The Impact of Study Island as a Formative Assessment Tool

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Abstract

The purpose of this study was to examine the effectiveness of the Study Island program as a formative assessment tool in the secondary levels of reading and math. Study Island is an online tool that assesses students according to their state's standards in English and math. The research design for the study was quantitative in nature and quasi-experimental with one independent variable consisting of two categories based upon participation status. Four chi-square tests of independence were used to address the hypotheses that academically at-risk students who participated in the Study Island program performed better on the Kansas Reading and Math Assessments than the academically at-risk students who did not participate. Additional analyses were conducted to determine the amount of improvement of the entire sample from the Center for Educational Testing and Evaluation (CETE) diagnostic reading and math assessments to the Kansas Reading and Math Assessments. Data from the four chi-square tests did not support a statistically significant relationship between the participation in the Study Island program and success on the Kansas Reading or Math Assessment. Data from the four frequency tables indicated a greater percentage of improvement from the CETE diagnostic assessments to the Kansas assessments than non-improvement, regardless of participation status. Ultimately, there was no statistically significant evidence that the at-risk students who participated in the Study Island program had a greater percentage of improvement than the non-participants. The findings of this study could help high schools within the Blue Valley School District determine if this particular online, formative assessment intervention could impact their students' learning and performance on summative tests.

Dedication

This dissertation is dedicated to the person who helped me believe that this was all possible: my wife and best friend, Erica.

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Chapter One

Introduction

In today's high stakes educational climate, educators increasingly seek methods that will help students take ownership of their education and, in turn, help them make the transition into learners. Obviously, no two students are alike in their ability to learn; therefore, it is essential to establish approaches that differentiate instruction for students on all skill levels. The challenge, according to Bramlett, Cates, Savina, and Lauinger (2010), is that educators must deal with the fact that there will always be students who struggle more than others in the general education classroom and who simply do not have the skills to effectively read, write, or understand certain concepts (p. 114). It is the educator's responsibility to develop the learning of all students, regardless of their skill sets.

The federal government addressed student learning gaps in the Individuals with Disabilities Education Improvement Act of 2004 (IDEIA) by including Response to Intervention (RTI). This model, which was first proposed by Gresham (2002), prompts educators to provide personalized, structured, research-based interventions designed to help students who possessed learning problems. In addition, a major component to the RTI process is that educators regularly collect academic progress checks from their students in order to evaluate the effectiveness of each intervention (Fasko, 2006, p. 5). Freidman (2010) explained that RTI "establishes a structure of stops along the way where questions are asked, diagnosis is determined, effective treatment options are explored, progress monitoring is embedded, and treatment is adjusted based on the results of the progress monitoring" (p. 207).

In order for the RTI process to become effective, progress monitoring should be used in conjunction with effective assessments that inform both the teacher and student about growth. Heritage (2007) warned of the danger that some lower skilled students may ultimately give up due to frustration if the instructional process is too quick or not differentiated to the meet their specific needs. She stated, “Teachers need the skills to translate their interpretations of assessment results into instructional actions that are matched to the learning needs of their students” (p. 144). Educators must develop RTI through the implementation of regular and effective formative assessment to gauge the skill set of each of their students. The goal is to have educators who are aware of the needs of their students and can develop strategies to address those needs. This should happen daily throughout the school year rather than through summative assessments at the end of a unit, quarter, semester, or year. Summative assessments are not used for productive measures of student learning but rather “summative assessment scores are often related to a student’s rank compared to peers’ ranks, and performance differences are the most important concern” (Yue et al., 2008, p. 339). Summative assessment as a gauge for learning does not allow educators to provide feedback concerning specific skill misunderstandings during the instructional process.

Formative assessments can be a key element to the RTI process in the fact that they can inform educators on the effectiveness for specific interventions that are used for their students. The evidence that is produced by formative assessment can be collected by the classroom teacher and, in turn, serve as a tool to modify instruction to further address the skills that have not been mastered (Cauley & McMillan, 2010). Regular formative assessments address what students have learned, what they have yet to learn, and allow educators to understand which skills should continue to be practiced. This enables students to be supported at each level of their learning and is defined as a “scaffolding” approach to instruction. Clark (2010) stated that the three byproducts of formative assessment are that, “it informs teaching practice, instructional decisions are made based on this information, [and] students receive scaffolded assistance on how to improve their work” (p. 341). The data educators receive from this type of ongoing assessment informs them on which tier a student should be placed in the RTI process.

One formative assessment approach that provides students with the ability to self-monitor their progress during the educational process and become more active participants in their education is Assessments for Learning (AFL). Stiggins (2005) explained when educators utilize AFL, “students are inside the assessment process, watching themselves grow, feeling in control of their success, and believing that continued success is within reach if they keep trying” (p. 327). This allows the educator to create an environment in which students are “partners in the assessment of learning and to use assessment results to change their own learning tactics” (Fluckiger, Vigil, Pasco, & Danielson, 2010, p. 136). Ultimately, a student learns by forming a relationship with a teacher that focuses more upon targeted knowledge skills than merely grades in a grade book (Gerzon, 2011, p. 18). These relationships help open up lines of communication between the teacher and student and allows for timely feedback regarding the student’s growth. Additionally, when students receive feedback from AFL, they are encouraged to create their own goals (Cauley & McMillan, 2010, p. 2).

Over the last decade, formative assessments have evolved from the traditional paper and pencil tests into more advanced technological tools (Boyle & Hutchinson, 2009, p. 304). Just as educators have sought out differentiated instructional strategies, they have also begun to utilize a variety of computerized programs with the goals of assessing their students in a more expedient and efficient manner. Boyle and Hutchinson (2009) stated that electronic assessments (e-assessments) possess the capability to help educators reach and assess the 21st century student. They also stressed that while still in its relative infancy, e-assessment has evolved as a tool to assess specific content skills and address formative assessment purposes (p. 305). Furthermore, studies within the last five years have indicated that the formative assessments students can access through computer software (also known as e-assessments) have resulted in “significantly higher learning gains for lower prior knowledge users” (Johnson-Glenberg, 2010, p. 169). As new formative based e-assessments appear each year, educators must continue to evaluate each technological tool’s sophistication and effectiveness within its specific educational context.

Background

The setting of this study was Blue Valley Southwest High School in the Blue Valley Unified School District #229 located in Overland Park, Kansas. Blue Valley Southwest opened with an enrollment of 786 students in August 2010 and contained a faculty of 97 employees. The 300,000 square foot building was built after the Blue Valley School District passed a 2005 bond (Blue Valley School District, n.d.).

This study was conducted during the Blue Valley Southwest’s inaugural school year, 2010-2011. Blue Valley Southwest’s 786 student enrollment for the 2010-2011 school year is displayed by gender and grade in Table 1. Southwest’s gender distribution of 50.5% female and 49.5% male students was consistent with Blue Valley School

District's 51% males and 49% female students. Additionally, Table 1 indicates that 12th graders only consisted of 12% in the student population. While 9, 10, and 11 graders were required to relocate to Southwest according to a newly designed district boundary map, 12th graders were given a choice to enroll in the new high school.

Table 1

Blue Valley Southwest High School 2010-2011 Enrollment by Grade and Gender

Grade	Male	Female	Total
9	123	122	245
10	113	104	217
11	101	124	225
12	52	47	99
Total	389	397	786

Note. Adapted from the *Blue Valley Southwest Adequate Yearly Progress (AYP) Report*, by the Kansas Department of Education, 2011.

Blue Valley Southwest is located within the upper middle-class community of Overland Park, Kansas. During the 2010-2011 school year, only 4% of Blue Valley Southwest's student population was eligible for federal aided Free and Reduced Lunch. Table 2 reveals the breakdown of Blue Valley Southwest's Free and Reduced Lunch students according to grade and gender. The low number of students is consistent with the school's high socio-economic community.

Table 2

2010-2011 BVSW Students Who Qualified for Free and Reduced Lunch by Grade Level and Gender

Grade	Male	Female
9	4	6
10	7	5
11	4	4
12	4	2
Totals	19	17

Note. Adapted from the *Blue Valley Southwest Adequate Yearly Progress (AYP) Report*, by the Kansas Department of Education, 2011.

During the 2010-2011 school year, the ethnic backgrounds of Blue Valley Students were 84.5% White Caucasian, 7.2% Asian/Pacific Islander descent, 3.2% African-American, 2% Hispanic, and .2% were of Indian descent (Blue Valley School District, n. d.).

During the first quarter of the 2010-2011 school year, the leadership team at Blue Valley Southwest High School made the decision to gather data on their new student population. This data was collected after all students took diagnostic math and reading assessments from the Center for Educational Testing and Evaluation (CETE). These assessments serve as formative tools which contain tested indicators for each grade and subject area that are consistent with the Kansas Reading and Math Assessments. After analyzing the CETE data, the leadership team targeted academically at-risk students who demonstrated deficiencies in specific math and reading skills. One particular at-risk group consisted of 86 students who were in the 10th and 11th grades. These 86 students scored below the “Meets Standards” performance level on the CETE reading and/or math assessments and were deemed in danger of not experiencing academic success on the Kansas Math and/or Reading Assessment that they would take during the second semester of that year. After analyzing the data, the leadership team assigned these students to a reading and/or math at-risk list. These three lists consisted of:

- 41 sophomores and juniors on the Math at-risk list
- 17 sophomores and juniors on the Reading at-risk list
- 28 sophomores and juniors on both the Reading and Math at-risk lists.

