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The effects of using Padlet on the academic performance and engagement of students in a fifth grade basic skills mathematics classroom

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THE EFFECTS OF USING PADLET ON THE ACADEMIC PERFORMANCE AND ENGAGEMENT OF STUDENTS IN A FIFTH GRADE BASIC SKILLS MATHEMATICS CLASSROOM

by

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Dedications

I would like to dedicate my thesis to my husband, Ryan, and my daughter, Jillian. Ryan, your constant support made it possible for me to complete my research. Thank you for believing in me and helping me believe in myself. Jillian, your smiling face reminded me every day of why all of this work was worth it. I hope I make you proud.

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Abstract

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The purpose of this study was to: (a) examine the effectiveness of Padlet in increasing the engagement of students in a fifth grade basic skills mathematics classroom, (b) examine the effectiveness of Padlet in increasing the academic achievement of students in a fifth grade basic skills mathematics classroom, and (c) determine if students in a fifth grade basic skills mathematics classroom are satisfied with the use of Padlet. The research was conducted using single-subject design methodology. The study followed an ABABAB alternating baseline pattern. Student academic achievement was evaluated through daily assessments, while student engagement was evaluated in one minute intervals for ten minutes daily. The results of this study suggest that the use of Padlet may help to increase the engagement and academic achievement of students in a fifth grade basic skills mathematics classroom. Padlet was found to increase the weekly mean engagement score for 4 out of the 6 students, and the weekly mean academic achievement score for 3 out of 6 students. Results also show that all students were satisfied with the use of Padlet. Implications for educating students in a basic skills setting include the recommendation to utilize additional education technologies such as Padlet in the classroom.

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Chapter 1

Introduction

Over the past few decades, technology has advanced at an exponential rate (Strommen & Lincoln, 1992). Strommen and Lincoln (1992) describe technology as a staple that can now be seen in nearly every aspect of our day to day lives. Children today are being brought up in environments rich in technology. Television, computers, interactive technologies, such a gaming systems and cell-phones, have allowed instant access to vast amounts of information and entertainment (Strommen & Lincoln, 1992). Consequently, children often arrive at school each morning having spent the majority of their time the previous evening using such technologies (Rideout, Foehr, & Roberts, 2010). In a school setting, technology may have the potential to increase the engagement of students by allowing instruction to be in a manner they are already familiar with (Strommen & Lincoln, 1992).

Active engagement in learning may serve as a predictor of student academic achievement, specifically for at-risk students (Dotterer & Lowe, 2010). Students may demonstrate active engagement in their learning by participating and answering questions during instruction (Ornelles, 2007). However, at-risk students may refrain from such engagement in fear of being misunderstood or incorrect (Fuchs, 2014). They may also be reluctant to seek the help needed to improve in areas of academic difficulty (Ornelles, 2007). One way to address these areas of difficulty is through the implementation of supplemental educational services. Under No Child Left Behind (NCLB), at-risk students are offered remedial services to assist in increasing their academic achievement in both reading and mathematics (Heinrich, Meyer, & Whitten, 2010). Such remedial

services may involve the use of technology (Ysseldyke, Betts, Thill, & Hannigan, 2004; Zhang, Trussell, Gallegos, & Asam, 2015).

A student response system (SRS) is a form of technology that allows for immediate student response of teacher created questions, as well as immediate teacher feedback regarding student responses (Johnson & McLeod, 2004). A SRS also serves as a formative assessment (FA) by allowing teachers to frequently monitor and reflect upon the progress of their students (Johnson & McLeod, 2004). Therefore, a SRS has the ability to support student learning (William, 2006). The FA app, known as Padlet, is a SRS used by students to post their thoughts, ideas, questions, and answers on a virtual bulletin board (Fiester & Green, 2016). Students also have the ability to insert links, pictures, and videos into their posts that may further support their learning (Fuchs, 2014). All information posted to Padlet by students occurs in present time (Fuchs, 2014). Thus, Fuchs (2014) suggests that opportunities are created that allow students to analyze and learn from their classmates' responses.

Statement of Problem

At-risk students are those students in danger of failing academically in the areas of reading and mathematics (Ornelles, 2007). Because of their academic struggles, Ornelles (2007) found that these students may display a disconnect to school resulting in lower levels of engagement in the classroom. Engagement in the classroom includes behavior such as participating during a lesson, asking questions, and reading content material aloud (Ornelles, 2007). Ornelles (2007) suggests that by not participating or asking questions, at-risk students may further hinder their own academic growth.

Moreover, increasing student engagement has been found to increase student achievement (Ornelles, 2007).

Marino and Beecher (2010) recommend that teachers embrace the power of technology as a strategy to support at-risk students in increasing engagement and academic performance. Padlet, an individual SRS, allows all students to be engaged at the same time, and to collaborate simultaneously (Fuchs, 2014). Students are also able to simultaneously demonstrate their learning by answering teacher created questions or completing activities, such as task sets, that relate to current content curriculum (Weller, 2013). As a result, Fuchs (2014) suggests that Padlet may serve as a valuable tool for both teaching and learning.

Significance of Study

Research has found that a SRS may serve as an effective tool for increasing student engagement and academic performance (Bartsch & Murphy, 2011; Blood & Need, 2008; Cydis, 2011; Dunn, Richardson, Oprescu, & McDonald, 2012; Gauci, Dantas, Williams, & Kemm, 2009; Moratelli & DeJarnette, 2014; Shaffer & Collura, 2009; Stowell & Nelson, 2007). One specific type of SRS, known as clickers, has been utilized in various studies (Bartsch & Murphy, 2011; Cydis, 2011; Moratelli & DeJarnette, 2014; Shaffer & Collura, 2009; Stowell & Nelson, 2007). However, there is limited research exploring the effect of other SRSs, such as Padlet, on student engagement and academic performance, as well as limited research exploring the effect of SRSs in the mathematics classroom. Moreover, few studies have been conducted to examine the effects of using mathematical apps and technologies to increase the

engagement and academic performance of at-risk students (Ysseldyke et al., 2004; Zhang et al., 2015).

This study will add to the literature by investigating the effects of using the SRS known as Padlet as a FA tool to increase the engagement and academic performance of students in a fifth grade basic skills mathematics classroom. The present study aims to use Padlet to increase student academic performance and engagement in the area of mathematics. Results of this study may provide implications for teaching at-risk students in a basic skills setting using technology.

Purpose of Study

The purpose of this study is to: (a) examine the effectiveness of Padlet in increasing the engagement of students in a fifth grade basic skills mathematics classroom, (b) examine the effectiveness of Padlet in increasing the academic achievement of students in a fifth grade basic skills mathematics classroom, and (c) determine if students in a fifth grade basic skills mathematics classroom are satisfied with the use of Padlet.

Research Questions

1. Will the use of Padlet increase the academic engagement of students in a fifth grade basic skills mathematics classroom?

2. Will the use of Padlet increase the academic achievement of students in a fifth grade basic skills mathematics classroom?

3. Will students in a fifth grade basic skills mathematics classroom be satisfied with the use of Padlet?

Key Terms

For the purpose of this study:

At-risk students will refer to students in danger of failing academically in the area of reading and/or mathematics.

Formative assessment (FA) will be defined as a type of assessment that assesses student learning at different points throughout the learning process to inform next steps in teacher instruction.

Student response systems (SRS) will be defined as a type of technology that allow students to immediately respond to teacher created questions, as well as teachers to provide instant feedback to their students.

Padlet will refer to a SRS that allows students to demonstrate their learning of given concepts by posting answers to a teacher created wall.

Chapter 2

Review of the Literature

Technology is ever-changing. Delgado, Wardlow, McKnight, and O'Malley (2015) suggest that the effects of advancing technology can be felt in every facet of our lives. Since the 1990's, educators have had the ability to reach all of their students, regardless of ability level, by incorporating technology into their teaching (Strommen & Lincoln, 1992). Depending on the instructional strategy used, the integration of technology may have a significant effect on student learning (Delgado et al., 2015). The performance and engagement of at-risk students has been found to increase through the use of classroom technology (Ysseldyke et al., 2004; Zhang et al., 2015). Research has also found that technology-based SRSs may serve as an effective tool for increasing student engagement and performance (Bartsch & Murphy, 2011; Blood & Need, 2008; Cydis, 2011; Dunn, Richardson, Oprescu, & McDonald, 2012; Gauci, Dantas, Williams, & Kemm, 2009; Moratelli & DeJarnette, 2014; Shaffer & Collura, 2009; Stowell & Nelson, 2007). This literature review will discuss the present use of technology, the need to increase the academic achievement and engagement of students receiving basic skills instruction in mathematics, the opportunity for technology to be used as a FA and SRS, and the individual SRS known as Padlet.

Present use of Technology

The "digital revolution" describes the recent changes in the way people go about their daily lives and communicate with one another as a result of advancements in technology (Delgado et al., 2015). In the past twenty years alone, technology has infiltrated nearly every facet of our day to day lives. First, television allowed for live broadcasted images to be displayed in our homes. Then, computers allowed for

instantaneous access to infinite amounts of information. As a result, the way in which people work and operate their businesses has changed, and computers have become a staple in most fields of employment (Delgado et al., 2015).

Children in the United States today are being brought up in environments rich in technology (Rideout et al., 2010; Strommen & Lincoln, 1992). Strommen and Lincoln described the majority of children's toys as running on batteries, being interactive, and having the ability to talk, sing, dance, or flash lights since the 1990's, and reported that television and computers have allowed for children to have instant control over the information they access through the use of a remote button or mouse click (Strommen & Lincoln, 1992).

Moreover, media plays an influential role in the lives of children, specifically those ages 8-18 (Rideout et al., 2010). In a qualitative study conducted by Rideout et al. it was found that children in this age group spend, on average, more than 7 ½ hours per week using different forms of media, and often utilize more than one technological device at a time (2010). This time using technology has likely increased since the conducted study.

