for the storyboard factor could also be a result of the reduced statistical power. As the group and storyboard predictors did not significantly contribute to the overall regression equation, they were removed.

Digital Story Performance as a Predictor

When the digital story score was included in the regression equation as the only predictor, the regression model was statistically significant ($F[1,34] = 54.79$, $p < 0.01$). This model was able to explain 62% of the overall variance with the final essay scores ($R^2 = 0.62$, $p < 0.001$). The digital story factor significantly predicted the essay score ($\beta = 0.88$, $p < 0.001$). The regression constant was not significant ($\beta = -1.44$, $p = 0.58$), possibly due to the lack of statistical power with the reduced sample size. With caution (due to the lack of statistical power and the non-significant coefficient), a student's essay score could be calculated with the following equation: Student's Essay Score = (Digital Story Score * 0.88) – 1.44. Both the essay and digital story scoring used a 25-point rubric; this equation implies that a student's essay score would be less than his or her digital story score. (For example, a student scoring a 25/25 on the digital story would score approximately 20/25 on the essay.)

This finding suggests that there may be a statistical relationship between a 9th grade student's digital story performance and their writing performance after a 10-week digital story activity. However, as mentioned earlier, caution must be used with this interpretation, as the analysis lacked statistical power and the coefficient was non-significant. While this research question aimed to examine how the storyboard and digital story activities contributed to writing performance, the next research question examines the relationship between students' technology self-efficacy and writing self-efficacy in all groups.

Research Question 3

Technology self-efficacy is similar to the concept of writing self-efficacy as they both describe one's confidence in a specific task: the use of technology or the process of writing. Both dimensions fall within Bandura's (1986) personal factors. Girasoli (2006) proposed that a student's academic self-efficacy could be linked to his or her technology self-efficacy, depending on how the technology was used to support the student's learning. Girasoli (2006) also hypothesized that, if a technology-enhanced learning environment was constructed to support a student's academic self-efficacy, then, as the student's confidence in the technology increased, so should the student's academic self-efficacy.

Students' Technology Self-efficacy

Bandura (1997) states that self-efficacy is task-specific and there should not be any generalizations between different kinds of self-efficacy. (For example, one can consider algebra self-efficacy, calculus self-efficacy, and multiplication self-efficacy as separate processes rather than a general, mathematics self-efficacy.) In this light, technology self-efficacy and academic self-efficacy should not be viewed as being directly connected to

each other. Each kind of self-efficacy should be viewed as a separate process, acting within an individual's personal factors (Bandura, 1986). However, Bong (1997) and Pajares (1996) have suggested that relationships between two, different kinds of self-efficacy may occur when skills from these two domains are co-developed.

In this study, the kind of technology self-efficacy measured was the confidence students have when using iPads. The iPad tasks can be surfing the web, taking pictures, word processing, and creating movies (Girasoli, 2012). Students in the outline-only group used the iPads for performing research with the Safari app (a world-wide web browser) and for typing their outlines and essays in Google Docs with the Google Drive app. Students in the BBS and AAV groups used the iPads for the same tasks along with additional activities. For example, students in the BBS and AAV groups used the Safari app to download images to use in their storyboards and digital stories. Additionally, students in these groups used the iMovie app to create their digital story videos.

In this study, over the 10-week period, there was a significant difference between the three groups' technology self-efficacy ($F[4,106] = 3.79$, $p < 0.01$) (see Figure 4.3). Initially, from the pre-test data, students in the BBS and AAV groups had lower levels of technology self-efficacy than the outline-only group. As time progressed, the BBS and AAV groups experienced an increase in technology self-efficacy. At the end of the study, the BBS and AAV groups had higher levels of technology self-efficacy compared to the outline-only group, with the AAV group having the highest level ($t = 2.13$, $SE = 0.38$, $p < 0.01$).

As the technology self-efficacy subscale on the survey measured tasks such as using iMovie, taking pictures, and importing images from Safari on the iPad, it is understandable that the BBS and AAV groups had gains in this dimension over time. The BBS and AAV

groups had to do these tasks to create their digital stories while the outline-only group did not. The outline-only group only performed word processing and research tasks on the iPad using the Google Drive and Safari apps. These tasks were measured only on a portion of the items in the technology self-efficacy subscale (Girasoli, 2012). These considerations are mentioned only to clarify what tasks a person should master to have a high level of technology self-efficacy in this study.

Relationships Between Technology Self-efficacy and Writing Self-efficacy

To initially examine any relationships between technology self-efficacy and writing self-efficacy in this study, correlations were calculated between the two dimensions at each of the three time points for the total sample. By the end of the study, the correlation between the two factors had increased slightly with their relationship as well as the significance of the correlation (pre-moment $r = 0.29$, $p < 0.05$; middle moment $r = 0.35$, $p < 0.01$; final moment $r = 0.42$, $p < 0.001$). These correlations don't imply that one kind of self-efficacy is causing the other, however, there is a mediating relationship occurring between them.

A linear regression analysis was performed on the data from the final moment to examine the relationships between the two factors. The final moment was chosen as it had the strongest correlation between writing self-efficacy and technology self-efficacy among the three groups and could help gauge the effects of the 10-week interaction. Writing self-efficacy was the independent variable while technology self-efficacy was the predictor. Similar to the linear regression equation for the second research question, the group variable was initially included in the analysis as a predictor. The inclusion of the group

variable did not contribute to an overall significant change in the equation (BBS vs. outline: $\beta = 0.61$, $p = 0.13$; AAV vs. outline: $\beta = -0.08$, $p = 0.85$) and was removed.

The lack in significance with the group factor was surprising, as one would expect a difference between the BBS and AAV groups versus the outline-only group. From the technology self-efficacy repeated measures analysis, the BBS and AAV groups had significantly increased technology self-efficacy over time while the outline-only group did not. Additionally, from the first research question's analyses, the BBS group had the most significant gains in writing self-efficacy over time compared to the other groups. The lack of significance with the group factor indicates that overall, group membership does not contribute to predicting one's writing self-efficacy at the final moment. Rather, one must consider the group membership over time with writing self-efficacy as found in RQ_1.

When technology self-efficacy was the only predictor in the regression equation, the regression model accounted for 18% of the overall variance in writing self-efficacy scores ($R^2 = 0.18$, $p < 0.01$). Further, technology self-efficacy significantly predicted writing self-efficacy ($\beta = 0.47$, $p < 0.01$). From the regression model, a student's writing self-efficacy score can be predicted with the following equation: Writing Self-efficacy Score = 2.83 + (Technology Self-efficacy Score * 0.47). From these results, students' technology self-efficacy has a linear relationship with writing self-efficacy due to the co-development of technology and writing skills.

When examining these results in light of Bandura's (1986) model of triadic reciprocal determinism, a student's technology self-efficacy and writing self-efficacy can be personal factors. As personal factors are influenced by (and influence) environmental and behavioral factors, it appears that students' writing and technology performance (as

behavioral factors) are influencing students' personal factors. It is possible that, as students gain confidence in using the technology to support writing skills, their writing confidence also increases.

Limitations

With any quasi-experimental design due to lack of randomized control, there are threats to internal and external validity that need to be addressed (Campbell & Stanley, 1963). Explained in detail at the end of the first chapter, there can be concerns with history (e.g., students' previous experience with iPads), testing (e.g., students' not placing enough effort into subsequent surveys), and selection (e.g., students were from a convenience sample). Additionally, there can be concerns of diffusion of treatments (e.g., students in different classes discussing their activities), and multiple treatment interference (e.g., difficulty in controlling the effects of prior treatments).

While this study aimed to explore the use of digital storytelling to improve writing performance among 9th grade students, caution must be exercised when attempting to generalize the results to the entire national 9th grade population. The students that participated in this study were a convenience sample. Additionally, all students had the same teacher. The teacher may have biases towards students that could affect their performance ratings or self-efficacy outcomes. The teacher may also have an instructional style that differs from high school teachers in a national population.