In order to help meet the needs of the 86 at-risk students, the leadership team decided to develop a supplemental intervention that utilized the Study Island online program. Study Island is a web-based assessment tool that allows students the opportunity to practice in the areas of their designated state's reading and math standards. Through the use of a formative assessment framework, students can advance through a progression of electronic assessments that monitor whether they have mastered specific state standards. Teachers then have the ability to establish which standards a student can focus on based upon his or her performance on a pre-assessment that appears at the beginning of the Study Island program. Once students master a skill by answering 70% of questions correctly, they progress to the next skill assessment ("Archipelago up as Study Island Grows," 2010, p. 1).

The Blue Valley Southwest leadership team did not mandate that all 86 students participate in the program. Instead, students were encouraged to participate in the program with the incentive of achieving extra credit within their Communication Arts and/or Math classes. Since Study Island is a web-based subscription tool, students were allowed to progress through the program on their home computers or any computer lab within the school. The Communication Arts and Math teachers then monitored and collected data from each student's performance on Study Island's series of formative assessments. Having analyzed the assessment data, teachers were then able to address specific skills that the students were lacking. Ultimately, 37 students participated in the Study Island program during the 2010-2011 school year and 49 did not (Wilson, 2011).

Statement of the Problem

In order to reach students on all skill levels, it is imperative that every intervention be regularly evaluated and tested for its effectiveness. Heritage (2007) explained this by stating, "what is missing in assessment practice in this country is the recognition that, to be valuable for instructional planning, assessment needs to be a moving picture rather than a periodic snapshot" (p. 141). Since education is a dynamic rather than static process, educators must constantly assess whether or not the interventions that are used have credibility and impact student learning (Heritage, 2007, p. 142).

Although the Blue Valley Southwest leadership team had already decided to purchase Study Island, they wanted data that demonstrated how much it impacted the 37 at-risk students who participated in the program. While Study Island had been regularly used within Blue Valley elementary and middle schools, no data existed as to whether Study Island is effective at the secondary level for struggling Blue Valley School District students. In the last five years, Study Island studies have been conducted in states such as Ohio and Pennsylvania and contain data that indicates an increase in student achievement due to participation in the Study Island program (Bracht, 2011). However, a study was needed to quantitatively measure the effectiveness of Study Island as a formative assessment tool and its impact on the Kansas Reading and Math Assessments within an academically at-risk population.

Purpose Statement

The purpose of this study was to evaluate the effectiveness of Study Island for Blue Valley Southwest students who, because of their low performance on the CETE Assessments, had been deemed academically at-risk in reading and/or math. The Southwest educators encouraged these students to complete a series of formative assessments on the Study Island Program with the goal that by participating in this intervention, the students would practice and eventually master reading and math skills. The Study Island intervention program was not mandatory for each student on the at-risk list. Therefore, this study compared Kansas Reading and Math Assessment data from the 37 students who participated in the Study Island intervention program and the 49 students who did not.

Significance of the Study

The results of this study could be relevant to educators at the school and district level because of its focus on student performance. Study Island is an intervention tool that was implemented to help Blue Valley Southwest High School achieve its Student Performance SMART Goal that, "100% of 11th grade students tested in reading and math [would] perform at 'Meet Standards' or above on the Kansas State Assessments" (Blue Valley Southwest School Learning Plan, 2010, p. 1). Furthermore, Study Island was used to support three of Blue Valley Southwest's Learning Plan Action Steps:

- Each PLC team will develop content-specific activities to support indicators on math and reading assessments and internally review each quarter.

- Math and CA departments will regularly administer formative assessments around the tested indicators and internally review progress monthly. Students will also track their progress.
- Departments will develop interventions to help students who are not performing at a level of proficiency. (Blue Valley Southwest High School, 2010, p.1)

Because this study was conducted during the high school's inaugural year, the data collected was used to determine the future of the school's use of Study Island as a tool for formative assessment. The school was required to pay a subscription for each of the students who participated in the Study Island program. Therefore, understanding the effectiveness of the program could aid the Blue Valley Southwest leadership team in the future when making decisions about formative e-assessments.

In addition to its significance to Blue Valley Southwest High School, this study also has implications for the entire Blue Valley School District. Study Island has been used within the Blue Valley elementary and middle school levels for the last ten years; however, the district has not collected data on Study Island's impact on high school students. The findings of this study could help high schools within the Blue Valley district determine if this particular online, formative assessment intervention could impact their students' learning and performance on summative tests. Moreover, this study could contribute to the greater body of knowledge, specifically to help other school districts decide whether Study Island would be useful for their own struggling students.

Delimitations

Because this study centered upon only one high school, generalizations cannot be made to all high schools in all contexts. The data from this study came from a school that is in an affluent socio-economic community where students have access to a variety of resources that students in other contexts may not possess. The data from this study also came from the first year of the Study Island program within Blue Valley Southwest; therefore, generalizations cannot be made to studies conducted over multiple years.

Assumptions

The following assumptions were made when conducting this study.

1. Students in the Study Island program put forth maximum effort when participating in the program.
2. Teacher instruction and feedback to the students was influenced by the assessment data provided by the Study Island program.
3. All students within the Study Island program had an equal opportunity to access and participate in the formative assessments.
4. Students utilized their best effort when taking the diagnostic CETE assessment, as well as the Kansas Reading and Math Assessments.
5. The diagnostic data provided by the CETE was accurate.
6. The formative assessment data from the Study Island program was accurate.
7. The Kansas Reading and Math Assessment data provided by the Kansas Department of Education was accurate.

Research Questions

In order to assess Study Island's effectiveness as an intervention tool, the following questions guided this study.

1. To what extent does the online formative assessment program, Study Island, impact the performance of academically at- risk Blue Valley Southwest High School 10^{th} and 11^{th} graders on the Kansas Reading Assessment?
2. To what extent does the online formative assessment program, Study Island, impact the performance of academically at- risk Blue Valley Southwest High School 10^{th} and 11^{th} graders on the Kansas Math Assessment?

Definition of Terms

The following terms have been defined for the purpose of clarity.

Formative Assessment. "An assessment conducted during learning to promote, not merely judge or grade, student success… In its traditional form, formative assessment has been thought of as providing teachers with more frequent evidence of students' mastery of standards to help teachers make useful instructional decisions. In this way, formative assessment is intended to enhance student learning" (Stiggins, 2008, p. 2).

Kansas Reading and Math Assessments. State-mandated, standardized, multiple-choice assessments that determine each Kansas school district's Annual Yearly Progress. Both assessments are given in three, untimed test sessions for grades 3-8 and high school (Kansas Department of Education, 2011).

Professional Learning Communities (PLC). "An ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve. Professional learning communities operate under the assumption that the key to improved learning for students is continuous job-embedded learning for educators" (DuFour, DuFour, Eaker, & Many, 2006, p. 157).

Response to Intervention (RTI). "A method through which educators can identify students with learning disabilities while supporting students who are struggling academically in the general education classroom" (Murawski & Hughes, 2009).

School Learning Plan. A yearly plan created by representatives from a variety of a school's stakeholders that contains: measurable goals, action steps and resources needed to achieve those goals, and evidence of each goal's attainment (DuFour et al., 2006).

Study Island. An online formative assessment tool that is "designed to help students master the content specified in the state Academic Standards" (Study island: Kansas, 2011). In the case of this study, the Study Island questions were specifically created by the Kansas Reading and Math Assessments.

Summative Assessment. "An assessment of learning designed to provide a final measure to determine if learning goals have been met. They are tests administered after learning is supposed to have occurred to determine whether it did" (Stiggins, 2005).

Overview of Methodology

This study was quantitative in nature and was quasi-experimental with one independent variable with two categories. These categories were defined as the participation status of the 86 academically at-risk Blue Valley Southwest 10th and 11th graders. Ultimately, 37 academically at-risk Blue Valley Southwest students participated in the Study Island program during the 2010-2011 school year, while 49 academically at-risk Blue Valley Southwest students did not participate. The dependent variables were 2011 Kansas Reading and Math Assessment proficiency level**.** Four chi square tests of independence were conducted to determine to what extent the online formative assessment program, Study Island, impacted the performance of academically at- risk Blue Valley Southwest High School 10th and 11th graders on the Kansas Math Assessment and/or the Kansas Reading Assessment. These four chi square tests were based on the observed and expected frequencies of success for the following:

- Performance on the Kansas Reading Assessment by students who were at-risk in reading
- Performances on the Kansas Math Assessment by students who were at-risk in math
- Performance on the Kansas Reading Assessment by students who were at-risk in both reading and math
- Performance on the Kansas Math Assessment by students who were at-risk in both reading and math.

Each chi square analysis was conducted with a significance level of .05.

Organization of the Study

This dissertation is divided into five chapters. Chapter one includes the introduction of the study's topic, a conceptual framework, background of when and where the study took place, a rationale of the study, the statement of the problem, significance of the study, purpose statement, delimitations, assumptions, research questions, definition of terms, and overview of the methodology. Chapter two offers a review of literature in the areas of differentiated learning, importance of feedback, formative assessment, and integration of technological assessment tools in the classroom. Chapter three presents the methodology of this study by providing a description of the research design, population and sample, sampling procedure, instrumentation, measurement, data collection procedures, data analysis and hypothesis testing, and limitations of the study. The results of the study are discussed in chapter four and include a discussion of descriptive statistics, hypothesis testing, and additional analyses. Chapter five provides interpretations by comparing the study's findings to literature and provides recommendations for additional study.

Chapter Two

Literature Review

This chapter provides a review of literature that explains the evolution of formative assessment within the educational process. A variety of journal articles, reports, book excerpts, and studies (both quantitative and qualitative in nature), are cited throughout the chapter. The first section highlights the areas of intelligence development, constructivism, cognitive theory, and self-regulated learning and demonstrates how they provide for the emergence of the formative assessment movement. The second section describes the scaffolding and response to intervention (RTI) processes, in addition to presenting the rationale for why formative assessment is necessary for both. The third section examines the major tenets of formative assessment and provides an explanation of how formative assessment can be used as a data collection tool that demonstrates students' mastery of content-specific skills. The chapter concludes with a final section that explains how technology has become essential to the educational process and, specifically, how it can be effectively utilized for formative assessment. The online formative assessment tool, Study Island, is explained within this section, and both quantitative and qualitative studies examining its use in the classroom are presented.