Furthermore, the rise in popularity of mobile and online forms of media has contributed to the increase of media content consumption among children. Cell phones have altered the way in which children not only communicate with one another, but also the way in which they utilize media. Whether used for texting, playing games, listening to music, or scrolling through the internet, a cell phone has become a staple item in the lives of children (Rideout et al., 2010). A cell phone is often the first thing many children look at when they wake up and the last thing they look at before they fall asleep (Rideout

et al., 2010). Rideout et al. (2010) argues that for most children in the United States, technology is accessible anywhere and anytime. By understanding the impact technology has on children, it becomes possible for those who play significant roles in their day to day lives to better reach, guide, and teach them through technology (Rideout et al., 2010).

Using 1:1 Technology in the Classroom

Educators are one group of people who play a significant role in the lives of children (Rideout et al., 2010). Just as the "digital revolution" refers to the changes brought about by technology in our daily lives, such changes are also evident in the field of education. Over the past few decades, educational technologies have shifted from film and classroom radios to, when possible, 1:1 technology, including computers and iPads (Delgado et al., 2015). This 1:1 ratio is considered to be the most favorable scenario allowing for each student to have the most direct time with technology use as possible.

As a result of the 2009 initiation of the Common Core State Standards, the role of technology has been incorporated into education as one way to help students build critical thinking skills (Delgado et al., 2015). Morin, Thomas, and Saadé (2015) found that students reported online learning systems as effective in helping them build their critical thinking skills. It is essential that technology plays an active role in content curriculums as it engages students in activities that foster such skills (Morin, Thomas, & Saadé, 2015).

Increasing Academic Achievement for At-risk Students

Engagement is one factor that may have an effect on student academic achievement (Dotterer & Lowe, 2010). Dotterer and Lowe (2010) examined whether classroom context, including aspects such as quality of instruction and social/emotional

climate, influence student engagement, and whether engagement influences student achievement in a qualitative study of 1,014 fifth grade students with and without prior academic difficulties. Findings suggest that the students with prior academic difficulties who received high quality instruction and were in a positive climate were more engaged during the learning process. Despite this positive result, behavioral engagement, including paying attention during the learning process, did not elicit increased academic achievement. In contrast, it was found that psychological engagement, including feeling like you belong and being motivated, was positively linked to academic achievement for at-risk students. Thus, engagement may serve as a predictor of student academic achievement, specifically for students that are struggling or considered to be at-risk (Dotterer & Lowe, 2010).

Under NCLB, at-risk students may be provided with supplemental educational services (SES) if their school has failed to meet adequate yearly progress (AYP) in and increase student achievement for 3 consecutive years. The goal of these supplemental education services is to increase student academic achievement in reading and mathematics through tutoring services and remediation (Heinrich et al., 2010). Schools receive Title 1 funding in order to provide such services to their at-risk students. Asher (2006) raises the concern that, although SESs have been offered since 2001, little is known about the effect they have on student academic achievement. In determining the effect, it is important to consider whether or not the tutoring and remediation offered connect directly to the instruction students are receiving in their general education classroom (Asher, 2006).

One way to offer remediation of the general education curriculum is through the implementation of Response to Intervention (RTI). RTI is a three tiered intervention model used to identify students with learning disabilities in the general education classroom. Specifically, tier 2 involves the use of remedial instruction of the general education curriculum for students at-risk for failing (Marino & Beecher, 2010). This remedial instruction involves the use of direct and systematic approaches to teaching in an effort to prevent future difficulties in academic areas such as mathematics and reading. Bryant et al. (2008) studied the effect of RTI and found that tier 2 interventions had no significant effect on the academic performance of 42 at-risk first grade students in mathematics. However, through the additional implementation of intervention booster lessons, the students were able to improve in the areas of number sense and arithmetic combinations. This suggests that RTI, specifically tier 2, has a unique role in the general education classroom (Bryant et al., 2008).

Despite the role of RTI, students in the general education classroom may not receive the remedial instruction needed to increase their academic achievement until after they have been identified as needing special education services (Ornelles, 2007). In addition, students at-risk for failing may hinder their own academic growth by not engaging in classroom instruction. Ornelles (2007) found that first grade students at-risk for failing were able to increase their academic engagement through the use of interventions designed to increase their interactions with their classmates and involvement in instruction. This is significant as an increase in student engagement has been found, in turn, to increase student achievement (Ornelles, 2007).

Specifically, students at-risk for failing mathematics may benefit from strategies designed to increase their achievement in the area of word problems. Kong and Orosco (2016) propose that students that struggle in math, not only have difficulty with basic computation, but also with comprehending word problems. They examined the effect math comprehension strategies have on the problem solving ability of eight third grade students at-risk for math difficulties. The strategies included the use of direct instruction, and the review of key math vocabulary. Instruction was tailored to meet each student's unique academic needs, and students were only permitted to progress to the next level of difficulty in word problems once they demonstrated mastery at their current level. At the conclusion of the study, all students significantly increased their achievement in the area of word problems (Kong & Orosco, 2016). Kong and Orosco (2016) recommend that teachers utilize math comprehension strategies in the general education classroom to help increase the problem solving skills of students at-risk for failure.

Use of Technology to Increase Academic Achievement

Technology may have a unique role in the general education classroom in increasing the overall academic achievement of at-risk students. Both Ysseldyke et al. (2004) and Zhang et al. (2015) found that student performance in math improved through the use of mathematics apps and technologies. In a study conducted by Ysseldyke et al. (2004), a curriculum based instruction management system was utilized with 712 students in grades 3-6 math. Both Title 1 and non-Title 1 students were included in this study. Accelerated Math, a curriculum based instructional management system, allows for teachers to not only monitor their student's progress, but also to adapt the instruction they receive based on their current level of understanding. Results of the control group-

experimental-group study suggest that student mathematical achievement was enhanced with the implementation of Accelerated Math at the end of five months (Ysseldyke et al., 2004).

Similarly, Zhang et al. (2015) examined the effectiveness of different math apps in closing the learning gap between typical and at-risk students. The study consisted of 19 students in a fourth grade mathematics classroom. Each student was provided with an iPad that was pre-set with three different math apps designed to supplement the curriculum they learned in their general education classroom. At the end of one month, students demonstrated an increase in their performance on mathematical assessments. As a result, the researchers suggest that at-risk students may require the use of additional strategies to increase their engagement and performance (Dotterer & Lowe, 2010). Consequently, the use of math apps may be an effective strategy to close the learning gap between typical and at-risk students (Zhang et al., 2015).

Technology-Based Formative Assessment

Marino and Beecher (2010) recommend teachers embrace the power of technology as a strategy to assist their at-risk students and students with learning disabilities. By implementing technology in the classroom, teachers are able to utilize a wide variety of teaching strategies to support their students' learning. A SRS is a form of technology that allows teachers to regularly monitor the progress of their students (Johnson & McLeod, 2004). Such progress monitoring may be useful in demonstrating if a school has met their AYP, increasing student achievement of at-risk students (Heinrich et al., 2010).

A SRS may take different forms, but the majority of systems allow for immediate student feedback, as well as feedback from the teacher regarding their work. Students may submit answers, share responses, and demonstrate their learning through the use of multiple choice or true/false questions, surveys, and open-ended response questions (Johnson & McLeod, 2004). Because of this, SRSs may be considered tools for conducting FA. William (2006) argues that FA provides teachers with the opportunity to assess their students' knowledge at various points in their learning. Results from such assessments, in turn, inform future instruction. Depending on the display of students' understanding, a teacher may continue teaching, stop for a brief discussion, or reteach the material at hand. Teachers may use FA to support student learning (William, 2006).

In order to be effective in supporting student learning, William (2007) proposes that FA include tasks with clear goals and criteria for success, and that teachers provide feedback that positively impacts learning. Providing clear goals and FA feedback in mathematics may help students better understand the various discrepancies in mathematical notation, for instance, selecting which operation to perform in a given task (William, 2007). Specifically, at-risk students may benefit from the clarification of how their learning will be evaluated, as well as being provided with quality examples of final products (William, 2007). Moreover, providing students with feedback designed to address their unique learning needs in mathematical areas such as algebra, may have a positive effect on student learning (Nichols, 2009). Foegen (2008) found that the use of specific progress monitoring measures in algebra, such as the analysis of basic skills, foundational concepts, and key content, provided indicators of present levels of student academic achievement. To support the learning of students with academic difficulties in

mathematics, teachers should not only use FAs to track student progress, but also to make educated decisions regarding changes to scheduled instruction (Foegen, 2008).

Miller (2009) investigated the effect of using a technology based FA to support student learning. Nearly 700 post-secondary education students utilized the computer software known as Hot Potatoes to complete a curriculum based assessment. Hot Potatoes allowed for a variety of student feedback responses to curriculum content including multiple-choice, fill in the blank, matching, and true/false. Students were provided with immediate support, such as a direct link to information that covers the content in question, through the click of a button. Accuracy of student responses was also able to be checked in real time. It was found that the FA supported teachers in providing feedback that increased student outcomes (Miller, 2009).

Gauci et al. (2009), and Blood and Neel (2008) examined the effects of using a SRS on the engagement and performance of post-secondary students. Both studies incorporated the use of a SRS with graduate students during a lecture course. Blood and Neel (2008) administered a lecture to a control group accompanied by notes, PowerPoint slides, and a class activity once a week for ten weeks. In contrast, the experimental group utilized a SRS to answer questions that checked for understanding prior to moving on to the class activity. It was found that the students in the experimental group increased in both their engagement and quiz scores at the end of 10 weeks (Blood & Neel, 2008). Similar to the findings of Blood and Neel (2008), it was found that students who utilized the SRS during the lectures increased participation, and scored higher on their exams than those who did not (Gauci et al., 2009).