Students were not randomly assigned to the within-class student groups in this study. While the three classes were randomly chosen for the over-arching BBS, AAV, and outline-only groups, purposeful grouping was used to balance the skill levels of the within-

class discussion groups. This kind of grouping can have many opportunities for error as the participants don't have an independent opportunity to be chosen (Kerlinger, 1986).

There were also some sample size limitations with the analyses for the factor analysis and three research questions. With the factor analysis, the sample size (N = 57) was between the "very poor" to "poor" level (Comrey & Lee, 1992). Meyers, et al. (2006) recommend a sample size of at least 200 for a factor analysis. The sample size for the RM-MANOVA in the first research question's analysis was at the minimum level for acceptable power (N = 57). With the second research question, the sample size (N = 36) was below the minimum for adequate statistical power (N = 48). Lastly, for the RM-MANOVA analysis of technology self-efficacy among groups in the third research question's analysis, the sample size (N = 57) was at the minimum level for acceptable power. These sample sizes and corresponding statistical power should be considered when interpreting this study's results. Future studies might consider analyzing the last section of the survey (items 20 - 28) as a separate factor. These items were meant to measure writing motivation. When included in this study's factor analysis, some items were factored as writing self-efficacy.

With the first research question, the 8th grade EXPLORE writing scores (as the covariate) did not correlate with the middle essay scores ($r = 0.17$, $p = 0.20$). The EXPLORE scores were chosen as a covariate to control for students' prior writing performance. This covariate did correlate moderately with students' pre-test essay scores ($r = 0.43$, $p < 0.001$) and strongly with final essay scores ($r = 0.51$, $p < 0.001$). However, the low correlation with the middle essay scores may have contributed to the non-statistically significant findings with the MANOVA and the lack of statistical significance with the covariate in the RM-MANOVA. Additionally, Pajares (2003) advises previous test scores, when used as a

covariate, might be confounded by prior levels of self-efficacy. Due to these findings, the EXPLORE English score may not be an adequate covariate for analyzing writing performance a year after a student has taken the EXPLORE test.

This study used self-report instruments for measuring self-efficacy and motivation. There are reliability and validity limitations concerns as social desirability effects are possible (Thorndike, 2005). Rubrics were also used to assess students' writing performance. While there was inter-rater agreement between the two people who scored the essays, there can be challenges when using rubrics. Sometimes, a rater may not follow the rubric while scoring and instead, grade the student holistically rather than by dimension as specified (Kohn, 2006; Lumley, 2002; Rezaei & Lovorn, 2010).

To ensure reliability with students' essay scores, the teacher and an outside individual separately graded all essays. The ICC was in the fair range for the final test scores ($ICC = 0.40$, $p < 0.05$). The lower level of agreement between the two raters may have affected the results in this study. For the factor analysis, the sampling adequacy was at the "very poor" to "poor" level (Comrey & Lee, 1992). As the sample size (N = 57) was below the recommended level for a "fair" factor analysis (N = 200) (Meyers, et al., 2006), the subscale factors are limited in their impact on the overall study. It is possible that the calculated factors are not strong indicators of writing self-efficacy, writing motivation, and technology self-efficacy. Also, a second rater did not score the storyboards or the digital stories in this study. This might lead to biased scoring with the storyboards and digital stories as the teacher was the only rater for these measures.

Educational Implications and Conclusions

There is an urgent need for improving adolescents' writing skills while in high school to prepare them for careers and college upon graduating (Beaufort, 2006; Graham & Perin, 2007b, National Commission on Writing, 2004, 2005). Consequently, there is a need for more research on writing due to the overall poor writing performance in U.S. schools (Miller & McCardle, 2011). This study examined how students' writing skills could be improved using educational technology, both in and outside of the classroom.

The CCSS focuses more on students' writing skills rather than reading, compared to the No Child Left Behind (NCLB) Act, which concentrated more on reading (Applebee, 2013). Additionally, the CCSS expects students to use technology with writing exercises, including the use of digital media (National Governors Association Center for Best Practices, 2010). The use of digital stories, along with a text-based discussion forum (like Google Groups) to support the development of digital stories, can increase ninth grade students' English writing self-efficacy over a 10-week period. Due to this finding, using digital stories to support writing can be an effective method to address the CCSS's requirements of using technology to develop writing artifacts in a novel way.

The use of Google Docs in this study by all groups is also aligned with the CCSS recommendations for using technology with writing. The teacher remarked that the use of Google Docs helped him provide effective and targeted feedback to students' writing. He was able to specifically point out writing concerns within the text. When students corrected an item and clicked on the "resolved" button for a teacher comment, the teacher received an e-mail notification. This helped the teacher keep track of how and when students were resolving their issues. Additionally, the teacher utilized the "revision

history" component, so he could check when a student had last worked on a document. While teacher feedback was not a measured variable in this study, subsequent studies should incorporate the analysis of teacher feedback to gauge its impact on students' writing self-efficacy.

Future studies on digital storytelling would need to be longer than the 10-week period measured in this study. There were no statistically significant gains in writing performance for students that created digital stories as prewriting activities. However, students that created digital stories and discussed the stories within their student groups on a BBS experienced gains in writing self-efficacy. As writing self-efficacy can predict writing performance (Pajares & Johnson, 1996), it is possible that after a semester or a school year, students' writing performance may increase. A future study should measure the impact digital storytelling can have with writing self-efficacy, writing motivation, and writing performance over a semester or a school year. In this manner, there might be other gains (or not) during a longer intervention. As discussed, the digital story activities should be interspersed between other activities to reduce student students getting tired of the activity and help support student engagement. The storyboarding activity should be shortened to help the time management of the overall digital storytelling activity as well.

At the end of this study, students' technology self-efficacy and writing self-efficacy were closely related. This is an important consideration that teachers should understand when using technology to support learning in the classroom. When using digital story activities, the students will need to gain confidence in using the technology as they progress through the writing lessons. Teachers will need to ensure students have the supports they need to understand how to use the digital story and word processing

technologies. When students' technology self-efficacy increases, so does the co-development of their writing self-efficacy in a TELE.

The inclusion of digital storytelling activities with a supportive, writing-centric TELE could aid with increasing students' writing self-efficacy, a personal factor that contributes to students' writing performance. Ninth grade teachers that include this kind of activity and supports would be able to better address students' confidence with writing and meet the requirements of the CCSS. A future study should examine the effects of digital storytelling over a longer period of time to measure any effects with writing performance.

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Appendices

Appendix A

Project Plan for the Study

Corresponding CCSS items are in parentheses. A table of the CCSS codes and definitions are at the end of this appendix.

Timeframe	Comparison Group	BBS Group	AAV Group
Week 1	Distribute permission forms and teach the teacher how to use the iPads and associated software.		
Week 2	Collect permission forms.		
	Students take the writing self-efficacy, technology self-efficacy, and motivation survey.		
	Students read the poem, "Invictus" by William Ernest Henley. Students then write a 1-2 page essay explaining what Henley means by the poem's line, "I am the master of my fate; I am the captain of my soul." Students use the iPads and Google Drive for writing the essay (W.9-10.3, 6). 1. The teacher assigns each student an iPad and distributes them at the beginning of each class. 2. The teacher shows the students how to log into Google Drive, create a new document, and share the document with the teacher with assistance from the researcher. 3. The teacher writes the goals of the activity on the classroom's whiteboard (i.e., think about the topic, type the story over the next two days, the teacher will provide feedback electronically, the teacher will discuss the writings with the class). 4. The teacher provides feedback electronically using Google Drive and discusses the students' written artifacts: what were good models and what needed changes.		
Week 3	Students research, choose, and read a Greek myth. Teacher-led lessons and discussions on: 1. Plot and conflict (W.9-10.3a) 2. Character and characterization (W.9-10.3a) 3. Use of words and phrases to tell details (W.9-10.3d) 4. Reading comprehension (RL.9-10.4, 5) 5. Elements of literature (RL.9-10.1, 2, 3) 6. How to give peer feedback		
Week 4-5	Students are given the prompt, "Create an outline (or storyboard) of the Greek myth that you read, focusing on the characters involved and explain the myth as it relates to a natural phenomena." (W.9-10.3). The teacher discusses the goals of this activity and provides guidance during the activity.		