Intelligence Development

Countless attempts have been made to understand knowledge acquisition. It is one thing to assess a student's knowledge of content-related skills, but it is an entirely different matter to determine how one develops cognitive skills needed for all learning. Educational theorists have attempted to explain intelligence development while focusing upon the premise that humans learn and construct knowledge through processes developed within their cultures and societies (Shepard, 2005, p. 66). Educators must understand these theories in order to reach all students regardless of their skill sets by establishing a system of support to help them develop as individual learners.

Zone of Proximal Development and constructivism. In the early twentieth century, Vygotsky emerged as the leading theorist who focused upon a child's development of cognitive skills. Vygotsky (1978) believed that children begin their lives with basic "lower mental functions" that are based upon what they perceive, what they associate with the world around them, and the instinctive or automatic functioning that they already possess (p. 39). It is not until a more knowledgeable source such as a parent, teacher, or capable peer intervenes, that children begin to develop "high mental functions" such as their use of memory, acquisition of language or counting skills, and problem solving in general (Doolittle, 1995, p. 3). According to Kozulin (2003), Vygotsky initiated the notion that humans learn about the world through the use of symbolic tools that can only be achieved through education from more knowledgeable sources.

Before formal education ever takes place, children begin to *internalize* information about the world around them on an unconsciousness level (Tharp & Gallimore, 1988, p. 29). Vygotsky (1978) developed the theory of the zone of proximal development to explain that intellectual growth occurs in the cognitive region that bridges the lower end of an individual's ability to learn on one's own with the upper end of accomplishment by means of assistance of a more knowledgeable source (Doolittle, 1995 p. 40). In his book *Mind in Society* (1978), Vygotsky defined the distance between internalized, independent problem solving and the potential development with the aid of another source by stating,

> The zone of proximal development defines those functions that have not yet matured, but are in the process of maturation, functions that will mature tomorrow but are currently in an embryonic state. These functions could be termed the "buds" or flowers" of development rather than the "fruits" of development. (p. 86)

This metaphor helps illustrate that with assistance, children can move from the collaborative learning phase to independent problem-solving.

Classroom instructors can put this psychological theory into place by initiating specific procedures that foster cognitive growth. Vygotsky (1978) believed that by providing purposeful engagement, meaningful feedback, and self-analysis, educators could more effectively teach their students. According to his theory, it is the educator's job to monitor student ability and create instruction that fits within the student's zone of proximal development (p. 86). If the instruction is below the zone of proximal development, students will become disengaged because they have already learned the information. On the other hand, if instruction is too challenging and above the students' zones of proximal development, they will be susceptible of frustration, confusion, and eventually give up (Doolittle, 1995, p. 5). Moreover, educators must prompt students to transfer the repetition of abstract concepts into the application of real life scenarios (Fox & Riconscente, 2008, p. 383). It is the role of the educator to look beyond the zone of proximal development in order to formulate a plan of what they want their students' cognitive abilities to be in the future (Au, 2007, p. 274). Educators should structure their instruction after monitoring their students' skills and abilities.

Vygotsky's theory of the zone of proximal development was founded upon the notion that humans develop intelligence through active participation with the social context around them (Phillips, 2000). Constructivism is the philosophy that is founded upon this belief that instruction should support active knowledge construction rather than communicating knowledge (Duffy & Jonassen, 1992). This suggests that the children must take a participatory role in the educational process and that the teacher should serve as a facilitator to help them grow. A process must be established to help students self-monitor their growth, and discovery must be established within the classroom to help encourage cognitive curiosity (Liu & Matthews, 2005, p. 387).

Cognitive theory and self-regulated learning. According to cognitive theorists such as Albert Bandura (1986), self- regulation is vital in the educational process. Essentially, introspection promotes humans to learn in a more proactive manner and helps them gauge what they need to do in order to transcend the zone of proximal development. Cognitive theorists have argued that the behavior and motivation of students are influenced by "personal, contextual, and self-processes" (Burney, 2008). Martin (2004) stated that the structured classroom model where a teacher assesses knowledge of material that they have presented in a strict lecture manner does not foster the risk-taking and knowledge application that is necessary for cognitive development. He proposed that teachers should support students becoming active participants, giving them the skills to be self-directed. Similarly, Bandura (1986) stated that students should be "agents" for their own development. Continual, data-based assessments should be created to inform both the teacher and the student about the level of skill development.

Bandura (1986) additionally believed that student behavior is directly influenced by the way students think and feel about themselves and that it is necessary that students possess self-efficacy. Burney (2008) defined self-efficacy as "one's confidence in one's own competence to perform a given task" (p. 132). In order to instill students with this quality, as well as encourage student engagement and development, cognitive theorists believe that curricular plans should center on self-monitoring, skill development, and self-regulation.

When teaching those who struggle with skill development, educators must promote self-motivation to help their students to progress past the zone of proximal development. Cognitive development occurs when these students become determined goal-setters who believe that they can transcend difficult tasks (Burney, 2008). In order for this to happen, the learning environment should serve as a student-oriented process that is facilitated by an instructor (Evans, Cools, & Charlesworth, 2010, p. 467). Educators should break difficult tasks or skills into smaller, more manageable tasks that encourage students to gain confidence and become motivated to improve (Burney, 2008, p. 131). Self-regulatory skills can be taught through purposeful teacher and student collaboration and regular assessment that not only inform the teacher what the student has learned, but also involve students in self-assessment. Through the acquisition of self-regulation, students can become successful not only in the classroom but eventually as independent, life-long learners.

Vygotsky's theory of the zone of proximal development, constructivism, cognitive theory, and self-regulation are connected by the premise that educators must continually assess the level of their students' mastery over any skill that is taught. These theories help explain how humans construct and develop through “culturally embedded, socially supported processes” (Shepard, 2005, p. 66). Although it may be interesting to understand the zone of proximal development, educators are challenged with the necessary task of assisting their students to move beyond what they are currently able to do.

Response to Intervention and Scaffolding

While the acquisition of knowledge may come easily to some individuals, others possess specific roadblocks within their personal cognitive developmental paths that require an intervention. Vygotsky (1978) argued that this intervention must come from a more capable source than the learner (p. 86). It is the teacher’s responsibility to find the deficiencies in a student’s learning and address them in the most expedient and effective manner possible. In the last two decades, Response to Intervention (RTI) has become a standard practice to identify these deficiencies, propose effective avenues for accommodation and intervention, and supply data on how an individual student responds to the intervention (Bramlett et al., 2010, p. 114). A major tenet of RTI is that educators should not wait until students fail or get left behind, but rather proactively place them in an environment or special education instruction that addresses their weaknesses (Buffum, Mattos & Weber, 2010, p. 11). Gresham, VanDerHeyden, and Witt noted that, “perhaps the most compelling reason for adopting a RTI approach is that it offers the opportunity of providing help to struggling children immediately” (p. 13). Cognitive development is a central aspect to RTI because progress monitoring must be an ongoing effort after the diagnosis and intervention has been set into place (Friedman, 2010, p. 207). The key to

RTI's effectiveness rests upon the teachers who put their students' specific learning needs at the forefront of the educational process.

Multi-tiered instruction. Buffum, Mattos, and Weber (2010) contended that the central focus of any school should be the effort to equip "every student with the skills and knowledge needed to be a self-sufficient, successful adult" (p. 14). Therefore, in order for each student to master the targeted skills, RTI must be established that allows struggling students to receive more support and time to progress further within the zone of proximal development (Buffum, Mattos & Weber, 2010, p. 15). In the reauthorization of Individuals with Disabilities Education Act of 2004 (IDEIA), the federal government stated in order to address students' learning gaps, schools "Must permit the use of a process based on the child's response to scientific, research-based intervention" (IDEIA, 2004, p. 5). In the RTI model, educators attempt to accomplish this by identifying three tiers of support with increasingly more time and intervention for each tier. It is the expectation that between 90% and 95% of all learners will achieve the target instruction after progressing through Tier 1 and Tier 2 (Hoover & Love, 2011, p. 40). All three tiers focus upon differentiated instruction for all learners.

The Tier 1 level of support consists of grade appropriate and challenging curricular requirements that a student receives in the general education environment (Hoover & Love, 2011 p. 40). Buffum, Mattos, and Weber (2010) stated that this curriculum should be derived from specific, research-supported standards that all students must accomplish during each grade level (p. 14). From those standards, educators should pace their instruction according to accessible learning targets that each student should master in order to progress further. Differentiation must occur during Tier 1 in order to address the various learning needs that all learners possess. Data should be collaboratively collected by teachers within similar grade or content areas in order to find which skills their students' lack, which learning targets should be retaught, and which assessment tools provide the most valid data (Stiggins & DuFour, 2009, p. 640). The need for teacher collaboration in the RTI process will be addressed further in this chapter.

After specific needs have been discovered by an educator, Tier 2 is the next step in the RTI model that addresses which type of supplemented instruction is needed for a struggling student (Hoover & Love, 2011, p. 40). Interventions are then created by educators to help struggling students learn the skills that were missed during general classroom instruction. Examples include but are not limited to, reading and math interventions, tutoring or paired reading strategies, and computer-aided instruction (Bramlett et al., 2010, p. 119). Ultimately, it is essential that Tier 2 be implemented in a timely manner so that a student does not fall more behind than he or she already has. For this to take place, Buffum, Mattos and Weber (2010) stressed that skilled professionals must work with these students to help them understand which skills they are lacking that prevent them from being successful in the educational process (p. 15).