Clickers, one specific form of SRS, are small devices that allow students to answer questions asked by their teacher with the click of a button (Blood & Gulchak, 2012). Blood and Gulchak (2012) argue that opportunities to answer teacher questions can occur frequently and are available to every student in the class, not just the ones that raise their hand. Using the SRS, students may submit their answers anonymously without worrying about repercussion from their peers if they are incorrect (Blood & Gulchak, 2012). Blood and Gulchak (2012) recommend that, through the use of clickers, teachers pose questions that emphasize key information in the curriculum to improve student academic achievement. Due to the confidential nature of responses, opportunity for simultaneous engagement in key curriculum content, and the ability to receive immediate teacher feedback, many studies have found that students have positive experiences while using clickers (Cydis, 2011; Karaman, 2011; Miller, 2009; Shaffer & Collura, 2009; Stowell & Nelson, 2007). Such positive experiences may also result from an increase in student academic achievement after using clickers (Bartsch & Murphy, 2011; Shaffer & Collura, 2009).

Bartsch and Murphy (2011), Shaffer and Collura (2009), and Stowell and Nelson (2007) conducted quantitative research studies that examined the effects of clickers on post-secondary students during lecture-based courses. The 52 student participants were randomly assigned to one of two groups, with both groups receiving a lecture. One group included the use of clickers to answer engaging questions that did not directly relate to the lecture content, while the other group simply raised their hand. A nine question content quiz was administered shortly after the lecture. It was found that students who utilized the clickers to answer the engaging questions performed better on the quiz.

According to Bartsch and Murphy (2011), this was because students were more engaged in the lesson, which in turn, led to increased academic achievement. Shaffer and Collura (2009) determined that students who utilized the clickers during their lecture scored on average 8 points higher on their exam than the students who did not utilize the clickers.

Similarly, Stowell and Nelson (2007) conducted a three group experimental design study on the effectiveness of student response methods. The study included a clicker group, a non-clicker/hand-raising group, as well as a response card group, and encompassed 140 psychology students altogether. The effects of the response methods on student participation and performance during a 30 minute lecture were examined. Even though technology was not used in the response card group, it was still found that students using either form of SRS, clickers or response cards, participated more frequently than those in the hand-raising group. Regardless of this increased participation, it was found that there was no notable difference on post-lecture quiz scores (Stowell & Nelson, 2007).

In contrast to the aforementioned studies, Moratelli and DeJarnette (2014) and Cydis (2011) examined the impact of clickers on the engagement and achievement of a younger population including fifth and seventh grade students. PowerPoint lessons were created for 22 fifth grade students that directly reviewed material to be covered on an upcoming literacy assessment. It was noted that students participating in this study were clearly excited to use the clickers on a regular basis in their instruction. Student engagement was ranked as a 3, 2, or 1, with 3 being the most engaged possible. Although both male and female student engagement scores increased over the four week implementation of clickers, male engagement was 0.4 points higher on average by the

end of the four weeks. In regards to their academic achievement, 59% of the students improved their test score averages (Moratelli & DeJarnette, 2014).

In addition, Cydis (2011) conducted a related study that consisted of 5 seventh grade students, in addition to 19 college level students, for a total of 24 study participants. Personal response system software was used in combination with clickers allowing teachers to insert questions in their PowerPoint lessons. Both qualitative and quantitative research was conducted to identify student perception of the clicker use and whether or not their learning improved. Students noted that they felt their involvement in the lesson increased, and that the clickers were easier to use than standard pencil and paper responses. Data reveals that students were also able to answer the questions asked with at least 84% accuracy (Cydis, 2011).

Dunn et al. (2012) proposed that mobile-based SRSs are not only as effective as other response systems, such as clickers, but are able to overcome the difficulties teachers and students may face while utilizing other response systems in the classroom. Such difficulties include the need for student training prior to using the devices and the amount of time spent distributing and collecting the devices, both of which take away from instructional time (Dunn et al., 2012). In the research study, 731 post-secondary students used VotApedia to call in their answers for problems posted by their teacher on the board. Qualitative research was conducted via student survey and feedback that addressed the benefits and student perceptions using a mobile-based/cell-phone SRS. Mobile-based response systems are often free or low-cost as students simply utilize their own cell-phone to vote. This may be an appropriate option for schools that do not have regular access to technology. Nearly 80% of students felt that the mobile-based response system

increased their feeling that the class was worth-while. Moreover, 70% of students felt that the use helped to improve their overall learning (Dunn et al., 2012).

Despite the aforementioned positive effects SRSs have on student engagement and performance, there is evidence that they may not be beneficial in improving student learning (Dabbour, 2016; Karaman, 2011). Dabbour (2016) implemented the use of a SRS in a post-secondary engineering ethics course consisting of 38 students, while the control group consisted of 36 students. Socrative served as the SRS and students were able to answer questions of varied format, as well as complete teacher created quizzes, all of which were accessible online. Even though student class attendance was higher for the experimental group, there was no noteworthy effect on the improvement of students' learning based on the results of an engineering exam at the end of the semester. Dabbour (2016) points to an important limitation of his study. He noted that students enrolled in the engineering ethics course tend to study less than those enrolled in other standard engineering courses (Dabbour, 2016).

Karaman (2011) presents evidence that suggests the use of SRSs may not be effective in long-term retention of student learning. Karaman studied the impact of SRSs on 44 post-secondary participants enrolled in a computer education course divided into two groups. The experimental group was able to answer teacher questions during instruction through use of a SRS over the course of 8 weeks, while the control group answered verbally. It was found that while there was an effect on student learning in the first 4 weeks, there was no effect at the end of the second 4 weeks. Therefore, the long-term effect of using SRSs to improve student learning was not evident (Karaman, 2011).

Nonetheless, SRSs may have the power to transform classroom environments. Through the use of SRSs, students are encouraged to participate frequently, have the ability to be actively engaged in instruction, and receive instantaneous teacher feedback, which may help to increase their engagement and improve their overall understanding of the content material presented (Kolikant, Drane, & Calkins, 2010).

The SRS Padlet

One possible way for students to increase engagement, collaborate with their peers, and receive instant teacher feedback within the classroom is through the use of the individual SRS known as Padlet. Padlet allows students to communicate with their classmates, as well as their teacher, in regards to class content (Fiester and Green, 2016). According to Fiester & Green (2016), Padlet allows for students to be actively engaged in a lesson when they may otherwise be distracted. Padlet may also serve as a FA tool for teachers. On the other hand, it may serve as a bulletin board where students can post their thoughts, ideas, questions, and answers. Students may then participate in discussion with their peers by replying to each other's posts (Fiester & Green, 2016). Such engagement in peer conversations allows teachers to see what their students are thinking. According to Smith and Mader (2016), the metacognitive processes behind students' thinking become apparent to teachers through the use tools such as Padlet.

According to Fuchs (2014), Padlet can be used for a variety of classroom purposes. Teacher questions can be posted to the wall, as opposed to asked verbally to the class. Students then have the opportunity to not only submit their answer, but also to read and evaluate their classmate responses. Teachers can request that students copy and post related links and images for a given lesson. Padlet can also be used in place of the

standard do-now or ticket out the door. While Fuchs (2014) discusses the benefit of Padlet serving as a FA app for teachers, possible challenges are presented. Teachers must rely on internet access to implement the app in their classroom, and the appropriateness of student responses may become an issue when they know their peers can read everything they post (Fuchs, 2014).

Fuchs (2014) argues that it is essential teachers pursue new strategies that will reach all of their students, in turn, increasing their level of engagement in the classroom. Weller (2013) pursued the implementation of Padlet with 40 pre-service teachers via a qualitative research study. Participants were required to complete a different task set at each of their scheduled monthly sessions after having only a few minutes of training on how to use Padlet. Prior to completing the task set, participants were placed in one of 13 groups with three or four other pre-service teachers. After the second session, participants completed a survey regarding how they felt using Padlet. All groups shared they felt Padlet was easy to use and helpful in completing their task sets. They noted the ability to instantly share their work, as well as check on the thinking of their peers. Twelve out of the 13 pre-service teacher groups stated that they would utilize Padlet in their future teaching. While 11 out of the 13 groups stated Padlet was fun to use, one group did not think it was fun because the internet browser they were using kept causing their Padlet wall to freeze. Another group simply did not prefer the layout of the posts. However, Weller (2013) noted that the page layouts could be easily changed. Based on these findings, Weller (2013) suggests that student learning may be improved through the use of Padlet.

While Weller (2013) investigated the effects of using Padlet at the post-secondary level, it appears promising that Padlet may serve as a FA tool that can be easily incorporated into any classroom. Specifically, at-risk students receiving RTI supports in the elementary classroom may benefit from the frequent progress monitoring capabilities (Bryant et al., 2008). In using Padlet, teachers have the ability to immediately view student responses, quickly assess student learning, and make informed decisions regarding the next steps in instruction (Fuchs, 2014).

Conclusion

This review of literature details the present uses of technology, the importance of increasing academic achievement and engagement for at-risk students, the opportunities for technology to be used as a FA and SRS, and the individual SRS known as Padlet. Common recommendations among the authors of reviewed studies include the use of SRSs to improve student learning and engagement (Bartsch & Murphy, 2011; Blood & Need, 2008; Cydis, 2011; Dunn et al., 2012; Gauci et al., 2009; Moratelli & DeJarnette, 2014; Shaffer & Collura, 2009; Stowell & Nelson, 2007). As the "digital revolution" continues to occur, Delgado et al (2015) suggests additional research studies be conducted to examine the effectiveness of new technological instructional strategies. Likewise, Zhang et al. (2015) recommends that additional studies be conducted to identify different math apps that are effective in improving student learning.