<table>
<tr><td rowspan="4"></td><td colspan="3">The teacher also shares the evaluative rubrics with the students.</td></tr>
<tr><td rowspan="3">Students:
1. Perform research by using online resources (W.9-10.6, 7, 8, 9).
2. Create an outline for the essay (W.9-10.5).
3. The teacher discusses the outlines with the students in the classroom.
4. Write a 1-2 page first draft of the essay (W.9-10.5).
5. The teacher discusses the first drafts with the students in the classroom.</td><td colspan="2">The teacher and researcher demonstrate how to create storyboards and movies on the iPad and show exemplars.

Students:
1. Perform research by using online resources (W.9-10.6, 7, 8, 9).
2. Create storyboards with the Storyboard app (SL.9-10.4, 5; W.9-10.5, 6)
3. Produce the digital story with the iMovie app (SL.9-10.4, 5, 6; W.9-10.5, 6).</td></tr>
<tr><td>Students are placed into groups and share their storyboards and iMovies as they create them using Google Drive (for the media) and the BBS (for student and teacher feedback) (SL.9-10.4, 5, 6; W.9-10.5, 6).</td><td>Students are placed into groups and share their storyboards and iMovies as they create them using the AAV for student and teacher feedback (SL.9-10.4, 5, 6; W.9-10.5, 6).</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Week 6</td><td colspan="3">Students write a 1-2 page story based on the prompt, “Write an essay based on the outline (or digital story) that you created” (W.9-10.3). Additionally:
1. The teacher shares the evaluative rubric with the students.
2. Students write the essays using Google Drive and the iPads (W.9-10.6).
3. The teacher provides feedback electronically using Google Drive and discusses the students’ written artifacts: what were good models and what needed changes.</td></tr>
<tr><td></td><td colspan="3">The teacher evaluates the essays and provides feedback to students on essays using Google Drive.</td></tr>
<tr><td></td><td colspan="3">Students take the writing self-efficacy, technology self-efficacy, and motivation survey.</td></tr>
<tr><td>Week 7</td><td colspan="3">Students read Homer’s “The Odyssey.”
Teacher-led lessons and discussions on:
1. Theme (W.9-10.9a)
2. Figurative language (W.9-10.3d)
3. Foreshadowing and suspense (W.9-10.3b, 3c)
4. Review skills from Week 3</td></tr>
</table>

<table>
<tr><td></td><td colspan="3">5. How to give peer feedback</td></tr>
<tr><td rowspan="4">Week 8-9</td><td colspan="3">Students are given the prompt, “Choose an adventure or episode from The Odyssey and develop the story in your own words.” (W.9-10.3). The teacher discusses the goals of this activity and provides guidance during the activity. The teacher also shares the evaluative rubrics with the students.</td></tr>
<tr><td rowspan="3">Students:
1. Perform research by using online resources (W.9-10.6, 7, 8, 9).
2. Create an outline for the essay (W.9-10.5).
3. The teacher discusses the outlines with the students in the classroom.
4. Write a 1-2 page first draft of the essay (W.9-10.5).
5. The teacher discusses the first drafts with the students in the classroom.</td><td colspan="2">The teacher and researcher review how to create storyboards and movies on the iPad and show exemplars of students’ work from the Week 4-5 lesson.

Students:
1. Perform research by using online resources (W.9-10.6, 7, 8, 9).
2. Create storyboards with the Storyboard app (SL.9-10.4, 5; W.9-10.5, 6)
3. Produce the digital story with the iMovie app (W.9-10.5, 6).</td></tr>
<tr><td>Students are placed into groups to share their storyboards and iMovies as they create them using Google Drive (for the media) and the BBS (for student and teacher feedback) (SL.9-10.4, 5, 6; W.9-10.5, 6).</td><td>Students are placed into groups to share their storyboards and iMovies as they create them using the AAV for student and teacher feedback (SL.9-10.4, 5, 6; W.9-10.5, 6).</td></tr>
<tr><td rowspan="3">Week 10</td><td colspan="3">Students write a 1-2 page story based on the prompt, “Write an essay based on the outline (or digital story) that you created” (W.9-10.3). Additionally:
1. The teacher shares the evaluative rubric with the students.
2. Students write the essays using Google Drive and the iPads (W.9-10.6).
The teacher provides feedback electronically using Google Drive and discusses the students’ written artifacts: what were good models and what needed changes.</td></tr>
<tr><td colspan="3">The teacher evaluates the essays and provides feedback to students on essays using Google Drive.</td></tr>
<tr><td colspan="3">Students take the writing self-efficacy, technology self-efficacy, and motivation survey.</td></tr>
</table>

CCSS English Language Arts Standards for Grades 9-10

National Governors Association Center for Best Practices (2010)

Standard	Description
CCSS.ELA-Literacy.RL.9-10.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-Literacy.RL.9-10.2	Determine a theme or central idea of a text and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.
CCSS.ELA-Literacy.RL.9-10.3	Analyze how complex characters (e.g., those with multiple or conflicting motivations) develop over the course of a text, interact with other characters, and advance the plot or develop the theme.
CCSS.ELA-Literacy.RL.9-10.4	Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).
CCSS.ELA-Literacy.RL.9-10.5	Analyze how an author's choices concerning how to structure a text, order events within it (e.g., parallel plots), and manipulate time (e.g., pacing, flashbacks) create such effects as mystery, tension, or surprise.
CCSS.ELA-Literacy.SL.9-10.4	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
CCSS.ELA-Literacy.SL.9-10.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
CCSS.ELA-Literacy.SL.9-10.6	Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.
CCSS.ELA-Literacy.W.9-10.3	Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

CCSS.ELA-Literacy.W.9-10.3a	Engage and orient the reader by setting out a problem, situation, or observation, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events.
CCSS.ELA-Literacy.W.9-10.3d	Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters.
CCSS.ELA-Literacy.W.9-10.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
CCSS.ELA-Literacy.W.9-10.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
CCSS.ELA-Literacy.W.9-10.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CCSS.ELA-Literacy.W.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
CCSS.ELA-Literacy.W.9-10.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
CCSS.ELA-Literacy.W.9-10.9a	Apply *grades 9–10 Reading standards* to literature (e.g., "Analyze how an author draws on and transforms source material in a specific work [e.g., how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare]").