The third tier of the layered RTI instructional model consists of highly intensive instruction that is needed for a student's mastery of all skills taught within his or her grade level (Hoover & Love, 2011, p.40). The students who receive instruction on Tier 3 require intervention on a number of levels. Therefore, it is essential that a Tier 3 student receive individual instruction based upon the recommendation of a team of educators who understands his or her specific needs. Once a recommendation is provided, a plan is created to help increase the student's achievement (Buffum, Mattos & Weber, 2010, p.

16). If a student does not achieve success after participating in this intensive plan, it may be because the student has a learning disability and should be recommended for special education.

Identifying students with specific learning disabilities. When utilized correctly, RTI helps inform both educators and students about specific roadblocks for learning. While students participate in Tier 2 interventions, Freidman (2010) contended that that they should undergo "progress monitoring" similar to the cognitive theory cornerstone of self-regulation. The goal behind progress monitoring is to help both the teacher and the student understand which skills have been acquired and which still need to be focused upon in the future (p. 208). Data should be reviewed not only by classroom teachers, but also leadership teams to monitor skill acquisition on school wide level. In his study that focuses upon RTI eligibility, Shinn (2007) noted that progress monitoring should be used for all students approximately every three to four weeks, before students have a chance to fail. All students who struggle do not possess specific learning disabilities; therefore, interventions can be established before special education is recommended (p. 601). This early intervention process also allows special educators to become more informed with what students with learning disabilities need as they enter into a special education program. After reviewing the tier interventions' progress monitoring data, evaluations must be set in place to help identify potential learning disabilities and professionals should establish cognitive and psychological assessments that serve as interventions as well (Hale, Alfonso, Berninger, Bracken, Christo, Clark, & Goldstein, 2010, p. 231). After accurately identifying the impediments to a student's cognitive development, educators can implement interventions that are successful for individual students, and the student can have a greater opportunity for inclusion in the educational process (Hale et al., 2010, p. 231).

Professional Learning Communities and RTI. A collaborative, collegial culture must be created within a school environment for the RTI process to be implemented effectively. Murawski and Hughes (2009) explained that collaboration among educational colleagues should go beyond department meetings and curriculum planning and instead focus on a systematic process to impact student learning (p. 267). This aligns with the Professional Learning Communities (PLC) concept defined by DuFour, DuFour, and Eaker (2008) as,

> Educators committed to working collaboratively in ongoing processes of collective inquiry and action research to achieve better results for the students they serve. Professional Learning Communities operate under the assumption that the key to improved learning for students is continuous, job- embedded learning for educators. (p. 14)

PLC collaboration should be a major component to the RTI process regardless of the grade, content, or department levels. Murawski and Hughes (2009) contended that PLC collaboration is essential to the RIT process to ensure that research-based educational strategies are implemented to meet the needs of all students. Additionally, data collection should be used as a vehicle to assess how well students are mastering the learning targets being taught, as well as ensuring that students within Tiers 2 and 3 receive increased individual instruction through small group environments (p. 271).

Collaboration among teachers can also help inform which interventions would best serve students in all skill sets. Teachers must work together when deciding which interventions should be implemented on each grade level. This can only happen if they analyze their students' past assessment data so they can better understand how to impact multiple skill levels and possible educational deficiencies (Vaughn & Fletcher, 2010, p. 296). One of the biggest reasons that teachers must collaborate is so that they can create common formative assessments in order to compare their students' results and help all teachers understand the instructional practices that did and did not work during Tier 1 (Buffum, Mattos, & Weber, 2010, p. 15). Common formative assessments and data collection will be discussed specifically in the next section of this chapter.

Parent involvement in the RTI process. Beyond teacher collaboration, parents must also be major components within the RTI process. Since data collected during the RTI process can be used for special education recommendations, schools must document that a student's parents have been notified regarding the data that has been collected and the strategies for increasing the child's rate of learning (IDEIA, 2004). It is the school's responsibility to maintain a proactive approach by creating a partnership with parents to help expedite which interventions are needed for student achievement. The first step that educators must undergo is informing parents about the multi-tiered process. Although most students will not progress to the third tier of individualized intensive interventions, the parents should understand every RTI step from the beginning (Byrd, 2011 p. 33). Parents must understand the specific intervention decisions educators have made on every tier of the RTI process (p. 35).

Ultimately, any time a parent can be involved in the RTI process, the possibility of more support for the child is increased. The "more knowledgeable sources" that Vygotsky (1978) wrote about in his book *Mind in Society* are not merely confined to classroom teachers. Parents who are educated in the RTI process can have a positive influence over student achievement and can be key to a student's motivation (Byrd, 2011, p. 37).

Potential challenges within RTI. Although research has supported the effectiveness of RTI, Buffum, Mattos, and Weber (2012) stressed that educators must focus upon student learning rather than other motivators. They stated that if RTI is only used as a way to improve standardized test scores, rather than concentrating on their students' learning gaps, teachers may feel that they must rush through strict pacing guides to cover the necessary standards before the test is given (p. 12). Creating firm time limits on teaching standards contradicts the multi-tiered and extended-time instructional model. In addition, when RTI is "implemented" as a series of items on a checklist to stay legally accountable, educators fail to keep the focus on differentiated learning (Buffum, Mattos & Weber, 2010, p. 12). It is also imperative that educators follow the entire multi-tiered model in order to ward off premature special education recommendations. Buffum, Mattos and Weber (2010) also stressed that rather than focusing on what students do not understand, educators must seek more effective instructional strategies to meet their needs (p.13).

The Building Blocks of Formative Assessment

Response to Intervention cannot be effectively utilized without an ongoing process of scaffolding information. Smith and Okolo (2010) defined scaffolding as "individualized guidance, assistance, and support during the initial phases of instruction and then phased out as students master knowledge and skills" (p. 266). The duration of scaffolding differs from student to student; extended scaffolding will obviously be prolonged with students who experience learning disabilities (Smith & Okolo, 2010, p. 267). Metacognition is necessary to the scaffolding process because students are required to continually apply information that they have already learned in new and more challenging contexts. This supports Vygotsky's cognitive theory that ongoing development is needed for future problem-solving (Clark, 2010, p. 341). Therefore, it is essential that teachers are provided the opportunity to monitor the progress of their students' cognitive development. Educators must develop common assessments that they can use for data collection and determine which instructional strategies were the most and least effective during their teaching in the first Tier of the RTI process (Buffum, Mattos & Weber, 2010, p. 15).

Obviously, assessment is used in the educational environment to determine what a student has learned; however, if assessments are only used to recall superficial or random details, they can result in competition among students rather than individualized improvement (Black & Wiliam, 1998a). Assessments must be used with two primary purposes: to gain understanding of student learning through data collection and to perpetuate the learning process for students (Stiggins, 2008, p. 3). Assessments provide information on three different levels: in the classroom, at the school-level, and at the institutional-level. Continuous monitoring of skill mastery is essential at the classroom level through the use of formative assessments. Those formative assessments must be consistent within all content and grade-related classes so teachers can analyze the data within their grade-level teams or professional learning communities. This should occur before school districts, state school boards, and federal legislators require information from summative assessments that demonstrate whether students have achieved the required standards (Stiggins & DuFour, 2009, p. 640).

Educators cannot rely solely upon state testing or end of the term summative assessments; they must gather information about their students throughout the entire instructional process. Summative assessments merely provide information for the teacher after the material has been taught. Consequently, students no longer have an opportunity to learn from the data or undergo measures to enhance their understanding (Clark, 2010 p. 342). The notion of "formative evaluation" was proposed by Bloom (1969), as an attempt to provide guidance and intervention during each stage of the learning process. Therefore, formative assessments are not merely a series of tests administered to assign a grade but rather a tool that provides data regarding what the student has or has not learned, informing teachers what they must do in the future to address learning deficiencies (Wiliam, 2006, p. 284).

When utilizing formative assessments correctly, teachers not only gather evidence about their students' learning progress but also give students the opportunity to become active participants in the process. In fact, the implementation of formative assessment in the classroom is a process whereby educators can understand their students' daily learning in order to create the necessary interventions to improve that learning (Stiggins, 2008, p. 3). This supports the "black box" metaphor that Black and Wiliam (1998b) used to explain that teachers must continually understand their students' learning progress in order to have an environment in which teaching and learning coexist. They argued that the ongoing formative assessment that is used within the "black box" most significantly impacts struggling students, bridges the achievement gap, and ultimately raises the achievement of all students regardless of each student's skill set (Black & Wiliam, 1998b, p. 1).

Heritage (2007) proposed that this evidence can be gathered in three different strategies: on-the-fly assessment, planned-for interaction, and curriculum-embedded assessment. Teachers can use "on-the-fly assessment" and alter their instruction to help address their students' misconceptions within a particular class period. "Planned-for interaction" occurs when instructors decide how they will prompt student understanding before a lesson takes place. Finally, "curriculum-embedded" assessments are strategically placed throughout units and prolonged learning sequences so teachers can monitor their students' development (Heritage, 2007, p. 144). Whichever strategy is used, the focus is not just on a grade but on a possibility to monitor the growth of each student.

Formative assessment also provides an avenue to support and strengthen the multi-tiered RTI process. Educators require information regarding whether specific students should progress to the next intervention tier. Formative assessment provides this information through data that explains what the child has or has not learned in the past, present skill level, and which skills should be worked on in the future. Ultimately, formative assessments are essential in the final tier of special education (Dorn, 2010, p. 326).