This study aims to add to the research of Delgado et al (2015) and Zhang et al. (2015) by investigating the use of the individual SRS known as Padlet with students in a fifth grade basic skills mathematics classroom. Teacher created questions posted on Padlet will serve as a FA during guided practice prior to students beginning independent

work. The purpose of this study is to: (a) examine the effectiveness of Padlet in increasing the engagement of students in a fifth grade basics skills mathematics classroom, (b) examine the effectiveness of Padlet in increasing the academic achievement of students in a fifth grade basic skills mathematics classroom, and (c) determine if students in a fifth grade basic skills mathematics classroom are satisfied with the use of Padlet.

Chapter 3

Methodology

Setting

School. The study was conducted in a public middle school located in suburban South Jersey. The school district consists of four elementary schools, one middle school, and one high school. During the 2016-2017 school year, there were approximately 6,146 students enrolled in the school district. The middle school served 1,967 students in grades five through eight and is considered to be a Title 1 School. Of the 1,957 students enrolled, approximately 150 fifth and sixth graders currently receive basic skills instruction in either mathematics or language arts. If they qualify for services in both subject areas, they only receive services in the area they are found to be the weakest. The academic school day is approximately 6 hours and 20 minutes long. Single periods are 40 minutes long, while double periods are 80 minutes long. Students have 3 minutes to pass in between each period.

Classroom. The study was conducted in a fifth grade basic skills mathematics classroom within the middle school. The classroom consists of twenty six student desks placed in groups of varied sizes, two work tables, and two teacher desks. There is a teacher desk located at the front and the back of the classroom. A second teacher is present during periods 5/6 and serves as a basic skills inclusion teacher. Both the front and the back of the classroom also have a large, long white board with a bulletin board on each end. A ceiling projector projects images, such as student work or PowerPoints, from both the teacher's computer and document camera. There is a Chromebook cart located in the back left corner of the classroom. This cart houses and charges each student's individual district assigned Chromebook each night. The participants in the

study were either in attendance after lunch during periods 5/6 (11:17-12:40) or after special during periods 8/9 (1:27-2:50). The class routine remained unaltered except for the addition of the intervention.

Participants

Students. A total of six fifth grades students, 2 female and 4 male, participated in this study. All of the students were previously identified by the district as needing basic skills instruction. The district uses multiple measures to determine student eligibility for basic skills services. Scores from a fall 2015 4th grade district test completed on Link It, an online tool used to create, administer, and report assessments, as well as a spring 2016 Measures of Academic Progress (MAP) test were used. If a teacher recommendation was provided, that was also taken into consideration. Four students received mathematics instruction during period 5/6, while three students received mathematics instruction during period 8/9. Table 1 shows general participant information.

Table 1

General Participant Information

Student	Age	Gender	Grade	Subject Area(s) Qualify for Basic Skills	Baseline Daily Assessment Score	Baseline Engagement Score
1	11	M	5	math	4.33	6.33
2	11	M	5	math	6.29	7.00
3	10	M	5	math	6.43	6.57
4	10	F	5	math	6.30	6.40
5	10	F	5	math, LA	5.70	8.70
6	10	M	5	math	4.40	6.90

Note. Assessment and engagement possible score = 10.00

The first class, period 5/6, consisted of 3 students. Student 1 is an 11 year old Caucasian male. He was found by the district to qualify for basic skills services in math, as well as recommended by his 4th grade teacher. His strengths include asking for help when needed and participating in class instruction regularly. His weaknesses include being easily distracted from instruction and classwork due to social interactions. He has a good knowledge of his basic math facts, but has difficulty learning procedures associated with new concepts. He also benefits from being prompted through step by step problems.

Student 2 is a 11 year old African American male. He was found by the district to qualify for basic skills services in math. He also has a medical condition, ADHD, which enables him to be eligible for a 504 Plan. Accommodations provided include teachers having consistent behavior expectations. Student 2 prefers to stand at his desk while he works as it helps him focus. His strengths include asking for help when needed. His weaknesses include lack of participation and being easily distracted from instruction. He has a good knowledge of basic math facts. Student 2 also responds well to redirection.

Student 3 is a 10 year old African American male. He was found by the district to qualify for basic skills services in math. In the beginning of the school year, he received counseling services in the area of social skills regarding proper interactions with peers. His strengths include participating on a regular basis and recall of steps and procedures. His weaknesses include his organization and forgetfulness. He has a history of forgetting to complete homework assignments or losing them altogether. He also struggles with basic math facts and benefits from the use of a multiplication and division fact sheet.

The second class, period 8/9, consisted of 3 students. Student 4 is a 10 year old Caucasian female. She was found by the district to qualify for basic skills services in math. Her strengths include her focus and on-task behavior during instruction. Her weaknesses include lack of participation and volunteering during instruction. Nonetheless, she will often have an answer when called upon. Student 5 benefits from summarizing step by step procedures prior to starting independent practice. She enjoys helping others and teaching her classmates when she is confident in a concept area. She also has a good knowledge of basic math facts.

Student 5 is a 10 year old Caucasian female. She was found by the district to qualify for basic skills services in math and language arts, as well as recommended by her 4th grade teacher. Her strengths include her positive attitude. She works hard to understand difficult concepts on her own. Her weaknesses include waiting too long to ask questions which often causes further difficulty in her understanding. Student 5 benefits from positive teacher reinforcement and being prompted through step by step concepts.

Student 6 is a 10 year old Caucasian male. He was found by the district to qualify for basic skills services in math, as well as recommended by his 4th grade teacher. His strengths include his focus and on-task behavior during instruction. His weaknesses include not asking for help when needed. He often struggles with new concepts and benefits from checking for understanding prior to moving on to independent practice. Student 6 has a good knowledge of basic math facts but has difficulty applying that knowledge in procedural concepts.

Teacher. A certified middle school math teacher instructed both classes, periods 5/6 and 8/9, for the duration of the study. The teacher is in her 6th year of teaching middle school math for the district. The teacher is responsible for creating lessons that follow the district's curriculum plan and incorporate the New Jersey Core Curriculum Content Standards for fifth grade math. A basic skills inclusion teacher, certified in K-8 and social studies, was present for instruction during periods 5/6 only. The inclusion teacher has worked in the district for over 15 years and has taught basic skills instruction at the middle school for 4 years.

Materials

The materials used in this study include a copy of the fifth grade textbook, *My Math* Volumes 1-2, published by McGraw-Hill, and individual student Chromebooks, assigned by the district for the 2016-2017 school year. A timer was used to keep track of minute intervals while completing the daily engagement checklist. The application Padlet was used via Chromebook for the intervention.

Measurement Materials

Student engagement checklist. An observational checklist was developed to monitor student engagement during the first ten minutes of independent practice. The teacher checked student engagement every minute for ten minutes. A checkmark was used to indicate that the student was displaying on-task behavior at the time. An "x" was used to indicate that the student was displaying off-task behavior at the time. A copy of the engagement checklist can be seen in Figure 1.

Week of: _____ Week #: _____ Day #: _____

Student #	1 Minute	2 Minutes	3 Minutes	4 Minutes	5 Minutes	6 Minutes	7 Minutes	8 Minutes	9 Minutes	10 Minutes
1										
2										
3										
4										
5										
6										

Figure 1. Student Engagement Checklist

Daily academic assessments. The students completed a five question assessment, worth a total of ten points, at the end of each class period. The assessment questions served as a direct review of the content taught in that day's lesson. All assessments were created by the teacher and were administered verbally, via whiteboard, or via document camera. Questions ranged from basic computation to word problems, and included both single and multi-step problems.

Student academic progress table. An academic progress table was developed to record student scores from their daily assessments (see Figure 2).

Week of: _____ Week #: _____

Student #	Assessment 1	Assessment 2	Assessment 3	Assessment 4
1				
2				
3				
4				
5				
6				

Figure 2. Student Academic Progress

Student Likert survey. At the end of the intervention, the participating students completed a survey using a Likert Scale regarding their satisfaction with using Padlet. The survey consisted of nine statements in which students selected their level of agreement as strongly agree, agree, neutral, disagree, or strongly disagree. Questions inquired about the ease and helpfulness of Padlet, as well as whether or not students felt Padlet helped to increase their daily assessment score and engagement in their learning.

The tenth question requested that students share any additional comments regarding the use of Padlet. All student surveys were completed anonymously (see Figure 3).

This survey is anonymous. Do not put your name on this paper.

Use a check mark to select your level of agreement for each statement listed below:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. Padlet was easy to use.					
2. Padlet was difficult to use.					
3. Using padlet helped me to better understand what I was learning in class.					
4. Padlet allowed me to easily work together with my classmates.					
5. I felt comfortable sharing my answers on Padlet.					
6. After using Padlet, I performed higher on my daily assessments.					
7. After using Padlet, I was more engaged in my learning.					
8. I enjoyed using Padlet.					
9. I would like to use Padlet in the future.					

10. Please share any additional comments regarding the use of Padlet below:

_____

_____

Figure 3. Likert Scale Student Satisfaction Survey

Research Design

The research was conducted using single-subject design methodology. The study followed an ABABAB alternating baseline pattern. During phase A, baseline data was collected for two weeks for period 5/6 and three weeks for period 8/9. Baseline data was collected using an observation checklist and student academic daily assessment grades. During Phase B, the intervention phase, students used the SRS Padlet for one week daily during guided practice prior to moving on to independent practice. Padlet served as the independent variable, while student academic grades and engagement served as the dependent variables. Data was collected daily each week using the observation checklist and student academic grades. Padlet was then removed for one week during the second Phase A, and then reintroduced during the second phase B. Period 5/6 and period 8/9 received the baseline instruction and intervention on alternating weeks. This alternating procedure was implemented to reduce the impact of the weekly mathematics content on student performance data gathered to investigate the effect of the SRS Padlet. This pattern continued until study conclusion. Student academic achievement was measured through the implementation of daily assessments related to current mathematical content. Student academic engagement was measured through daily teacher observation of on-task behaviors each minute during the first ten minutes of independent practice. At the end of the study, students were given a Likert scale satisfaction survey to provide feedback on the use of Padlet.