Appendix B

Student ID: **Date:**

Name: **Channel:**

The Writing Self-efficacy, Technology Self-efficacy, and Motivation Survey

This questionnaire is designed to help us get a better understanding of your confidence in writing, your confidence with using an iPad, and your motivation to write. Please complete every item. **Please read each item carefully as you give your thoughtful response.**

Rate your degree of confidence by recording a number from 0 to 10 **next to each item** using the scale given below:

0	1	2	3	4	5	6	7	8	9	10
Cannot do at all					Moderately certain can do					Highly certain can do

How confident are you that you can…

	Confidence (0-10)
1. Compose an article for the school newspaper	_____
2. Write a one or two sentence answer to a specific test question	_____
3. Using an iPad, use the Safari app to surf the Internet	_____
4. Compose a one page essay in answer to a specific test question	_____
5. Write useful class notes	_____
6. Write a term paper	_____
7. Using an iPad, record a video with the Camera app	_____
8. Using an iPad, zoom in or zoom out on an image	_____
9. Write a letter to a friend or family member	_____
10. Write a letter to the editor of the daily newspaper	_____
11. Using an iPad, type an essay for class	_____
12. Using an iPad, take a picture with the Camera app	_____
13. Using an iPad, make a movie with the iMovie app	_____
14. Using an iPad, save an image from Safari to Photos	_____
15. List instructions for how to play a game	_____
16. Using an iPad, edit and revise a written composition	_____
17. Write an instruction manual for operating a cell phone	_____
18. Author a short fiction story	_____
19. Compose a poem on the topic of your choice	_____

Turn over and continue to page two…

Rate the following statements in terms of your behavior with this class by recording a number from 0 to 10 **next to each item** using the scale given below:

0	1	2	3	4	5	6	7	8	9	10
Not at all true of me					Moderately true of me					Very true of me

How true is it that…

	How true? (0-10)
20. Even when I do poorly on a writing test I try to learn from my mistakes	_____
21. I like what I am learning about writing in this class	_____
22. I think I will be able to use what I learn about writing in this class in other classes	_____
23. I prefer writing assignments that are challenging so I can learn new things	_____
24. I often choose essay topics I will learn something from even if they require more work	_____
25. I think that what I am learning about writing in this class is useful for me to know	_____
26. It is important for me to learn about writing	_____
27. I think that what we are learning about writing in this class is interesting	_____
28. I understand that writing is important to me	_____

Appendix C

Rubric for Evaluating a Storyboard

Criteria	4 (Exceptional)	3 (Skilled)	2 (Developing)	1 (Inadequate)
Choice of Scenes	The five stages of a short story (exposition, rising action, climax, falling action and resolution) and conflict are very clear in the scenes.	The plot of the story is somewhat clear and one or two stages of the short story are missing.	The plot of the story is missing most of the stages of a short story.	The plot of the story is not clear.
Characters	The main characters are clearly identified and their visual actions are well matched to the story in every scene.	The main characters are clearly identified and their visual actions mostly match to the story in every scene.	The main characters are identified but their visual actions are not specific enough to the story in most scenes.	It is difficult to understand who are the main characters in the scenes.
Setting and Props	The setting and props are directly related to the purpose of the story and enhance the understanding of each scene.	The setting and props are mostly related to the purpose of the story in each scene.	The setting and props do not support the characters well in each scene.	The setting and props do not seem related to the scenes.
Captions	The text captions are related to the scenes and the story and the connections to the actions in the scenes are easy to understand.	The text captions are related to the scenes and the story and most connections to the actions in the scenes are easy to understand.	The text captions are related to the scenes and story but the connections to the actions in the scenes are not easy to understand.	The text captions do not relate well to the scenes. There seems to be no connections to the actions in the scenes.
Spelling, Punctuation, and Grammar	There are no spelling, punctuation, or grammatical errors.	There are one to three spelling, punctuation, or grammatical errors.	There are four to five spelling, punctuation, or grammatical errors.	There are more than five spelling, punctuation, or grammatical errors.

Appendix D

Rubric for Evaluating a Digital Story with Grades 9-10

Criteria	5 (Exceptional)	4 (Skilled)	3 (Proficient)	2 (Developing)	1 (Inadequate)
Exposition: The multimedia artifact sets up a story by introducing the event/conflict, characters, and setting.	The digital story **creatively** engages the viewer by setting out a **well-developed** conflict, situation, or observation. The digital story establishes **one or multiple** points of view and introduces a narrator and/or complex characters.	The digital story engages and orients the reader by setting out a conflict, situation, or observation. It establishes **one or multiple** points of view and introduces a narrator and/or well-developed characters.	The digital story orients the reader by setting out a conflict, situation, or observation. It establishes **one** point of view and introduces a narrator and/or developed characters.	The digital story provides a setting with a **vague** conflict, situation, or observation with an **unclear** point of view. It introduces a narrator and/or **underdeveloped** characters.	The digital story provides a setting that is **unclear** with a **vague** conflict, situation, or observation. It has an **unclear** point of view and **underdeveloped** narrator **and/or** characters.
Narrative Techniques and Development: The digital story is developed using dialogue, pacing, description, reflection, and multiple plot lines.	The digital story demonstrates **sophisticated** narrative techniques such as engaging dialogue, artistic pacing, vivid description, complex reflection, and **multiple** plot lines to develop experiences, events, and/or characters.	The digital story demonstrates **deliberate** use of narrative techniques such as dialogue, pacing, description, reflection, and **multiple** plot lines to develop experiences, events, and/or characters.	The digital story **uses** narrative techniques such as dialogue, description, and reflection that illustrate events and/or characters.	The digital story uses **some** narrative techniques such as dialogue or description that **merely** retells events and/or experiences.	The digital story **lacks** narrative techniques and **merely** retells events and/or experiences.
Organization and Cohesion: The digital story follows a logical sequence of events.	The digital story creates a **seamless** progression of experiences or events using **multiple** techniques—such as chronology, flashback, foreshadowing, suspense, etc.—to sequence events so that they build on one another to create a coherent whole.	The digital story creates a **smooth** progression of experiences or events using a **variety** of techniques—such as chronology, flashback, foreshadowing, suspense, etc.—to sequence events so that they build on one another to create a coherent whole.	The digital story creates a **logical** progression of experiences or events using **some** techniques —such as chronology, flashback, foreshadowing, suspense, etc.—to sequence events so that they build on one another to create a coherent whole.	The digital story creates a sequence or progression of experiences or events.	The digital story **lacks** a sequence or progression of experiences or events or presents an **illogical** sequence of events.
Style and Conventions: The digital story uses images and sound effects to create a vivid picture of the events, setting, and characters.	The digital story uses **many** meaningful images (i.e. using Mayer's multimedia principles) and sound to convey a realistic picture of the experiences, events, setting, and/or characters. There are **no** conflicts between sounds and images when presented simultaneously.	The digital story uses meaningful images (i.e. using Mayer's multimedia principles) and sound to convey a realistic picture of the experiences, events, setting, and/or characters. There are **no** conflicts between sounds and images when presented simultaneously.	The digital story uses **some** meaningful images (i.e. using Mayer's multimedia principles) and sound to convey a realistic picture of the experiences, events, setting, and/or characters. There are **some** conflicts between sounds and images when presented simultaneously.	The digital story uses **little to no** meaningful images (i.e. using Mayer's multimedia principles) and sound to convey a realistic picture of the experiences, events, setting, and/or characters. There are **many** conflicts between sounds and images when presented simultaneously.	The digital story **merely** tells about experiences, events, settings, and/or characters.
Conclusion: The digital story provides a conclusion that follows from the course of the narrative. The conclusion provides a reflection on or resolution of the events.	The digital story moves to a conclusion that **artfully** follows from and thoughtfully reflects on what is experienced, observed, or resolved over the course of the narrative.	The digital story builds to a conclusion that **logically** follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.	The digital story provides a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.	The digital story provides a conclusion that follows from what is experienced, observed, or resolved over the course of the narrative.	The digital story **may** provide a conclusion to the events of the narrative.