While formative assessment may provide rich data for educators, students also have a responsibility to self-diagnosis their own learning deficiencies. Stiggins (2008) referred to teachers and students as "consumers of assessment information" (p. 9). This can only happen if a collaborative relationship exists between the student and teacher which centers on trust. This is especially important for students who have experienced failure in the past and are looking for a reason to keep trying. Teachers must clearly articulate learning targets so that students can accurately interpret the data of their own assessment. Clearly accessible curriculum-maps that define learning progressions can serve as a roadmap for students to help them understand where they are supposed to advance in their skill development (Stiggins, 2008, p. 9). When students understand the learning progression, they can become motivated to keep achieving more. By using a shared vocabulary with their teachers, students who operate within the formative assessment environment can communicate which strategies work best for their learning development (Stiggins & DuFour, 2009, p. 641). Ultimately, the educational decision-making transcends the educator and involves the student in the process.

It is important for students to become involved not only with interpreting formative assessment data, there should also be an effort to help students learn about their personal "learning gap" (Black & Wiliam, 1998a, p. 20). The learning gap refers to the discrepancy between a desired learning goal and the current state of understanding and can only be closed if the student recognizes it and undergoes active measures to attain his or her goal. The teacher, in turn, acts as a translator of the data and provides opportunities for improvement (Black & Wiliam, 1998a, p. 20). This student-teacher partnership shifts the focus from merely grade acquisition to a more dynamic skill accomplishment process (Fluckiger, et al., 2010, p. 136). However, if students are not active members in the process, they will be less apt to understand and close the gap.

Obviously, in order for assessment data to be accurately analyzed, the assessment itself must be a valid tool in measuring skill mastery. Therefore, teacher collaboration is necessary when creating common assessments of student achievement (DuFour & Marzano, 2011). Common assessment serves two roles: the first is to compare data on student learning, the second is for teachers to discuss which teaching strategies are the most effective in reaching high student achievement. Grade-level or content specific teams of teachers must define the specific skills that students must know (based upon state and district curriculum standards) in order to construct common assessments that are relevant and necessary for their students. Common assessments also provide consistency for students to understand desired goals. Arnold (2010) conducted a study that focused upon grade level collaboration in the creation of common assessments. While he did not find significant statistical improvement of student achievement on standardized summative assessments, teachers did report an increase in student self-efficacy. The study's qualitative data demonstrated that this was a result of a consistency of learning expectations and a positive atmosphere that relied upon goal attainment rather than unsubstantiated letter grades (Arnold, 2010). Ultimately, common formative assessment helps both teachers and students understand the purpose of daily instruction because the focus is on a specific attainable goal. Stiggins and DuFour (2009) argued that Professional Learning Communities (PLC) are the most effective way for teachers to collaborate in creating common formative assessment and collectively analyze the data that the assessments produce (p. 643). PLC advocates stress that educational leaders should provide teachers with time each week in order to support the formative assessment process.

Feedback. If the formative assessment process requires a partnership between the teacher and student, educators must make a concerted effort to provide purpose-driven feedback that leads to a specific goal. Hattie and Timperly (2007) defined feedback as, “information provided by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one’s performance or understanding” (p. 81). They explained that feedback cannot exist by itself in the learning process; it must be used “after a student has responded to initial instruction” (p. 82). Feedback that does not focus upon goals leaves students confused as to what is expected and how they are supposed to progress in the learning process (Kluger & DeNisi, 1996, p. 71). Therefore, teachers must go beyond merely assigning a letter grade in a summative manner. Black and Wiliam (1998a) explained the dangers of only providing summative grades. Letter grades without effective feedback result in passive students and promote competition among students rather than having them work together when achieving learning goals (p. 13). Beyond grades, teachers must also reevaluate how they question their students. In his book *Visible Learning,* Hattie (2009) stated that a vast majority of the 300-400 questions that a teacher asks his/her students per day lack higher levels of inquiry and do not add to the student’s thinking. He also stressed that teachers should analyze the questions that their students ask rather than just asking the students questions (p. 182).

Feedback can be formative in nature when it is a vital component to the scaffolding process. Hattie and Timperley (2007) stated that feedback should always address the student’s understanding throughout the learning process. By addressing the questions “Where am I going?”, “How am I going?”, and “Where to next?” teachers can effectively “feed up, feed back, and feed forward” (p. 88). Clark (2010) explained that feedback becomes formative only if it helps students learn about their own thinking by providing metacognitive strategies and allows them to understand where they are in relation to closing the learning gap. No feedback can be given unless teachers clearly define and explain learning targets to the students prior to assessing their understanding (p. 344). Cauley and McMillan (2010) noted that when instructing students about what is expected, teachers must model learning strategies that demonstrate both strong and weak outcomes of the assigned task. However, educators should not withhold feedback until the end of a unit; they must provide it throughout the learning process so students understand how they are progressing toward the desired goal. Cauley and McMillan (2010) further detailed this notion by stating that high-achieving students perform better when feedback is delayed, whereas low-achieving students need specific and immediate feedback. Specific feedback should not be overly complicated but rather consist of positive, verbal directives (p. 4). Formative feedback that is shared with a student should focus upon a clear, desired goal and help inform the student where he or she is in relationship to that goal. (Fluckiger, et al., 2010 p. 137) Essentially, feedback should only be given to perpetuate and enhance student learning. Teachers will be more apt to modify instruction if they constantly monitor their students' development and provide feedback interventions.

The manner in which feedback is given to students can greatly impact student learning. When providing instruction, educators must make comments that are not superficial with hollow, unbridled praise. When studying the effectiveness of feedback, Kluger and DeNisi (1996), noted that the only feedback that resulted in higher achievement was specific to the task at hand and provided strategies for improvement (p. 71). Teachers need to be trained to write the type of feedback that not only helps students understand what they are lacking but also provides a learning experience that teaches them where to proceed next (Black & Wiliam, 1998, p. 23a). Furthermore, "ego-involving evaluation" that only hinges upon praise actually has a negative impact with low-achievers and can decrease the quality of their performances on specific tasks. Shepard (2005) explained this by differentiating feedback according to "learning goals" and "performance goals." Performance goals cater to external motivators such as grades whereas learning goals are connected to the mastery of well-defined skills. Therefore, teachers should not worry about correcting errors that do not matter to the task at hand (p. 68). When feedback centers upon the aforementioned learning targets, students will be more apt to understand the purpose of what they are doing on a daily basis.

Self-assessment and student motivation. In addition to purpose-driven feedback, the formative assessment process also requires that students monitor their growth through self-assessment. Stiggins (2008) noted that self-assessment must be an on-going process in order for students to help themselves understand what they need to do in order to achieve their learning goals. If they progressively build upon past successes and understand where they are in the learning process, students can be motivated to move forward because they can understand that their goals are attainable. Self-assessment is the most successful when it relies upon this type of self-reflection (Stiggins, 2008, p. 9). Hattie (2009) also explained that by self-reporting grades, students are more apt to assess their performance based upon past achievement. When this is used in conjunction with setting goals and attainable learning targets, students can realize that their learning does not have a set limit, but rather can be enhanced, in some cases, to a high degree (Hattie, 2009, p. 43).

Black and Wiliam (1998a) further explained that self-assessment provides students with, “recognition of the desired goal, evidence about present position, and some understanding of a way to close the gap between the two” (p. 20). This spirit of self-assessment can even apply to the teacher level. Educators who demonstrate self-reflection can help their students do the same (Fluckiger, et al., 2010 p. 140). Teacher self-reflection is a logical component of the formative assessment process because educators may modify instruction after collecting ongoing formative data that demonstrates that past strategies have not worked.

Just as letter grades can detract from effective feedback, they can also hinder self-assessments. Klenowski (1995) noticed a lack of research involving self-assessment in the educational process. In his study, he found that both formal and informal student self-evaluations proved to be more effective than just a letter grade assigned to students. This is similar to Cauley and McMillan’s (2010) assertion that letter grades prevent students from understanding how they have improved and can actually discourage them in the future if they experience failure. Through his qualitative data, Klenowski found that students ultimately gained better understanding about their own metacognitive thinking because they learned which learning strategies were the most beneficial for their personal growth (p. 4). This supports the opinion that in order for true self-assessment to take place, teachers should consider pedagogical changes that allow students to have more control over their own learning (Klenowski, 1995). The teacher- student relationship must evolve so that students have more responsibility during the learning process and, in turn, receive encouragement to be more perceptive about how they learn.

Not only can self-assessment create more informed students, it can also positively impact them on an affective level. Black and Wiliam (1998b) spoke to this by expressing that the educational system is guilty of creating passive students who are fine with merely "getting by." This is a result of an over-reliance on an external reward system that only motivates students to obtain rewards such as grades or class ranking. They noted that unless teachers establish a culture of success, students will become frustrated in their abilities if they do not know the correct answer and eventually will give up. Education is more purpose-driven when students work toward a specific goal and the focus centers around learning rather than completing tasks (p. 4). Essentially, formative self-assessment is more beneficial when it focuses upon success rather than failure.

Students who learn through a goal-oriented system will also be more apt to cultivate self-efficacy and have more motivation to achieve future tasks. Students who have the ability to chart their learning progression can focus on accomplishment and cultivate intrinsic motivation to reach attainable goals (Stiggins, 2008, p. 9). This reinforces the students' notions that not only are they progressing toward a goal, but also they are mastering specific learning targets and skills. Consequently, the emphasis shifts from merely earning a grade to putting forth appropriate effort (Cauley & McMillan, 2010 p. 4). The danger of using formative assessment only for preparation of summative assessments (specifically standardized-tests) can result in students who are only focused upon superficial test-taking strategies. The focus in the formative assessment process should always focus upon skills and students should constantly understand where they are in relation to skill mastery (Dorn, 2010 p. 331).