Procedures

The research study was implemented over an eight week period from January 2017 to March 2017. Prior to the intervention, the students were taught how to use

Padlet. They were taught how to access the application via URL posted on the whiteboard. They were also given the opportunity to practice navigating through the virtual wall and posting responses to given questions and topics.

Instructional design. Identical instruction was provided by the teacher in both periods 5/6 and 8/9. However, the inclusion teacher was present to co-teach during periods 5/6. The groups received the intervention on alternating weeks once the initial baseline phase was completed. During baseline/Phase A, students moved directly from guided to independent practice. The researcher completed the engagement checklist at the start of independent practice and students were administered the daily assessment at the conclusion of independent practice.

During the intervention/Phase B, students accessed Padlet immediately after guided practice. Students used a URL provided on the whiteboard to access each day's Padlet wall. Each teacher created Padlet wall included a question/topic directly related to that day's current lesson. Questions/topics centralized on summarizing key information, solving basic computation or word problems, or examining errors in given problems. Students answered the question or responded to a topic by posting to the Padlet wall. Collaboration between peers occurred as students commented on each other's post. During this collaboration time, teacher feedback was also administered through comments on student posts. Students transitioned to independent practice immediately after using Padlet. The researcher completed the engagement checklist at the start of independent practice and students were administered the daily assessment at the conclusion of independent practice.

Measurement Procedures

Observations. Immediately after guided practice, the researcher observed the students as they began working on their independent practice. The researcher used a timer to check student engagement every minute for ten minutes. The researcher observed the students' engagement from the back of the classroom. During each interval, a checkmark was used to indicate on-task behaviors, while an "x" was used to indicate off-task behaviors.

Academic grades. Immediately after completing independent practice, students completed a daily five question assessment. Questions related directly to the content from each day's lesson. Students worked quietly and independently to complete the assessments. They were permitted to ask clarification questions only. Once completed, students turned in their assessments directly to the teacher.

Survey. At the conclusion of the study, all participants completed a satisfaction survey. All responses were anonymous. After reading the survey statements aloud, the teacher stepped outside of the room so the students could complete and turn in their completed surveys.

Data Analysis

Graphs were created to illustrate and visually compare each phase of data collection. Data points for this study occurred between 3-5 days a week. Student academic scores from the academic assessments were collected daily. Student engagement checks were also collected daily over 10 one minute intervals. All data was recorded into a spreadsheet. Both academic scores and engagement checks ranged from 0 to 10 points.

Chapter 4

Results

Engagement

Research question one asked, will the use of Padlet increase the academic engagement of students in a fifth grade basic skills mathematics classroom? Student academic engagement was evaluated immediately after guided practice, at the start of independent practice. An engagement checklist was utilized to record student engagement in one minute intervals for a total of ten minutes. A checkmark was used to indicate that the student was displaying on-task behavior at the time. An "x" was used to indicate that the student was displaying off-task behavior at the time. The maximum number of points a student could earn was 10 points. Means and Standard Deviation (SD) of each student's academic engagement were calculated and are presented in Tables 2 and 3.

Table 2

Mean and SD of Student Engagement for Period 5/6

	Baseline 1		**Intervention 1**		**Baseline 2**		**Intervention 2**		**Baseline 3**		**Intervention 3**		**Baseline 4**	
Student	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
1	6.33	1.21	9.67	0.58	6.00	2.00	8.00	0.00	6.00	1.00	9.50	0.71	6.00	0.00
2	7.00	1.91	9.33	0.58	9.00	0.00	7.67	1.53	7.00	1.00	9.67	0.58	9.33	0.58
3	6.57	1.13	9.33	1.15	7.67	0.58	9.00	0.00	6.67	3.51	9.33	0.58	8.00	1.00

Note. Mean and SD out of 10 total possible points

Table 3

Mean and SD of Student Engagement for Period 8/9

	Baseline 1		Intervention 1		Baseline 2		Intervention 2		Baseline 3		Intervention 3	
Student	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
4	6.40	1.26	10.00	0.00	7.33	2.52	9.33	1.15	8.00	1.00	9.67	0.58
5	8.70	1.16	8.67	1.15	8.67	1.15	9.67	0.58	8.67	1.15	10.00	0.00
6	6.90	1.79	10.00	0.00	5.50	2.12	9.33	0.58	7.67	1.53	8.00	1.00

Note. Mean and SD out of 10 total possible points

In the area of student academic engagement, the group mean for Period 5/6 at baseline 1 was 6.63, and the group mean at intervention 1 was 9.44. The group mean at baseline 2 was 7.56, and the group mean at intervention 2 was 8.22. The group mean at baseline 3 was 6.56, and the group mean at intervention 3 was 9.50. Finally, the group mean for Period 5/6 at baseline 4 was 7.78. Each intervention phase showed a higher group mean than any baseline phase. Student 1 and 3 both had individual intervention means higher than their baseline means. However, Student 2's intervention 2 mean of 7.67 was less than the baseline 2 mean of 9.00.

The group mean for Period 8/9 at baseline 1 was 7.33, and the group mean at intervention 1 was 9.56. The group mean at baseline 2 was 7.17, and the group mean at intervention 2 was 9.44. The group mean at baseline 3 was 8.11, and the group mean at intervention 3 was 9.22. Unlike Period 5/6, Period 8/9's intervention means were all greater than 9.00. Similar to Period 5/6, each intervention phase showed a higher group

mean than any baseline phase. Student 4 and Student 6 both had individual intervention means higher than their baseline means. However, student 5's intervention 1 mean of 8.67 was equivalent to and/or less than her baseline means.

Academic Achievement

Research question two asked, will the use of Padlet increase the academic achievement of students in a fifth grade basic skills mathematics classroom? Student academic achievement was evaluated daily using a five question assessment, worth a total of ten points, administered at the end of each class period. The assessment questions served as a direct review of the content taught in that day's lesson. Means and SD of each student's academic achievement were calculated and are presented in Tables 4 and 5.

Table 4

Mean and SD of Academic Scores for Period 5/6

	Baseline 1		**Intervention 1**		**Baseline 2**		**Intervention 2**		**Baseline 3**		**Intervention 3**		**Baseline 4**	
Student	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
1	4.33	3.08	7.33	3.79	4.00	1.73	4.00	0.00	5.67	1.15	8.50	0.71	6.50	0.71
2	6.29	1.80	7.67	0.58	7.33	2.52	6.00	2.65	6.33	1.53	9.67	0.58	8.00	2.65
3	6.43	2.57	8.67	2.31	3.67	3.51	6.67	1.15	3.33	2.52	8.67	1.53	8.33	2.08

Note. Mean and SD out of 10 total possible points

Table 5

Mean and SD of Academic Scores for Period 8/9

	Baseline 1		Intervention 1		Baseline 2		Intervention 2		Baseline 3		Intervention 3	
Student	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
4	6.30	2.16	6.33	1.53	7.67	2.08	9.00	1.00	7.67	1.53	10.00	0.00
5	5.70	2.50	8.67	0.58	4.67	0.58	8.67	0.58	6.67	0.58	9.00	1.00
6	4.40	2.46	7.67	1.53	5.00	0.00	6.67	2.08	6.67	0.58	8.00	1.00

Note. Mean and SD out of 10 total possible points

In the area of student academic achievement, the group mean for Period 5/6 at baseline 1 was 5.68, and the group mean at intervention 1 was 7.89. The group mean at baseline 2 was 5.00, and the group mean at intervention 2 was 5.56. The group mean at baseline 3 was 5.11, and the group mean at intervention 3 was 8.94. Finally, the group mean for Period 5/6 at baseline 4 was 7.61. Although, two of the intervention phases showed a higher group mean than any baseline phase, the group mean for intervention 2 was lower than the group mean for baseline 1. Student 1 and 2 both had individual intervention 2 means less than their baseline 1 and 2 means.

The group mean for Period 8/9 at baseline 1 was 5.47, and the group mean at intervention 1 was 7.56. The group mean at baseline 2 was 5.78, and the group mean at intervention 2 was 8.11. The group mean at baseline 3 was 7.00, and the group mean at intervention 3 was 9.00. Unlike Period 5/6, Period 8/9's intervention means showed a

higher group mean than any baseline phase. Students also had individual intervention means higher than their baseline means.

Individual Results

Student 1 is an 11 year old Caucasian male. He was found by the district to qualify for basic skills services in math. Figure 4 illustrates both the academic and engagement scores in points for Student 1. During baseline 1, Student 1's mean academic achievement score was 4.33. During intervention 1 when Padlet was implemented, the mean score increased to 7.33. Student 1's mean academic achievement score during baseline 2 and intervention 2 remained consistent at 4.00. During baseline 3, the mean score increased slightly to 5.67. During intervention 3, the mean score continued to increase to 8.50. Student 1 returned to baseline and ended with a decreased mean academic achievement score of 6.50.

Student 1's mean engagement score during baseline 1 was 6.33. During intervention 1, the mean score increased to 9.67. During baseline 2 when the use of Padlet was removed, the mean score decreased to 6.00 before increasing again to 8.00 during intervention 2 when Padlet was re-introduced. Student 1's mean score remained at 6.00 for the two remaining baselines, while there was another increase to the mean score of 9.50 between the two baselines during intervention 3. As seen in Figure 4, Student 1's engagement scores were higher during the intervention phases when compared to the baseline phases, with the exception of one equivalent engagement score during baseline 2. Student 1's academic scores also ranged from as low as 2 points to as high as 10 points.