Appendix E

Rubric for Evaluating a Narrative Essay with Grades 9-10

Criteria	5 (Exceptional)	4 (Skilled)	3 (Proficient)	2 (Developing)	1 (Inadequate)
Exposition: The text sets up a story by introducing the event/conflict, characters, and setting.	The text **creatively** engages the reader by setting out a **well-developed** conflict, situation, or observation. The text establishes **one or multiple** points of view and introduces a narrator and/or complex characters.	The text engages and orients the reader by setting out a conflict, situation, or observation. It establishes **one or multiple** points of view and introduces a narrator and/or well-developed characters.	The text orients the reader by setting out a conflict, situation, or observation. It establishes **one** point of view and introduces a narrator and/or developed characters.	The text provides a setting with a **vague** conflict, situation, or observation with an **unclear** point of view. It introduces a narrator and/or **underdeveloped** characters.	The text provides a setting that is **unclear** with a **vague** conflict, situation, or observation. It has an **unclear** point of view and **underdeveloped** narrator **and/or** characters.
Narrative Techniques and Development: The story is developed using dialogue, pacing, description, reflection, and multiple plot lines.	The text demonstrates **sophisticated** narrative techniques such as engaging dialogue, artistic pacing, vivid description, complex reflection, and **multiple** plot lines to develop experiences, events, and/or characters.	The text demonstrates **deliberate** use of narrative techniques such as dialogue, pacing, description, reflection, and **multiple** plot lines to develop experiences, events, and/or characters.	The text **uses** narrative techniques such as dialogue, description, and reflection that illustrate events and/or characters.	The text uses **some** narrative techniques such as dialogue or description that **merely** retells events and/or experiences.	The text **lacks** narrative techniques and **merely** retells events and/or experiences.
Organization and Cohesion: The text follows a logical sequence of events.	The text creates a **seamless** progression of experiences or events using **multiple** techniques—such as chronology, flashback, foreshadowing, suspense, etc.—to sequence events so that they build on one another to create a coherent whole.	The text creates a **smooth** progression of experiences or events using a **variety** of techniques—such as chronology, flashback, foreshadowing, suspense, etc.—to sequence events so that they build on one another to create a coherent whole.	The text creates a **logical** progression of experiences or events using **some** techniques —such as chronology, flashback, foreshadowing, suspense, etc.—to sequence events so that they build on one another to create a coherent whole.	The text creates a sequence or progression of experiences or events.	The text **lacks** a sequence or progression of experiences or events or presents an **illogical** sequence of events.
Style and Conventions: The text uses sensory language and details to create a vivid picture of the events, setting, and characters.	The text uses **eloquent** words and phrases, showing details and **rich** sensory language and mood to convey a realistic picture of the experiences, events, setting, and/or characters.	The text uses **precise** words and phrases, showing details and **controlled** sensory language and mood to convey a realistic picture of the experiences, events, setting, and/or characters.	The text uses words and phrases, telling details and sensory language to convey a **vivid** picture of the experiences, events, setting, and/or characters.	The text uses words and phrases and telling details to convey experiences, events, settings, and/or characters. There are some spelling and/or grammatical mistakes.	The text **merely** tells about experiences, events, settings, and/or characters. There are many spelling and/or grammatical mistakes.
Conclusion: The text provides a conclusion that follows from the course of the narrative. The conclusion provides a reflection on or resolution of the events.	The text moves to a conclusion that **artfully** follows from and thoughtfully reflects on what is experienced, observed, or resolved over the course of the narrative.	The text builds to a conclusion that **logically** follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.	The text provides a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.	The text provides a conclusion that follows from what is experienced, observed, or resolved over the course of the narrative.	The text **may** provide a conclusion to the events of the narrative.

Appendix F

Rubric for Evaluating Peer Feedback

Criteria	3 (Exceptional)	2 (Developing)	1 (Inadequate)
Mechanics: Feedback on spelling, grammar, narrative, and choice of images.	Feedback is clear, direct, constructive, and positive. The peer identified what was well done and what needed to change.	Some feedback is given or the feedback is not very clear.	Barely any feedback is given or the feedback is negative.
Organization: Feedback on plot structure and organization of scenes.	Feedback is clear, direct, constructive, and positive. The peer identified what was well done and what needed to change.	Some feedback is given or the feedback is not very clear.	Barely any feedback is given or the feedback is negative.
Style: Feedback on the author's choice of events, setting, and characters.	Feedback is clear, direct, constructive, and positive. The peer identified what was well done and what needed to change.	Some feedback is given or the feedback is not very clear.	Barely any feedback is given or the feedback is negative.

Appendix G

Rubric for Evaluating Teacher's Feedback

Criteria	3 (Exceptional)	2 (Developing)	1 (Inadequate)
Mechanics: Feedback on spelling, grammar, narrative, and choice of images.	Feedback is clear, direct, constructive, and positive. The teacher identified what was well done and what needed to change.	Some feedback is given or the feedback is not very clear.	Barely any feedback is given or the feedback is negative.
Organization: Feedback on plot structure and organization of scenes.	Feedback is clear, direct, constructive, and positive. The teacher identified what was well done and what needed to change.	Some feedback is given or the feedback is not very clear.	Barely any feedback is given or the feedback is negative.
Style: Feedback on the author's choice of events, setting, and characters.	Feedback is clear, direct, constructive, and positive. The teacher identified what was well done and what needed to change.	Some feedback is given or the feedback is not very clear.	Barely any feedback is given or the feedback is negative.
Goals (when present): Teacher-set goals for the storyboard, digital story, and peer feedback sessions.	The goals for the students are clear, precise, and attainable.	The goals for students are given but lacked some details and are attainable.	The goals given to the students are vague and are not detailed AND/OR not attainable.

Appendix H

Parental Waiver Letter

Parental Permission Form for Participation in a Research Study

University of Connecticut

Principal Investigator: Scott W. Brown, PhD
Student Researcher: Anthony Girasoli
Study Title: Using Digital Stories and iPads to Promote Writing Skills, Self-efficacy, and Motivation to Write among 9th Grade Students

Please read this with your child.

Introduction

We would like to invite your child to participate in a research study. This study focuses on increasing students' writing skills, writing self-efficacy (confidence), and writing motivation by using iPads to create little movies called digital stories. The study will take place in your child's 9th grade English class as part of his or her normal classroom activities. Three English classes will participate in this study. Two classes will be randomly chosen create digital stories on the iPads as a planning exercise for writing and to type essays. These two classes will also use the iPads to collaborate on the digital stories. The third class will be randomly chosen to only use the iPads for typing outlines and essays.

Why is this study being done?

The purpose of this study is to help increase students' writing skills, writing confidence, and writing motivation through the use of technology. We will be comparing the effectiveness of using multimedia, in the form of digital stories, to creating outlines as a planning activity for writing essays. We'll also examine the effectiveness of using technology as a means for students and teachers to give feedback to other students on their digital stories.

What are the study procedures? What will my child be asked to do?

As part of your child's normal lessons for English, he or she will be using an iPad provided by NFA. If your child is in one of the two classes that will create digital stories, he or she will develop digital stories and type written essays during class. Your child will create a storyboard, much like Hollywood movie producers, and create a short movie with an iPad. Creating a storyboard and digital story will be a planning activity that will lead to creating an essay based on the digital story.

In the two digital story classes, one class will use a text-based discussion forum (called a BBS: Bulletin Board System) where students can give feedback to each other on their digital stories. The teacher, Mr. Kirker, will also be able to give feedback in this text forum. In the other digital story class, students will use a discussion forum that uses video clips to give feedback

to each other (called an AAV: Asynchronous Audio/Visual system). Mr. Kirker will also use this audio/video forum to give feedback to students on their digital stories.

If your child is chosen to be in the third (comparison) class that does not make digital stories, he or she will use the iPad to type an outline as a planning activity. Then your child will write an essay on the iPads, similar to the other two classes.

The kinds of data that we will be collecting for research purposes are:

1. The storyboard and storyboard score
2. The digital story and digital story score
3. An essay outline
4. An essay composition and essay composition score
5. Any text conversations in the BBS
6. Any audio/video conversations in the AAV
7. How your child is giving feedback in the BBS or AAV
8. Survey data from your child on his or her writing self-efficacy, technology self-efficacy, and writing motivation.
9. Your child's ACT Explore score for writing (this will help us compare data between the students.)

If you do not want your child to participate in this study, we will not include his or her data as part of the research.

What other options are there?

If you or your child does not wish to participate in the study, your child will still do the lesson with the technology as it will be part of the teacher's normal classroom procedures. The only exception will be that your child's scores will not be included in the study.

What are the risks or inconveniences of the study?