Students are more likely to work toward understanding, learning, and skill development if they participate in a positive, self-assessment format. Conversely, grades alone can actually deter intrinsic motivation because low-achieving students may feel that they do not have the ability to master any skill (Meece, Anderman, & Anderman, 2006, p. 499). Since grades assume a secondary role in the formative assessment process, teachers should strive to create a safe culture that promotes risk-taking and self-reflection. When students are freed from the notion that there is a right or wrong answer, they can begin to learn through trial and error with the teacher serving as a facilitator for growth (Meece, Anderman, & Anderman, 2006). When teachers offer suggestions of growth in the formative assessment process, rather than point out failures, students will begin to understand how to judge their own work.

Although student motivation is a goal of formative feedback, formative assessment alone is not enough. A study on formative assessment and student motivation conducted by Yin et al. (2008) found that formative assessment does not have a significant influence on student motivation. They conclude that teachers require support in utilizing effective formative assessment feedback and should continue to reevaluate if their formative assessments do not adequately address the needs of their individual students (p. 356). This echoes Shepard's (2005) assertion that teachers must learn during the formative assessment process just as much as the students (p. 69). Ultimately, the formative assessment process is strengthened through a goal-oriented partnership between the educator and student.

Technological Assessment in the Classroom

While the importance of formative assessment has been stressed by researchers it can be logistically difficult to maintain. Therefore, Black and Wiliam (1998b) explained that educators should continually search for new formative methods and strategies (p. 5). Through the emergence of new web-based technology, educators have the opportunity to utilize additional assessment tools which can be used on a more regular basis. Students who participate in formative electronic assessment (e-assessment) programs have performed higher on summative standardized tests (Wang, Wang, Wang, & Huang, 2006). Similarly, Mendicino, Razzaq, and Heffernan (2009) studied 5th grade math students who participated in a computer aided instruction program and found that they learned more from web-based homework than traditional pencil and paper practices. In both studies, the e-assessment's ability to provide immediate feedback was the catalyst for learning because the students received their scores in a timely manner.

The advent of e-assessment has given rise to new neurocognitive-based theories in relation to e-learning. With the assumption that all learners approach a task with a sincere intent to learn, Johnson-Glenberb (2010) explained that students are more apt to learn when there is an anticipation of some sort of satisfying stimuli. Essentially, the combination of novelty and challenge will motivate learners to move beyond their zone of proximal development (p. 166). Hattie (2009) also explained that assessments computers promote engagement and positive attitudes (p. 220). However, the challenge of creating effective e-assessment is to produce a program that maintains novelty that sustains a learner's engagement but does not rely too much on visual stimuli at the expense of the intended content. Moreover, e-assessment designers and the educators who implement them in the classroom must strive to use them as tools to reach a "range of learners." This requires e-assessment that differentiates its assessment to individual learners rather than a strict format that is the same for all users (Johnson-Genberb, 2010, p. 167).

Although computer-aided instruction has the potential to impact cognitive development, learning only occurs through "informed and sophisticated e-assessment" (Boyle & Hutchinson, 2009, p. 313). It is the responsibility of the designers of these technological, formative tools to develop sophisticated products that challenge students and assess relevant content. Baker (2003) stressed that e-assessments should only be implemented after researchers have provided evidence of technology fidelity and credibility. This includes the validity of the data that is produced by the e-assessment, as well as how that data is interpreted by educators and students (p. 423).

Just as the goal of formative assessment is to build the cognitive development of students, e-assessment offers the ability to provide computer aided instruction. Technology is a force in today's students' lives; therefore, educators should begin to understand how to effectively utilize it in their classrooms (Wang et al., 2006). Moreover, e-assessment has the potential reach a wider range of students' learning styles than the traditional paper and pencil assessment because it can utilize a variety of instructional modes and visual styles. Hattie (2009) explained that when students use computers and technology during the learning process, they benefit by maintaining control over their own pace (p. 220). As technology becomes more sophisticated, higher levels of computer-generated feedback becomes a reality (Boyle & Hutchinson, 2009 p. 307). However, e-assessment tools do not only impact students. Salend (2009) suggested that e-assessment also offers educators the opportunity to efficiently gather their students' assessment data in a more expedient manner. This electronic data can also be used to inform their future instruction (p. 49).

Concerning the integration of e-assessment into the classroom, Johnson-Glenberb (2010) noted that computer-aided instruction has two significant benefits to educators. First, e-assessment offers students the ability to adapt instruction for their own needs. Offering a variety of learning pathways within a program, the learner can decide which route seems the most relevant (p. 167). This mirrors Salend's (2009) assertion that e-assessment helps foster self-assessment and motivates students to take more ownership over their progress rather than having it dictated by a teacher (p. 57). The second benefit that Johnson-Glenberb (2010) provided is technology's potential to utilize "stealth assessments." Teachers should provide increased stimuli, such as game playing, which does not interrupt the normal flow of learning. This allows students to be more motivated in an assessment activity rather than participating in the traditional paper and pencil test (p. 167). Ultimately, a computer-generated assessment can be a fun way for students to demonstrate their knowledge.

Although computed aided instruction and formative e-assessment tools can be effective for student learning, educators must contend with a variety of challenges and barriers. While technology has become more sophisticated, Baker (2003) warned that there are few e-assessments designed to address multiple purposes of testing. For example, most e-assessments only offer one format, such as essay or multiple-choice. Educators must also take financial considerations into account when implementing e-assessment programs (p. 424). This factor will always accompany technological use because the purchase of computers, software, and faculty training are required for its implementation (Cavucci, 2009). Therefore, educators must discern the effectiveness of the technological tools that they choose to purchase. Salend (2009) suggested that evaluation must focus upon e-assessment that is “most effective, equitable, and appropriate for use by students and teachers” (p. 57). Unless district leaders develop a technology plan that includes the availability of online access, software, hardware, technical support, and startup costs, the e-assessment program will never reach its intended purposes.

Educators must also understand that they still have an obligation to provide instruction and introduce material in an effective manner. Additionally, if the technology does not address state and district curriculum standards, it will lack relevance to the learning process. While formative e-assessment integration may have an impact on student performance on standardized tests, it does not inherently enhance instruction (Parlapanides, 2010). This is especially true when students are expected to learn the material in isolation without the guidance from a teacher. When teachers use e-assessments as tools for self-teaching, they run the risk of creating an environment where students feel disconnected rather than becoming more engaged in the learning process (Wang et al., 2006).

In the broad history of education, e-assessments are a relatively new phenomenon; therefore, school districts are currently learning which programs are the most effective in impacting student learning. One of the leading e-assessment programs in the market today is a web-based program entitled Study Island (Noto, 2010, p. 1). The purpose of this program is to prepare students for federal-mandated state summative assessments in both reading and math, as well as the Scholastic Assessment Test (SAT) and the American College Test (ACT). The purchase of a subscription is necessary for each student to complete the program. Rather than students merely focusing upon test-taking strategies, they can progress through a series of formative assessments that are directly tied to their state's assessed standards (Hixson, 2010, p. 45). Teachers have the opportunity to generate the specific assessments that they want a student to focus upon, or the program creates its own assessment list based upon the student's performance on a pre-assessment. The creators of Study Island have stressed that the intent of the program is for teachers to present specific concepts or skills and the program provides the opportunity for students to demonstrate their understanding of that concept of skill. The program's designers intend to engage students by embedding the formative assessments within games and animation presentations. If a student correctly answers 80% of the answers (or another percentage chosen by a teacher), he or she receives a "blue ribbon" and advances to the next formative assessment. If students fail to reach the appropriate standards, the program has the capability to modify future assessments to meet their deficiencies. Teachers are then provided a detailed report of each student's formative assessment data and have the opportunity to intervene or modify future instruction (Hixson, 2010). Since the program is web-based, rather than installed software, students have the ability to take the formative assessments in school or at home.

As Study Island has become more popular among educators, a variety of studies have been conducted to understand its impact on student achievement in both formative and summative assessments. These studies have produced mixed results regarding student achievement on summative assessment as a result of their involvement with

Study Island. Parlapanides (2010) found that pre-algebra 8th grade students who were exposed to the Study Island program scored higher on standardized math tests. Additionally, he found that these students also demonstrated more independent learning skills than the students who did not participate in the Study Island program (p. 60). Another Study Island study conducted by Bracht (2011) focused on both elementary and middle school students. He found that Study Island resulted in higher student achievement on summative assessments with elementary students; however, it did not have a statistically significant impact on the middle school students. Moreover, he came to the conclusion that the inclusion of Study Island resulted in decreased instructional time. He did find that middle school students did experience more time on task in both communication arts and math (p. 168). It should be noted, currently there is minimal research involving the implementation of Study Island on the secondary level.

Another factor in understanding Study Island is teachers' perceptions of the program. Taylor's (2011) mixed-methods study focused upon perceptions of teachers from three middle schools. Her data revealed both positive and negative opinions from the teachers. Many teachers expressed negative perceptions involving a lack of training in how to use the Study Island data to inform, plan, and implement instruction. Teachers demonstrated positive perceptions toward the integration of Study Island in their classrooms, but they expressed negative opinions regarding the effectiveness of Study Island as a formative assessment tool (Taylor, 2011). The study did not focus upon student achievement on summative assessments but did support the necessity of providing teachers with e-assessment training and professional development involving formative assessment data analysis (p. 120).

Summary

This chapter's review of literature consisted of a series of peer-reviewed articles, studies, and reports involving the integration of formative assessment as a means of impacting student learning. A brief history of intelligence development was presented, specifically through Vygotsky's (1962) theories of cognitive development, and the zone of proximal development. Connections were made between constructivism, self-regulation, and scaffolding in order to explain the emergence of the multi-tiered instructional practices within the Response to Intervention model. In addition, an overview of formative assessment was presented by examining the importance of feedback, self-assessment, and student motivation in its implementation. Finally, chapter 2 provided an explanation regarding the emergence of e-assessment in the 21st century classroom and concluded with studies that focused upon the web-based formative assessment program, Study Island.