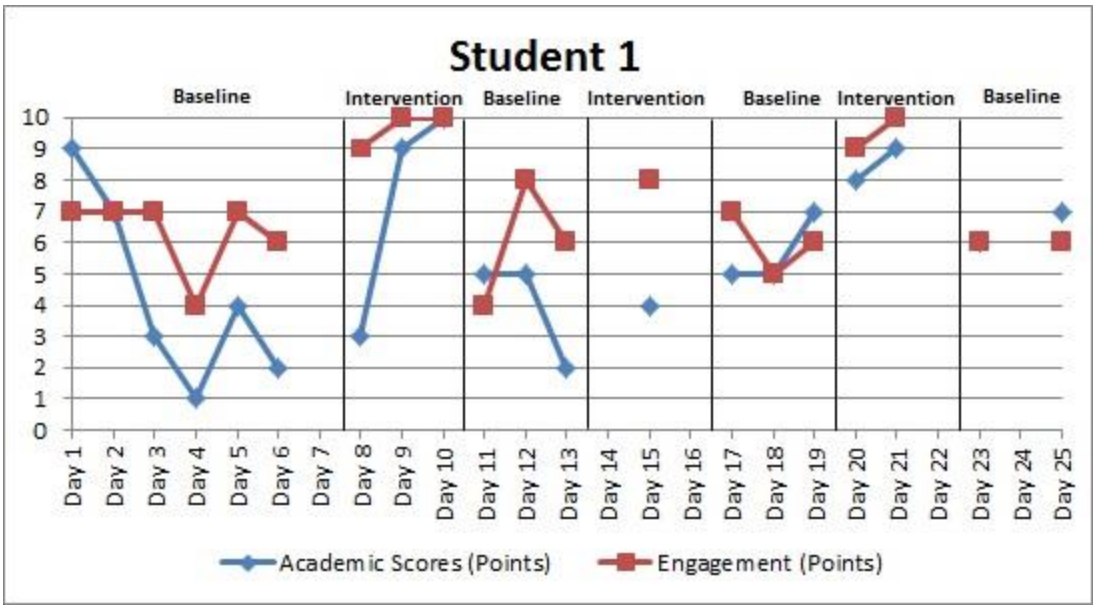

Figure 4. Student 1 Academic Scores and Engagement

Student 2 is a 11 year old African American male. He was found by the district to qualify for basic skills services in math. Figure 5 illustrates both the academic and engagement scores in points for Student 2. During baseline 1 before the use of Padlet, Student 2's mean academic achievement score was 6.29. During intervention 1, the mean score increased to 7.67. Although there was a slight decrease to a mean score of 7.33 during baseline 2, there was a larger decrease to a mean score of 6.00 during intervention 2. During baseline 3, Student 2's mean score increased to 6.33 before increasing significantly to 9.67 during intervention 3 with the use of Padlet. Student 2 returned to the final baseline and ended with a mean score of 8.00.

Student 2's mean engagement score during baseline 1 was 7.00. With the use of Padlet, the mean score increased to 9.33 during intervention 1. There was a slight decrease in the mean score to 9.00 during baseline 2, followed by a decrease to 7.67 during intervention 2, and a third consecutive decrease to 7.00 during baseline 3.

Intervention 3 brought a significant increase in Student 2's mean score to 9.67. Student 2 returned to baseline and ended with a mean engagement score of 9.33. A visual analysis of Figure 5 shows, with the exception of baseline 2, that Student 2's daily academic and engagement scores tended to increase and/or decrease in a similar pattern.

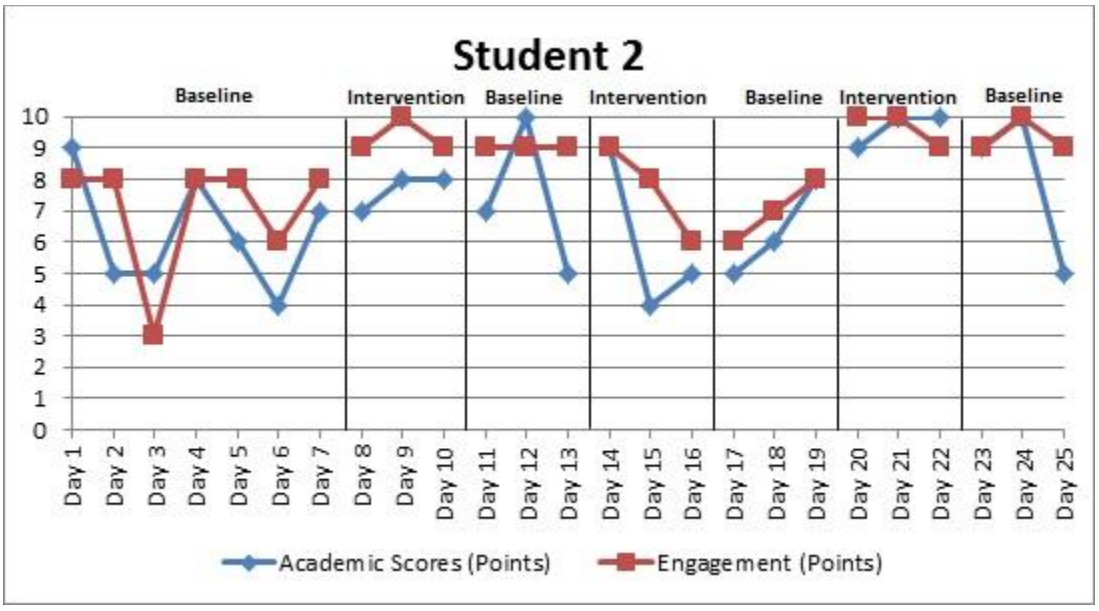

Figure 5. Student 2 Academic Scores and Engagement

Student 3 is a 10 year old African American male. He was found by the district to qualify for basic skills services in math. Figure 6 illustrates both the academic and engagement scores in points for Student 3. The data shows a significant range between Student 3's first three baseline and first three intervention scores. Before the use of Padlet, Student 3's mean scores for baseline 1, 2, and 3 were 6.43, 3.67, and 3.33. After the use of Padlet, Student 3's mean scores for the intervention phases were 8.67, 6.67, and 8.67. This shows an increase in the mean score from each baseline to intervention phase. Student 3 returned to baseline and ended with a mean score of 8.33.

Similarly, Student 3 showed an increase in the mean engagement score from each baseline to intervention. Student 3's mean score for baseline 1, 2, and 3 were 6.57, 7.67, and 6.67. His mean score for the intervention phases were 9.33, 9.00, and 9.33. Student 3 ended baseline 4 with a mean score of 8.00. A visual analysis of Figure 6 shows that Student 3's academic scores tended to vary on a daily basis, ranging from as low as 0 points to as high as 10 points. With the exception of baseline 3, Student 3's engagement scores increase and/or decrease in a more subtle manner.

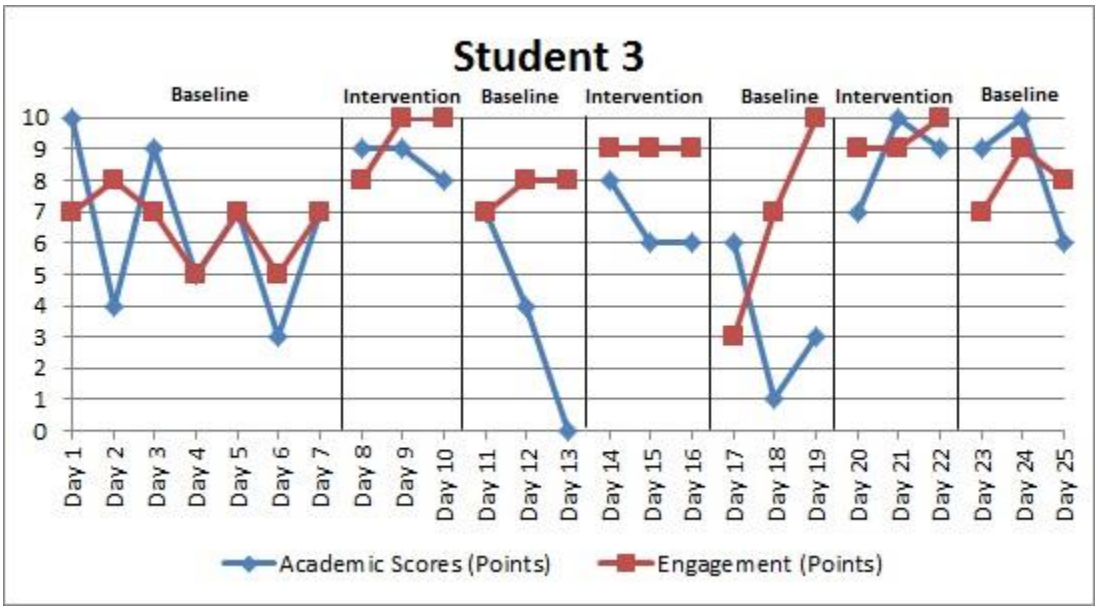

Figure 6. Student 3 Academic Scores and Engagement

Student 4 is a 10 year old Caucasian female. She was found by the district to qualify for basic skills services in math. Figure 7 illustrates both the academic and engagement scores in points for Student 4. Student 4's mean academic achievement score during baseline 1 was 6.30. Intervention 2 showed a minute increase with a mean score of 6.33. Student 4's mean scores for baseline 2 and 3 were both 7.67. Both

baselines were immediately followed by an increase to the mean engagement score of 9.00 during intervention 2 and 10.00 during intervention 3.