We believe there are no known risks to your child because of his/her participation in the research study; however, a possible inconvenience may be the time it takes to complete the study. Additionally, there is a possible risk to privacy/confidentiality.

What are the benefits of the study?

We hope that this study will demonstrate new ways in which iPads and multimedia can be used to help students' writing skills. We also hope the storyboarding and digital story activities can help increase students' writing confidence and motivation to write. Additionally, we hope the audio/visual discussion forum will help students and teacher provide more detailed and supportive feedback to other students. Overall, we hope that lesson activities like these can be used in other schools across the country to improve student writing skills. Writing skills are very important as they are used in other academic

areas and can have an impact on career achievement and academic performance in college. It is also possible that your child may not directly benefit from this study.

Will my child receive payment for participation? Are there costs to participate?

Your child will not receive payment for participating and there are no costs to participate.

How will my child's information be protected?

All student data will be kept confidential and shared only with his or her English teacher, Mr. Kirker, for course grading purposes. Once the research study has completed, all identifying information of your child in the study's data will be removed. All videos and text from the discussion forums will not be shared with anyone except the students, the principal and student investigators, and Mr. Kirker. At the conclusion of the study, the discussion media (text and audio/video) as well as the storyboards and digital stories will be deleted. Mr. Kirker will keep a copy of the students' essay outlines and essay compositions.

You should also know that the UConn Institutional Review Board (IRB) and the Office of Research Compliance may inspect study records as part of its auditing program, but these reviews will only focus on the researchers and not on your child's responses or involvement. The IRB is a group of people who review research studies to protect the rights and welfare of research participants.

Can my child stop being in the study and what are my and my child's rights?

Your child does not have to be in this study if you do not want him/her to participate. If you give permission for your child to be in the study, but later change your mind, you may withdraw your child at any time. There are no penalties or consequences of any kind if you decide that you do not want your child to participate.

Whom do I contact if I have questions about the study?

We will be happy to answer any questions you have about this study. If you have further questions about this project or if you have a research-related problem, you may contact the principal investigator, Dr. Scott W. Brown at 860-486-0181 (scott.brown@uconn.edu), or the student researcher, Anthony Girasoli, 860-425-5533 (girasolia@nfaschool.org).

If you have any questions concerning your child's rights as a research participant, you may contact the University of Connecticut Institutional Review Board (IRB) at 860-486-8802.

Parental Permission Form for Participation in a Research Study

University of Connecticut

Return Slip

Principal Investigator: Scott W. Brown, PhD
Student Researcher: Anthony Girasoli
Study Title: Using Digital Stories and iPads to Promote Writing Skills, Self-efficacy, and Motivation to Write among 9th Grade Students

Documentation of Permission:

I have read this form and decided that I will give permission for my child to participate in the study described above. Its general purposes, the particulars of my child's involvement and possible risks and inconveniences have been explained to my satisfaction. I understand that I can withdraw my child at any time. My signature also indicates that I have received a copy of this parental permission form. Please return this form to your child's teacher by October 11.

_____	_____	_____
Child Signature:	Print Name:	Date:
_____	_____	_____
Parent/Guardian Signature:	Print Name:	Date:

Relationship to Child (e.g. mother, father, guardian): _____

_____	_____	_____
Signature of Person Obtaining Consent	Print Name:	Date:

Appendix I

Effect Sizes

Estimated sample sizes for small through large effects with $\alpha = 0.05$ and Power = 0.80 for RQ_1, RQ_2, and RQ_3 (Cohen, 1988). For multivariate analyses, Cohen's f^2 effect size statistic is used. For a regression analysis, Cohen's f statistic is used.

Effect Size	Small	Moderate	Large
f^2	0.02	0.15	0.35
N	641	81	32

Effect Size	Small	Moderate	Large
f	0.1	0.25	0.4
N	327	57	24

Appendix J

Missing Cases Summary

Pre-, Middle, and Final Moment Survey Cases

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Q1	55	96.5%	2	3.5%	57	100.0%
Q2	55	96.5%	2	3.5%	57	100.0%
Q3	55	96.5%	2	3.5%	57	100.0%
Q4	55	96.5%	2	3.5%	57	100.0%
Q5	55	96.5%	2	3.5%	57	100.0%
Q6	55	96.5%	2	3.5%	57	100.0%
Q7	55	96.5%	2	3.5%	57	100.0%
Q8	55	96.5%	2	3.5%	57	100.0%
Q9	55	96.5%	2	3.5%	57	100.0%
Q10	55	96.5%	2	3.5%	57	100.0%
Q11	55	96.5%	2	3.5%	57	100.0%
Q12	55	96.5%	2	3.5%	57	100.0%
Q13	55	96.5%	2	3.5%	57	100.0%
Q14	55	96.5%	2	3.5%	57	100.0%
Q15	55	96.5%	2	3.5%	57	100.0%
Q16	55	96.5%	2	3.5%	57	100.0%
Q17	55	96.5%	2	3.5%	57	100.0%
Q18	55	96.5%	2	3.5%	57	100.0%
Q19	55	96.5%	2	3.5%	57	100.0%
Q20	55	96.5%	2	3.5%	57	100.0%
Q21	55	96.5%	2	3.5%	57	100.0%
Q22	55	96.5%	2	3.5%	57	100.0%
Q23	55	96.5%	2	3.5%	57	100.0%
Q24	55	96.5%	2	3.5%	57	100.0%
Q25	55	96.5%	2	3.5%	57	100.0%
Q26	55	96.5%	2	3.5%	57	100.0%
Q27	55	96.5%	2	3.5%	57	100.0%
Q28	55	96.5%	2	3.5%	57	100.0%

Appendix K

Means and Standard Deviations of the Pre- (P), Middle (M), and Final (F) Variables

Pre-moment Survey Data

	N	Minimum	Maximum	Mean	Std. Deviation
SMEAN(P1)	57	0	9	5.38	2.134
SMEAN(P2)	57	3	10	8.51	1.710
SMEAN(P3)	57	1	10	9.35	1.514
SMEAN(P4)	57	0	10	7.16	2.328
SMEAN(P5)	57	3	10	8.09	1.873
SMEAN(P6)	57	0	10	6.44	2.366
SMEAN(P7)	57	1	10	9.02	1.950
SMEAN(P8)	57	4	10	9.42	1.385
SMEAN(P9)	57	5	10	9.09	1.313
SMEAN(P10)	57	1	10	6.87	2.252
SMEAN(P11)	57	2	10	7.78	2.281
SMEAN(P12)	57	4	10	9.53	1.266
SMEAN(P13)	57	1	10	7.24	2.390
SMEAN(P14)	57	0	10	8.65	2.277
SMEAN(P15)	57	2	10	8.00	2.062
SMEAN(P16)	57	0	10	6.98	2.248
SMEAN(P17)	57	0	10	5.07	2.821
SMEAN(P18)	57	1	10	6.91	2.270
SMEAN(P19)	57	0	10	6.98	2.800
SMEAN(P20)	57	0	10	7.53	2.352
SMEAN(P21)	57	0	10	6.87	2.522
SMEAN(P22)	57	0	10	8.05	2.255
SMEAN(P23)	57	0	10	6.04	2.679
SMEAN(P24)	57	0	10	5.65	2.874
SMEAN(P25)	57	0	10	8.04	2.591
SMEAN(P26)	57	0	10	8.45	2.329
SMEAN(P27)	57	0	10	6.47	2.678
SMEAN(P28)	57	0	10	8.07	2.711
Valid N (listwise)	57				