The findings from the review of literature revealed the importance of ongoing formative assessment within the learning process and the necessity of providing data for both students and teachers. The research also argued that this data should demonstrate the student's level of understanding to help inform educators how to modify instruction, provide interventions, and engage the student in the assessment process. Moreover, there is evidence that as technology becomes a more influential factor in the modern classroom, e-assessment tools, such as Study Island, have become more sophisticated. While Study Island is a leading program in the e-assessment field, minimal studies have been conducted involving its effectiveness in impacting student learning, especially in the secondary education level. This review of literature demonstrates the necessity for future research involving the impact of Study Island on high school students. Chapter three provides an explanation of the research design, population and sample description, and the methodology used in this study.

Chapter Three

Research Methodology

The focus of this study was to investigate whether the web-based, formative assessment program, Study Island, can improve secondary student performance on the Kansas Reading and Math Assessments. Study Island was used as an intervention for academically at-risk sophomores and juniors at Blue Valley Southwest High School. Chapter three contains an explanation of the research methodology for this study and provides a description for study design, population, instrumentation, measurement research hypothesis, dependent and independent variables, data collection procedures, and data analysis.

Research Design

The research design for the study was quantitative in nature and quasi-experimental with one independent variable consisting of two categories based upon participation status: chose to participate and did not choose to participate. The dependent variables were the performance levels of Met Standards and Did Not Meet Standards on the 2011 Kansas Reading and Math Assessments**.**

Population and Sample

The population for this study was secondary students who lacked essential reading and math skills. Since these students' academic skills had to be improved, interventions were needed to address their deficiencies. The sample used in the study consisted of 86 sophomore and junior students who were in enrolled in Blue Valley Southwest High School during the 2010-2011 school year. These 86 students were targeted because of their low performance on a Reading and/or Math CETE diagnostic assessment taken at the beginning of the school year. Out of the 86 students, 41 sophomores and juniors were placed on the Math At-Risk list, 17 sophomores and juniors were placed on the Reading At-Risk list, and 28 sophomores and juniors were placed on both the Reading and Math At-Risk lists.

Sampling Procedures

The sampling procedure for this study was purposive criterion sampling. Blue Valley Southwest 10th and 11th graders deemed academically at-risk based upon their performance on the CETE reading and/or math diagnostic assessments were the only students selected for the study because they were the only grade levels who participated in the Kansas Reading and Math Assessments. Therefore, the two criteria characteristics were:

1. Blue Valley Southwest 10th or 11th graders
2. Students who scored below Meets Standard on the CETE reading (<68%) and/or math (<50%) diagnostic assessment

Table 3 contains the data regarding how many students participated in the three at-risk groups of reading, math, and math/reading.

Table 3

Subsample Participation of At-Risk Students in the Study Island Program

At-Risk Subject	Participated	Did Not Participate	Total
Reading	10	7	17
Math	14	27	41
Reading and Math	13	15	28
Total	37	49	86

Note. Adapted from the *Blue Valley Southwest Study Island Data*, by Blue Valley Southwest High School, 2010.

Ultimately, 69 students scored below 50% on the Math diagnostic and 45 students scored below 68% on the reading diagnostic. As a result, the Blue Valley Southwest leadership team elected to purchase subscriptions to the web-based, formative assessment program, Study Island. Students were offered extra-credit incentives if they participated in the formative assessment program. This resulted in 37 students who participated in the program and 49 who did not.

Instrumentation

The two instruments that were used in the study were the Kansas Math and Reading Assessments. Both of these assessments were created by the Kansas Department of Education and are annual tests administered to grades 3-8, and 10^{th}-11^{th} grades in order to determine Annual Yearly Progress. The Kansas Math and Reading Assessments are aligned with the Kansas Math and Reading Curriculum indicators (KSDE Assessment Fact Sheet, 2011). This study's sample took these assessments at Blue Valley Southwest High School during of April 2011.

The 2011 Kansas Reading Assessment consisted of three multiple-choice test sessions. None of these sessions were timed, but the Kansas Department of Education has recommended that each session should last approximately 45 minutes. Each year, the Kansas Reading Assessment consists of four to six items per indicator. The 2011 assessment consisted of 84 items which assessed16 Kansas curricular indicators in narrative, expository, technical and persuasive text types (Kansas Department of Education, 2011). The 16 indicators that were addressed on the Kansas Reading Assessment can be found in Appendix A.

The 2011 Kansas Math Assessment consisted of three untimed, four option multiple-choice test sessions. Again, the Kansas Department of Education has recommended that approximately 45-60 minutes should be used for each test session. The 2011 assessment consisted of 84 questions that assessed 15 Kansas math curricular indicators in the areas of algebra and geometry (Kansas Department of Education, 2011). The 15 indicators that were addressed on the Kansas Math Assessment can be found in Appendix B.

Measurement

After the study's population took both the Kansas Reading and Math Assessments, each student was placed in one of five performance levels including: Exemplary, Exceeds Standard, Meets Standard, Approaches Standard, and Academic Warning. Table 4 includes the Kansas Department of Education performance level score ranges for the Kansas Reading and Math Assessments.

Table 4

Recommended Performance Level Percentage Scores for the High School Kansas Reading and Math Assessments

Assessment	Academic Warning	Approaches Standard	Meets Standard	Exceeds Standard	Exemplary
Reading	0-53	54-67	68-80	81-88	89-100
Math	0-37	38-49	50-67	68-81	82-100

Note. Adapted from the *Performance Level Descriptors Guidelines,* by the Kansas Department of Education, 2011.

Prior to conducting the hypothesis tests for this study, the 5 performance levels were collapsed to: Met Standard (students who scored in the Meets Standard, Exceeds Standard, or Exemplary performance levels) and Did Not Meet Standard (students who scored in the Academic Warning or Approaches Standard performance level.) The formation of these two categories was necessary because of the limited sample size.

Validity and Reliability

When making inferences or judgments about an instrument, it is important to determine its validity. Therefore, for the purpose of this study, it is necessary to understand to what the degree the Kansas Reading and Math Assessments actually measure what the instruments' designers intended to be measured. The Kansas Math and Reading Assessments are standardized state achievement tests that measure the content that the study's population should have been taught in their 10th and 11th grade English and Math classes (Kansas Department of Education, 2011). In order to determine the validity of these assessments one must,

> determine the degree to which examinees' performance on a test correlates at expected levels with one or more outcome criteria, or what is called criterion-

> related validity evidence. This type of validity evidence is needed to support inferences about an individual's current or future performance by demonstrating that test scores are systematically related to other indicators or criteria. The results of these analyses provide evidence to support the validity of the Kansas Assessment scores. (Poggio, et. al, 2007, p. 76)

In addition to criterion-related evidence, factor analysis was used to ensure the unidimensionality of both tests. This validity evidence is based upon a formative testing component within the Kansas Reading and Math Assessments computerized system. The formative testing provides feedback regarding the assessed students' mastery on specific Reading and Math indicators after they have completed a Math indicator or a passage-type Reading testlet. Poggio, et al. (2007) outlined the assessed indicator ranges by stating,

> For the content area of mathematics (grades 3-8 and 10), each assessed indicator (range of 12-15 indicators per grade level) at a grade level is featured by one standard-specific testlet that ranges from 4 to 13 items, as well as a longer, comprehensive formative assessment. For Reading (grades 3-8 and 11), testlets at each grade level are arranged by passage-type (Narrative, Expository, Technical, and Persuasive) and range from 11 to 23 items. (p. 76)

Table 5 contains the correlations between the Grade 10 formative assessments and the Kansas Math Assessment. It also contains evidence that the predictive utility of the formative assessments is moderately due to the fact that coefficient values range from a low of .71 to a high of .82.

Table 5

Grade 10 2006 Kansas Math Assessment Correlated with General - All forms, then Split by Forms

	All Forms	P&P	A (Computer)	B	C	D
R	.82	.83	166	158	164	156
N	830	15	.86	.86	.82	.76

Note. Adapted from *Kansas Assessments in Reading and Mathematics Technical Manual,* by Poggio et. al., 2006, p. 77.

Additionally, Table 6 shows the correlations between the Grade 11 formative assessments and the Kansas Reading Assessment. Like Table 5, it also contains evidence that the predictive utility of the formative assessments is moderately due to the fact that all of the coefficient values range from .74 - .88.

Table 6

Grade 11 2006 Kansas Reading Assessment Correlated with General- All forms, then Split by Forms

	All Forms	P&P	A (Computer)	B	C	D
R	.83	.74	.85	.81	.88	.82
N	535	33	118	127	126	131

Note: Adapted from *Kansas Assessments in Reading and Mathematics Technical Manual, by* Poggio et. al., 2006, p. 78.

As Luneburg and Irby (2008) noted, reliability is essential for an instrument because it must "consistently measure whatever it is measuring" (p. 182). The type of reliability that Kansas Reading and Math Assessments employ is internal consistency reliability through Cronbach's alpha coefficients. Poggio, et. al. (2007) explain these reliability estimates by stating,

> The score reliability estimates are Cronbach alpha coefficients. The coefficient values range from a low of .88 to a high of .94 across all the Reading grade level forms and from .91 to .95 across all the Mathematics grade level forms. The overall general standard errors of measurement on the percent correct score scale range from 3.65 to 4.70 for scores on the Reading general assessment test forms and from 3.95 to 4.60 for scores on the Mathematics general assessment test forms. (p. 59)

Table 7 contains the reliability coefficients for the Kansas Reading Assessment.