Student 4's mean engagement score during baseline 1 was 6.40. A significant increase occurred as the mean score during intervention 1 was 10.00. When the use of Padlet was removed during baseline 2, the mean score was 7.33. After reintroducing Padlet, the mean score increased again to 9.33 during intervention 2. Similarly, there was a subsequent decrease to 8.00 during baseline 3, following by an increase to 9.67 during intervention 3. As seen in Figure 7, Student 4's daily academic and engagement points nearly coincide with one another during all phases, with the exception of intervention 1. Student 4 was also the only student to receive a 10.00 as a mean score for both academic achievement and engagement.

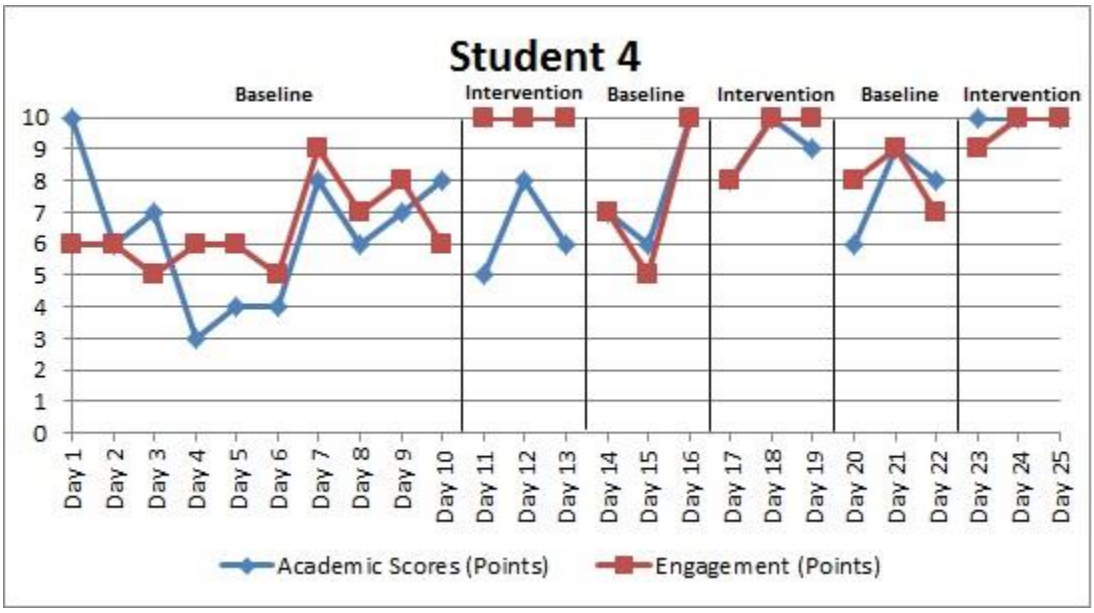

Figure 7. Student 4 Academic Scores and Engagement

Student 5 is a 10 year old Caucasian female. She was found by the district to qualify for basic skills services in math and language arts. Figure 8 illustrates both the academic and engagement scores in points for Student 5. During baseline 1, Student 1's mean academic achievement score was 5.70. During intervention 1 when Padlet was implemented, the mean score increased to 8.67. Student 5's mean score decreased significantly to 4.67 during baseline 2 before increasing again to 8.67 during intervention 2. With the removal of Padlet during baseline 3, the mean score decreased to 6.67. During intervention 3 when Padlet was re-introduced, the mean score continued to show an increase to 9.00.

Student 5's mean engagement score during baseline 1 was 8.70. During intervention 1, the mean score decreased slightly 8.67. During baseline 2 when the use of Padlet was removed, the mean score remained consistent at 8.67. There was an increase in the mean score to 9.67 during intervention 2, followed by another decrease to 8.67 during baseline 3. Student 5's mean score during intervention 3 was 10.00. As seen in Figure 8, Student 5's daily engagement scores tend to be consistently high, ranging from 7 points to 10 points.

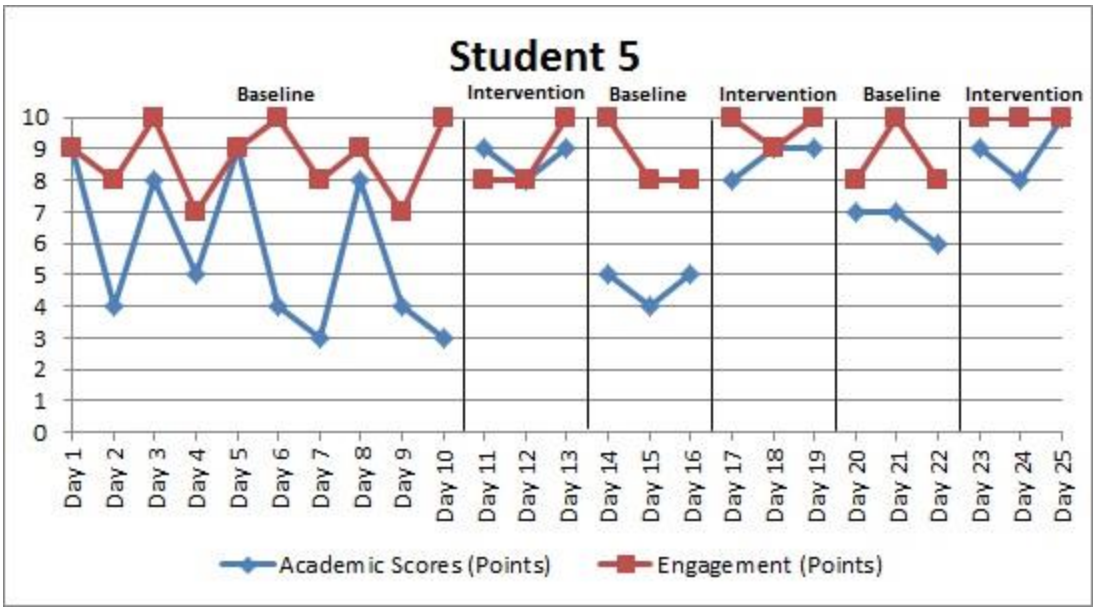

Figure 8. Student 5 Academic Scores and Engagement

Student 6 is a 10 year old Caucasian male. He was found by the district to qualify for basic skills services in math. Figure 9 illustrates both the academic and engagement scores in points for Student 6. Student 6's mean academic achievement score during baseline 1 was 4.40. With the use of Padlet during intervention 2, there was a significant increase to a mean of 7.67. Baseline 2 showed a decreased mean score of 5.00, followed by a mean score of 6.67 for both intervention 2 and baseline 3. Student 6's mean score for intervention 3 increased to 8.00.

Student 6's mean engagement score during baseline 1 was 6.90. A significant increase occurred as the mean score during intervention 1 increased to 10.00. This was followed by a subsequent significant decrease as the mean score during baseline 2 decreased to 5.50 with the removal of Padlet use. Student 6's mean score during intervention 2 was 9.33, followed by a mean score during baseline 3 of 7.67. Student 6

ended with a slight increase in his mean score to 8.00 during intervention 3. Student 6's academic scores range from as low as 1 point to as high as 9 points.

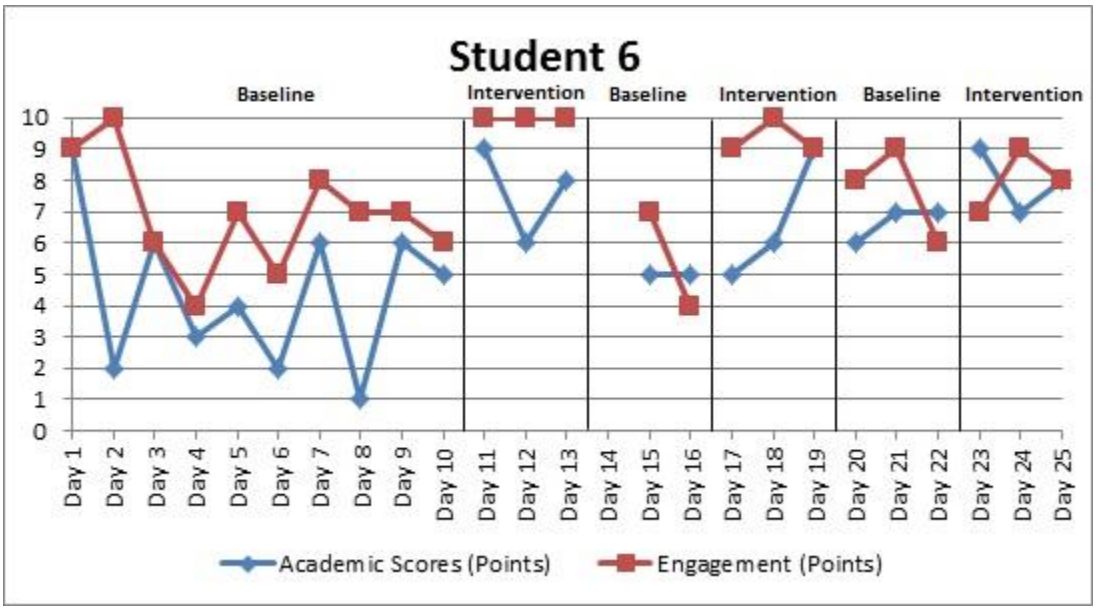

Figure 9. Student 6 Academic Scores and Engagement

Student Satisfaction

Research question three asked, will students in a fifth grade basic skills mathematics classroom be satisfied with the use of Padlet? Student satisfaction with using padlet was measured at the end of the study using a Likert Scale survey. Students completed the survey anonymously. It consisted of nine statements in which students selected their level of agreement as strongly agree, agree, neutral, disagree, or strongly disagree. Students shared any additional comments regarding the use of Padlet on the tenth and final question. Results were tallied, and percentages of student responses are presented in Table 6.