Middle-moment Survey Data

	N	Minimum	Maximum	Mean	Std. Deviation
SMEAN(M1)	57	0	10	5.83	2.336
SMEAN(M2)	57	3	10	8.60	1.769
SMEAN(M3)	57	7	10	9.73	0.718
SMEAN(M4)	57	2	10	7.31	2.290
SMEAN(M5)	57	3	10	7.98	1.995
SMEAN(M6)	57	3	10	6.75	2.037
SMEAN(M7)	57	2	10	9.24	1.812
SMEAN(M8)	57	7	10	9.80	0.609
SMEAN(M9)	57	5	10	8.91	1.313
SMEAN(M10)	57	2	10	6.67	2.139
SMEAN(M11)	57	2	10	8.53	1.831
SMEAN(M12)	57	1	10	9.60	1.434
SMEAN(M13)	57	4	10	8.36	1.967
SMEAN(M14)	57	6	10	9.62	1.009
SMEAN(M15)	57	3	10	8.18	1.582
SMEAN(M16)	57	0	10	7.36	2.191
SMEAN(M17)	57	0	10	5.84	2.366
SMEAN(M18)	57	2	10	6.96	2.252
SMEAN(M19)	57	0	10	6.67	2.719
SMEAN(M20)	57	0	10	7.11	2.241
SMEAN(M21)	57	0	10	6.73	2.356
SMEAN(M22)	57	1	10	7.42	2.425
SMEAN(M23)	57	0	10	5.69	2.583
SMEAN(M24)	57	0	10	5.13	2.745
SMEAN(M25)	57	0	10	7.16	2.484
SMEAN(M26)	57	1	10	8.71	1.924
SMEAN(M27)	57	0	10	6.60	2.257
SMEAN(M28)	57	2	10	8.42	2.006
Valid N (listwise)	57				

Final Moment Survey Data

	N	Minimum	Maximum	Mean	Std. Deviation
SMEAN(F1)	57	2	10	6.07	2.162
SMEAN(F2)	57	1	10	8.76	1.908
SMEAN(F3)	57	4	10	9.75	0.911
SMEAN(F4)	57	2	10	7.91	2.011
SMEAN(F5)	57	2	10	8.45	1.699
SMEAN(F6)	57	2	10	7.27	1.904
SMEAN(F7)	57	2	10	9.29	1.622
SMEAN(F8)	57	5	10	9.60	0.975
SMEAN(F9)	57	2	10	9.04	1.679
SMEAN(F10)	57	0	10	7.24	2.195
SMEAN(F11)	57	3	10	8.80	1.597
SMEAN(F12)	57	0	10	9.49	1.782
SMEAN(F13)	57	0	10	8.60	2.350
SMEAN(F14)	57	1	10	9.33	1.813
SMEAN(F15)	57	3	10	8.33	1.513
SMEAN(F16)	57	1	10	8.00	2.062
SMEAN(F17)	57	0	10	6.64	2.348
SMEAN(F18)	57	4	10	7.71	1.943
SMEAN(F19)	57	0	10	7.27	2.532
SMEAN(F20)	57	0	10	7.51	2.259
SMEAN(F21)	57	1	10	7.20	2.231
SMEAN(F22)	57	1	10	7.60	1.996
SMEAN(F23)	57	0	10	6.15	2.271
SMEAN(F24)	57	0	10	5.60	2.588
SMEAN(F25)	57	1	10	7.55	1.980
SMEAN(F26)	57	2	10	8.62	1.674
SMEAN(F27)	57	1	10	7.02	2.031
SMEAN(F28)	57	2	10	8.51	1.926
Valid N (listwise)	57				

Essay Data at the Pre-, Middle-, and Final Moments

	N	Minimum	Maximum	Mean	Std. Deviation
PretestEssayAVG	57	0.00	24.00	17.73	4.68
Essay1AVG	57	0.00	24.00	18.84	4.24
Essay2AVG	57	0.00	23.00	17.56	5.31
Valid N (listwise)	57				

Storyboard and Movie Data at the Middle and Final Moments

	N	Minimum	Maximum	Mean	Std. Deviation
Storyboard1	36	0.00	20.00	16.50	5.21
Movie1	36	0.00	24.00	19.69	4.23
Storyboard2	36	0.00	23.75	16.43	4.67
Movie2	36	0.00	24.25	20.97	5.52
Valid N (listwise)	36				

Appendix L

Initial Tests for Normality

Items with a Shapiro-Wilk statistic of $p < .001$ have a possible univariate normality violation.

Pre-moment Survey Data

	Shapiro-Wilk		
	Statistic	df	Sig.
SMEAN(P1)	.964	57	.090
SMEAN(P2)	.829	57	.000
SMEAN(P3)	.498	57	.000
SMEAN(P4)	.896	57	.000
SMEAN(P5)	.878	57	.000
SMEAN(P6)	.946	57	.014
SMEAN(P7)	.581	57	.000
SMEAN(P8)	.490	57	.000
SMEAN(P9)	.729	57	.000
SMEAN(P10)	.940	57	.007
SMEAN(P11)	.862	57	.000
SMEAN(P12)	.437	57	.000
SMEAN(P13)	.911	57	.000
SMEAN(P14)	.661	57	.000
SMEAN(P15)	.845	57	.000
SMEAN(P16)	.933	57	.003
SMEAN(P17)	.961	57	.067
SMEAN(P18)	.939	57	.007
SMEAN(P19)	.891	57	.000
SMEAN(P20)	.884	57	.000
SMEAN(P21)	.907	57	.000
SMEAN(P22)	.787	57	.000
SMEAN(P23)	.934	57	.004
SMEAN(P24)	.949	57	.017
SMEAN(P25)	.758	57	.000
SMEAN(P26)	.692	57	.000
SMEAN(P27)	.925	57	.002
SMEAN(P28)	.722	57	.000

Middle-moment Survey Data

	Shapiro-Wilk		
	Statistic	df	Sig.
SMEAN(M1)	.955	57	.033
SMEAN(M2)	.784	57	.000
SMEAN(M3)	.437	57	.000
SMEAN(M4)	.912	57	.001
SMEAN(M5)	.868	57	.000
SMEAN(M6)	.947	57	.014
SMEAN(M7)	.487	57	.000
SMEAN(M8)	.375	57	.000
SMEAN(M9)	.802	57	.000
SMEAN(M10)	.948	57	.016
SMEAN(M11)	.797	57	.000
SMEAN(M12)	.317	57	.000
SMEAN(M13)	.791	57	.000
SMEAN(M14)	.432	57	.000
SMEAN(M15)	.894	57	.000
SMEAN(M16)	.907	57	.000
SMEAN(M17)	.964	57	.091
SMEAN(M18)	.941	57	.008
SMEAN(M19)	.927	57	.002
SMEAN(M20)	.924	57	.002
SMEAN(M21)	.941	57	.008
SMEAN(M22)	.873	57	.000
SMEAN(M23)	.948	57	.016
SMEAN(M24)	.959	57	.051
SMEAN(M25)	.893	57	.000
SMEAN(M26)	.695	57	.000
SMEAN(M27)	.945	57	.012
SMEAN(M28)	.785	57	.000

Final Moment Survey Data

	Shapiro-Wilk		
	Statistic	df	Sig.
SMEAN(F1)	.960	57	.059
SMEAN(F2)	.693	57	.000
SMEAN(F3)	.311	57	.000
SMEAN(F4)	.884	57	.000
SMEAN(F5)	.833	57	.000
SMEAN(F6)	.941	57	.008
SMEAN(F7)	.504	57	.000
SMEAN(F8)	.479	57	.000
SMEAN(F9)	.633	57	.000
SMEAN(F10)	.911	57	.000
SMEAN(F11)	.768	57	.000
SMEAN(F12)	.323	57	.000
SMEAN(F13)	.665	57	.000
SMEAN(F14)	.435	57	.000
SMEAN(F15)	.871	57	.000
SMEAN(F16)	.856	57	.000
SMEAN(F17)	.927	57	.002
SMEAN(F18)	.897	57	.000
SMEAN(F19)	.884	57	.000
SMEAN(F20)	.877	57	.000
SMEAN(F21)	.911	57	.000
SMEAN(F22)	.915	57	.001
SMEAN(F23)	.946	57	.013
SMEAN(F24)	.950	57	.020
SMEAN(F25)	.907	57	.000
SMEAN(F26)	.788	57	.000
SMEAN(F27)	.930	57	.003
SMEAN(F28)	.780	57	.000

Essay Data at the Pre-, Middle-, and Final Moments

	Shapiro-Wilk		
	Statistic	df	Sig.
PretestEssayAVG	.871	57	.000
Essay1AVG	.816	57	.000
Essay2AVG	.734	57	.000

Storyboard and Movie Data at the Middle- and Final Moments

	Shapiro-Wilk		
	Statistic	df	Sig.
Storyboard1	.540	36	.000
Movie1	.715	36	.000
Storyboard2	.704	36	.000
Movie2	.527	36	.000

Appendix M

Factor Loadings

Items that did not load adequately on a single item (< 0.4) in the pattern matrix or correlated greater than 0.5 on more than one item in the structure matrix were removed. Factor 1 is writing motivation, factor 2 is writing self-efficacy, and factor 3 is technology self-efficacy.

Pattern Matrix

	Factor		
	1	2	3
SMEAN(P1)	**.756**	.012	.093
~~SMEAN(P2)~~	~~.377~~	~~.151~~	~~.103~~
SMEAN(P3)	-.262	**.403**	.229
SMEAN(P4)	**.767**	.027	-.180
~~SMEAN(P5)~~	~~.311~~	~~.249~~	~~-.014~~
SMEAN(P6)	**.716**	-.008	-.329
SMEAN(P7)	-.011	.033	**.666**
SMEAN(P8)	-.145	.167	**.870**
~~SMEAN(P9)~~	~~.341~~	~~-.029~~	~~.303~~
SMEAN(P10)	**.719**	-.109	.124
~~SMEAN(P11)~~	~~.438~~	~~-.259~~	~~.464~~
SMEAN(P12)	-.180	.221	**.776**
SMEAN(P13)	**.472**	-.046	.365
SMEAN(P14)	.053	-.057	**.676**
SMEAN(P15)	**.456**	.054	.277
~~SMEAN(P16)~~	~~.356~~	~~-.173~~	~~.367~~
SMEAN(P17)	**.486**	-.137	.291
SMEAN(P18)	**.601**	-.041	.013
SMEAN(P19)	**.416**	.081	.187
SMEAN(P20)	**.447**	.338	-.055
SMEAN(P21)	.161	**.663**	-.026
SMEAN(P22)	.082	**.778**	-.006
SMEAN(P23)	**.750**	.168	-.068
SMEAN(P24)	**.603**	.244	-.028
SMEAN(P25)	-.123	**.942**	.092
SMEAN(P26)	.238	**.597**	-.012
SMEAN(P27)	.334	**.511**	-.006
SMEAN(P28)	**.444**	.283	-.091

Structure Matrix

	Factor		
	1	2	3
SMEAN(P1)	.783	.342	.274
SMEAN(P2)	.464	.327	.221
SMEAN(P3)	-.042	.339	.246
SMEAN(P4)	.735	.308	.006
SMEAN(P5)	.410	.375	.108
SMEAN(P6)	.635	.223	-.162
SMEAN(P7)	.160	.158	.670
SMEAN(P8)	.129	.276	.868
SMEAN(P9)	.401	.171	.377
SMEAN(P10)	.703	.212	.272
SMEAN(P11)	.440	.012	.517
SMEAN(P12)	.095	.298	.777
SMEAN(P13)	.539	.220	.468
SMEAN(P14)	.189	.096	.677
SMEAN(P15)	.544	.296	.395
SMEAN(P16)	.371	.045	.417
SMEAN(P17)	.499	.120	.379
SMEAN(P18)	.587	.210	.147
SMEAN(P19)	.493	.289	.301
~~SMEAN(P20)~~	~~**.574**~~	~~**.512**~~	~~.116~~
SMEAN(P21)	.429	.724	.141
SMEAN(P22)	.402	.811	.165
SMEAN(P23)	.804	.465	.142
SMEAN(P24)	.697	.487	.162
SMEAN(P25)	.287	.909	.247
SMEAN(P26)	.482	.693	.160
~~SMEAN(P27)~~	~~**.543**~~	~~**.647**~~	~~.173~~
SMEAN(P28)	.539	.448	.069

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.

The following table is the factor correlation matrix. Factor 1 is writing self-efficacy, Factor 2 is writing motivation, and Factor 3 is technology self-efficacy.

Factor Correlation Matrix

Factor	1	2	3
1	1.000	.413	.236
2	.413	1.000	.195
3	.236	.195	1.000

Extraction Method: Principal Axis Factoring.

Rotation Method: Promax with Kaiser Normalization.

Appendix N

RQ_1 Analysis - MANCOVA

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[d]
Intercept	Pillai's Trace	.392	10.967[b]	3	51	.000	.392	32.900	.999
	Wilks' Lambda	.608	10.967[b]	3	51	.000	.392	32.900	.999
	Hotelling's Trace	.645	10.967[b]	3	51	.000	.392	32.900	.999
	Roy's Largest Root	.645	10.967[b]	3	51	.000	.392	32.900	.999
TestRawScores English	Pillai's Trace	.358	9.480[b]	3	51	.000	.358	28.441	.995
	Wilks' Lambda	.642	9.480[b]	3	51	.000	.358	28.441	.995
	Hotelling's Trace	.558	9.480[b]	3	51	.000	.358	28.441	.995
	Roy's Largest Root	.558	9.480[b]	3	51	.000	.358	28.441	.995
ExpGroup	Pillai's Trace	.118	1.082	6	104	.378	.059	6.494	.411
	Wilks' Lambda	.885	1.073[b]	6	102	.384	.059	6.437	.407
	Hotelling's Trace	.128	1.063	6	100	.390	.060	6.377	.402
	Roy's Largest Root	.101	1.759[c]	3	52	.167	.092	5.276	.432

a. Design: Intercept + TestRawScoresEnglish + ExpGroup

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

d. Computed using alpha =

RQ_1 Analysis – Repeated Measures MANCOVA

Multivariate Tests[a,b]

Within Subjects Effect		Value	F	Hypothesis df	Error df	Sig.
Time	Pillai's Trace	.013	.364	4	224	.834
	Wilks' Lambda	.987	.362[c]	4	222	.836
	Hotelling's Trace	.013	.359	4	220	.838
	Roy's Largest Root	.011	.642[d]	2	112	.528
Time * ScaleScoresEnglish	Pillai's Trace	.025	.696	4	224	.595
	Wilks' Lambda	.975	.694[c]	4	222	.597
	Hotelling's Trace	.025	.692	4	220	.598
	Roy's Largest Root	.025	1.403[d]	2	112	.250
Time * ExpGroup	Pillai's Trace	.105	1.555	8	224	.140
	Wilks' Lambda	.896	1.561[c]	8	222	.138
	Hotelling's Trace	.114	1.566	8	220	.136
	Roy's Largest Root	.096	2.680[d]	4	112	.035

a. Design: Intercept + ScaleScoresEnglish + ExpGroup

Within Subjects Design: Time

b. Tests are based on averaged variables.

c. Exact statistic

d. The statistic is an upper bound on F that yields a lower bound on the significance level.

RQ_3 Analysis – Repeated Measures MANOVA

Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.
Time	Pillai's Trace	.223	7.604	2	53.000	.001
	Wilks' Lambda	.777	7.604	2	53.000	.001
	Hotelling's Trace	.287	7.604	2	53.000	.001
	Roy's Largest Root	.287	7.604	2	53.000	.001
Time * ExpGroup	Pillai's Trace	.201	3.020	4	108.000	.021
	Wilks' Lambda	.801	3.113	4	106.000	.018
	Hotelling's Trace	.246	3.201	4	104.000	.016
	Roy's Largest Root	.236	6.365	2	54.000	.003