Table 6

Student Satisfaction Survey Results in Percentages

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. Padlet was easy to use.	67	0	33	0	0
2. Padlet was difficult to use.	0	0	0	50	50
3. Using padlet helped me to better understand what I was learning in class.	17	50	33	0	0
4. Padlet allowed me to easily work together with my classmates.	67	33	0	0	0
5. I felt comfortable sharing my answers on Padlet.	67	17	0	17	0
6. After using Padlet, I performed higher on my daily assessments.	33	50	17	0	0
7. After using Padlet, I was more engaged in my learning.	50	33	17	0	0
8. I enjoyed using Padlet.	100	0	0	0	0
9. I would like to use Padlet in the future.	67	17	17	0	0

According to the results of the student survey, 100% of students enjoyed using Padlet. Over half of the students, 67%, strongly agreed Padlet allowed them to easily work together with their classmates and to feel comfortable sharing their answers. However, one student, 17%, disagreed and did not feel comfortable sharing their answers on Padlet. All of the students were either neutral, agreed, or strongly agreed that Padlet helped them to better understand what they were learning in class. Accordingly, 50% of students felt that they performed higher on their daily assessments after using Padlet. In terms of use, 50% of students strongly disagreed that Padlet was difficult to use, and 67% strongly agreed that Padlet was easy to use. In regards to future use, 67% strongly agreed

that they would like to use Padlet in the future, and 17% agreed that they would like to use it, for a total of 84% agreeing.

In regards to the additional student comments regarding the use of Padlet, students referenced that Padlet "helped increase my learning," as well as "helped me on my tests." After using Padlet, 50% of students strongly agreed that they were more engaged in their learning. One student specifically noted that they "liked Padlet because it helped me focus in class." Two students referenced liking the comment capability because "if you're wrong, someone can help you" and other students can "catch my mistakes." Two students commented on one challenge that they experienced while using Padlet. They disliked how their Padlet posts would consistently move down the screen as other students either added new posts or commented on existing posts.

Chapter 5

Discussion

The purpose of this study was to examine the effectiveness of Padlet in increasing the academic engagement and achievement of students in a fifth grade basic skills mathematics classroom. At the conclusion of the study, students completed a survey to determine if they were satisfied with the use of Padlet.

Findings

The results of this study show that engagement increased during the intervention phases for 4 out of 6 students. When Padlet was implemented in the classroom, engagement increased for Students 1, 3, 4, and 6 across all three phases from intervention to baseline. The remaining two students, Students 2 and 5, also increased engagement, but with less consistency, with each student increasing engagement in two of the three intervention phases. Student 5 remained consistent in engagement from baseline 1(M = 8.70) to intervention 1 (M = 8.67) prior to increasing. In terms of Student 2, it appears the lower engagement in the second intervention phase may have been a result of his ADHD. His ability to focus during instruction or on the independent practice may have impacted his daily engagement. The finding that the use of Padlet increased student engagement in 4 of 6 students corroborates the findings of Gauci et al. (2009) and Blood and Neel (2008) suggesting the use of SRS technology is effective in increasing student engagement and participation.

The results of this study also show that the weekly mean academic achievement score increased during the intervention phases for 3 out of 6 students. The dependent variable of academic achievement for Students 3, 4, and 5 was higher during each intervention phase when compared to each baseline phase. In period 5/6, Students 1 and

2 increased during interventions 1 and 3, but not 2. The lower achievement for Student 1 during intervention 2 may be attributed to absences, as he was absent for two out of the three days Padlet was implemented. Furthermore, student progress may have been impacted by the academic content, e.g. perhaps, both Student 1 and 2 had difficulty with that phase's concept of dividing greater numbers by two and three digit divisors. In period 8/9, Student 6 had one weekly mean achievement score during intervention 2 that was equal to his score during baseline 3. With the exception of that one score, all students in period 8/9 increased in academic achievement. The finding that the use of Padlet increased student engagement in 3 of 6 students corroborates the findings of Ysseldyke et al. (2004) and Zhang et al. (2015) suggesting that student performance in mathematics improves through the use of math apps and technologies.

Dotterer and Lowe (2010) found that active engagement in learning may serve as a predictor of student academic achievement, specifically for at-risk students. Upon review of individual data, on days where student engagement was high, academic achievement was also high. The data for Students 2 through 5 illustrate the dependent variables of academic engagement and achievement following this pattern during at least two intervention phases. For example, Student 5 had daily engagement and achievement scores within two data points of one another during all intervention phases. Students 2 and 3 had engagement and achievement scores that were further spread out during intervention 2, while Student 4's scores were further spread out during intervention 1. The further spread of data during one intervention phase for Students 2 through 4 may have been caused by a difficulty understanding the given concept. It may be that even though the students were engaged in the lesson, they still had difficulty demonstrating

their learning on the daily assessment. This pattern is only noticeable for Student 6 during their third and final intervention phase. This data suggests that student engagement and academic achievement are not only closely related, but more specifically, engagement may serve as a precursor to academic achievement.

Nonetheless, one noted trend is that students scored higher overall in the area of academic engagement when compared to academic achievement throughout all intervention phases. For example, Student 1's intervention phase mean achievement scores ranged from 4.00 to 8.50 out of 10.00, while his intervention phase mean engagement scores ranged from 8.00 to 9.67 out of 10.00. Similarly, Student 3's intervention phase mean achievement scores ranged from 6.67 to 8.67 out of 10.00, while his intervention phase mean engagement scores ranged from 9.00 to 9.33 out of 10.00. Also following this trend, Student 6's intervention phase mean achievement scores ranged from 6.67 to 8.00 out of 10.00, while his intervention phase mean engagement scores ranged from 8.00 to 10.00 out of 10.00. Students 2, 4, and 5 also follow a similar trend.

All student participants completed a satisfaction survey at the conclusion of the study. The results illustrate that all of the students were satisfied with the use of Padlet and strongly agreed to enjoying using it. Prior researchers (Cydis, 2011; Karaman, 2011; Miller, 2009; Shaffer & Collura, 2009; Stowell & Nelson, 2007) found that students report positive experiences while using SRSs, as they provide the opportunity for simultaneous engagement in key curriculum content, and the ability to receive immediate teacher feedback. The present study also found all students to report positive experiences as they strongly agreed to enjoy using Padlet. Out of the 6 students, 5 either agreed or

strongly agreed that they would like to use Padlet in the future. The remaining student was neutral in regards to future use.

Limitations

This study had several possible limitations. One limitation may have been the time frame in which the study was conducted. The study was implemented over an eight week period from January 2017 to March 2017. Out of the eight weeks, six weeks were four days long due to teacher in-services and holidays. Due to regularly scheduled chapter assessments, the study was only able to occur on an average of 3 days each week. The data from the study may have been stronger if it was able to be collected for five consecutive days a week throughout the entire study.

A second limitation may have been the small number of participants in the study. Only six fifth grade students participated in this study. Therefore, the results of the study cannot be generalized to the entire population of fifth grade students in a basic skills math class. More specifically, the results of this study may have been limited by the data from Student 1. Out of the 25 days of data collection, Student 1 missed 5 days of the study. He was absent for three days and received in-school suspension two days. Because of this, a SD for intervention 2 was unable to be calculated for Student 1 as he was only present in school one out of the three study days.

A third limitation may have been the subject area itself. Because this study took place in a mathematics classroom, students were taught and/or reviewed a different math lesson every day. It is possible that student academic achievement scores on the daily assessments were affected by their ability to truly understand one specific concept. For instance, if a lesson was introduced one day and then reviewed the second, it is possible

that student scores may have been lower the first day and higher the second day after additional practice. Finally, mathematical concepts may have had a direct impact on student achievement as one concept may have come easier than the next for a student.

Implications and Recommendations

Though this study has its limitations, the data does suggest that the use of Padlet may help to increase the engagement and academic achievement of students in a fifth grade basic skills mathematics classroom. Padlet was found to increase the weekly mean engagement score for 4 out of the 6 students and the weekly mean academic achievement score for 3 out of 6 students. Students 3 and 4 increased in both engagement and academic achievement. This corroborates prior studies that have suggested technology-based SRSs serve as an effective tool for increasing student engagement (Bartsch & Murphy, 2011; Blood & Need, 2008; Cydis, 2011; Gauci et al., 2009; Moratelli & DeJarnette, 2014; Stowell & Nelson, 2007), as well as studies that have suggested that the use of mathematical apps and technologies improve student academic performance (Ysseldyke et al., 2004 & Zhang et al., 2015). As a result of only half of the students increasing their weekly mean achievement score, the findings for academic achievement may be considered inconsistent. However, all students in period 8/9 had weekly intervention mean achievement scores that were equal to or greater than their baseline scores. In addition, all students in period 1/2 increased in at least two out of three intervention phases.

Broader implications for educating students in a basic skills setting emerging from this study include the recommendation to utilize additional education strategies such as Padlet in the classroom. Padlet may serve as an effective SRS in the classroom

allowing for increased student engagement, collaboration, and instant teacher feedback. Given the results from the satisfaction survey, it is likely that students will enjoy utilizing Padlet in other mathematics classroom. Following the recommendation of prior researchers, it is recommended that additional studies be conducted to identify different math apps that are also effective in improving student learning (Zhang et al., 2015). Furthermore, it is recommended that research continues in order to strengthen the inconsistencies surrounding the dependent variable of academic achievement.

Conclusions

This study was successful in that it increased the academic engagement among students in a fifth grade basic skills mathematics classroom. The study also confirmed that students were satisfied with the use of Padlet. While this study attempted to determine the effectiveness of Padlet in increasing the academic achievement among students, results were less consistent and further studies are needed to validate findings. Recommendations for future research include conducting the study with a larger number of student participants, as well as investigating if the number of days Padlet is used per week impacts student outcomes.

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