Table 7

Reliability Coefficients for Equating Samples for the 11th Grade Kansas Reading Assessment by Test Form

Form	Sample Size of Items	*N*	α
592	77	9614	0.93
480	80	5766	0.93
581	81	5748	0.93
582	81	5699	0.92
583	79	5709	0.92

Note: Adapted from *Kansas Assessments in Reading and Mathematics Technical Manual*, by Poggio et. al., 2006, p. 78.

Table 7 contains data that indicates there is strong reliability for equating purposes for the Kansas Reading Assessment due to the large sample size and the fact that all reliability coefficients were .92 or greater. Additionally, Table 8 provides a description of the reliability information for Kanas Math Assessment.

Table 8

Reliability Coefficients for Equating Samples for the 10th Grade Kansas Math Assessments by Test Form

Form	Sample Size of Items	*N*	α
590	84	11106	0.95
591	84	4966	0.95
702	84	4816	0.95
719	84	4852	0.94
720	83	4881	0.94

Note: Adapted from *Kansas Assessments in Reading and Mathematics Technical Manual*, by Poggio et. al., 2006, p. 79.

Table 8 indicates that there is strong evidence for the reliability of equating purposes for the Kansas Math Assessment due to the large sample size and the fact that all reliability coefficients were .94 or greater.

In addition to determining the reliability of the Kansas Reading and Math Assessment scores, it is also necessary to determine their performance classification reliability. Each assessment contains cut scores (demonstrated in Table 4) to classify students into the five performance categories of Academic Warning, Approaches Standard, Meets Standard, Exceeds Standard, and Exemplary. Poggio, et. al (2007) explained how the student performance consistency is examined, There are two important indices used in reliability analysis for classification: classification consistency and classification accuracy. Classification consistency refers to the extent to which the classifications agree on the basis of two independent administrations of the test (or, two parallel forms of the test). Classification accuracy refers to the extent to which the actual classifications that are based on observed cut scores approximate those that are based on "true" cut scores. (p. 59)

Table 9 contains a summary of the classification accuracy indices and the performance classification consistency for the Kansas Math Assessments. It consists of probability misclassifications that indicate the likelihood that a student has been placed at a performance level to which they do not belong. It is noteworthy that the accuracy coefficients are high (ranging from a low of .93 to a high of .97) whereas the probabilities of false positives are low (ranging from a low of .02 to a high of .04).

Table 9

Classification Indices by Cut Points for the 10th Grade Kansas Math Assessment

Cut Point	Classification Accuracy	Classification Consistency	False Positive	False Negative
1 / 2345	0.93	0.91	0.04	0.03
12 / 345	0.94	0.91	0.03	0.03
123 / 45	0.96	0.94	0.03	0.02
1234 / 5	0.97	0.96	0.02	0.01

Note. 1 = Academic Warning, 2 = Approaches Standard, 3 = Meets Standard, 4 = Exceeds Standard, 5 =Exemplary. *Note*: Adapted from *Kansas Assessments in Reading and Mathematics Technical Manual,* by Poggio et. al., 2006, p. 59.

Table 10 contains a summary of the classification accuracy indices and the performance classification consistency for the Kansas Reading Assessments. Similar to Table 9, it also includes probabilities for misclassifications. Likewise, the accuracy coefficients are high (ranging from.90- .99) whereas the probabilities of false positives (ranging from a low of .00 to a high of .04 in Reading) and false negatives (ranging from a low of .01 to a high of .06) are low.

Table 10

Classification Indices by Cut Points for the 10th Grade Kansas Reading Assessment

Cut Point	Classification Accuracy	Classification Consistency	False Positive	False Negative
1 / 2345	0.99	0.99	0.00	0.01
12 / 345	0.98	0.97	0.01	0.01
123 / 45	0.95	0.93	0.02	0.03
1234 / 5	0.90	0.85	0.04	0.06

Note. 1 = Academic Warning, 2 = Approaches Standard, 3 = Meets Standard, 4 = Exceeds Standard, 5 =Exemplary. Adapted from the *Note*: Adapted from *Kansas Assessments in Reading and Mathematics Technical Manual,* by Poggio et. al., 2006, p. 59.

Table 9 and Table 10 provide data that demonstrates strong evidence that classification reliabilities were acceptable because all were greater than .90. For both Mathematics and Reading, the probabilities of misclassifications were low whereas the reliabilities of classification at a given cut point were high.

Data Collection and Coding Procedures

Before the researcher collected data for the study, an Institutional Review Board (IRB) form was approved by Baker University and the Blue Valley School District. The

IRB application can be found in Appendix C and the IRB approval letter can be found in Appendix D. The researcher was granted approval to conduct the study after submitting a draft of chapter one to Blue Valley School District's Director of Assessment and Research. Documentation regarding district approval can be found in Appendix E.

The data from the math and reading diagnostic assessments were developed by The Center of Educational Testing and Evaluation (CETE). These multiple-choice tests were used by Blue Valley Southwest English and Math teachers who taught sophomores and juniors during the 2010-2011 school year. The researcher received the CETE data from all of these English and Math teachers. Additionally, the researcher obtained Blue Valley Southwest High School's Kansas Reading and Math Assessments scoring data from Blue Valley Southwest's Director of Curriculum and Instruction, who had previously accessed the scores from The Kansas Department of Education. These multiple-choice tests were proctored by Blue Valley Southwest English and Math teachers who taught sophomores and juniors during the 2010-2011 school year.

Data Analysis and Hypothesis Testing

The researcher's primary goal was to evaluate the effectiveness of Study Island as a formative assessment tool by answering the following research questions and testing the following hypotheses:

RQ1: To what extent does the online formative assessment program, Study Island, impact the performance of academically at- risk Blue Valley Southwest High School 10th and 11th graders on the Kansas Reading Assessment?

H1: BVSW students who were at-risk in reading and participated in the Study Island program performed better on the Kansas Reading Assessment than the BVSW students who were at-risk in reading and did not participate in the program.

H2: BVSW students who were at-risk in both reading and math and participated in the Study Island program performed better on the Kansas Reading Assessment than the BVSW students who were at-risk in both reading and math and did not participate in the program.

RQ2: To what extent does the online formative assessment program, Study Island, impact the performance of academically at- risk Blue Valley Southwest High School 10th and 11th graders on the Kansas Math Assessment?

H3: BVSW students who were at-risk in math and participated in the Study Island program performed better on the Kansas Math Assessment than the BVSW students who were at-risk in math and did not participate in the program.

H4: BVSW students who were at-risk in both reading and math and participated in the Study Island program performed better on the Kansas Math Assessment than the BVSW students who were at-risk in both reading and math and did not participate in the program.

Four chi square tests of independence were conducted to determine to what extent the online formative assessment program, Study Island, impacted the performance of academically at- risk Blue Valley Southwest High School 10th and 11th graders on the Kansas Math and Reading Assessments. These four chi square tests were based on observed and expected frequencies of success for the following:

- Performance on the Kansas Reading Assessment by students who were at-risk in reading
- Performance on the Kansas Reading Assessment by students who were at-risk in both reading and math
- Performances on the Kansas Math Assessment by students who were at-risk in math
- Performance on the Kansas Math Assessment by students who were at-risk in both reading and math.

Each chi square analysis was conducted with a significance level of .05.

Limitations

An aspect of this study that should be considered as a potential limitation is the content of the Kansas Math and Reading Assessments. While they are both state implemented tests, they consist of content and skills that are not entirely consistent with other states' assessments. Therefore, results found within this study do not necessarily compare with results found on assessments designed and conducted in other states. Because Kansas only assesses 10^{th} and 11^{th} grades during the high school years, no generalizations regarding this study's conclusions can be made to the 9^{th} and 12^{th} grades. Finally, no data was available for collection prior to the 2010-2011 school year because the study was conducted during Blue Valley Southwest High School's inaugural year.

Summary

The purpose for evaluating Study Island's effectiveness was restated in this chapter. The research design for the study was quantitative in nature and was a quasi-experimental with one independent variable with two categories based upon participation status in the Study Island program. This chapter also detailed the study's population, sampling procedure, and data collection. Descriptions of data analysis, hypothesis testing, and limitations were also presented. The next chapter, chapter four, consists of a discussion of the study's results by including descriptive statistics, hypothesis testing, and additional analyses.

Chapter Four

Results

The purpose of this study was to determine to what extent the online assessment program, Study Island, impacted Blue Valley Southwest High School's academically at-risk 10^{th} and 11^{th} graders on the Kansas Reading and/or Math Assessments during 2010-2011 school year. Performance level data from the Kansas Reading and Math Assessments was compared between the at-risk students who participated in the Study Island program and those who did not. This chapter provides a description of the study's data, statistical analysis, results of the hypothesis tests that pertained to the two research questions, and a chapter summary.

Descriptive Statistics

The sample for this study consisted of Blue Valley Southwest 48 sophomores and 38 juniors who scored below the Meets Standard performance level on either CETE reading and/or math diagnostic assessments during the first quarter of the 2010-2011 school year. Table 11 contains data that provides gender and grade level totals for the 37 participants in the Study Island program.

Table 11

Study Island Participants by Gender and Grade Level

	Sophomores	Juniors	Total
Male	9	5	14
Female	17	6	23

Note. Adapted from the *Blue Valley Southwest Study Island Data*, by Blue Valley School District, 2010.

Table 12 contains data that provides gender and grade level totals for the 49 non-participants in the Study Island program.

Table 12

Study Island Non-Participants by Gender and Grade Level

	Sophomores	Juniors	Total
Male	20	10	30
Female	13	6	19

Note. Adapted from the *Blue Valley Southwest Study Island Data*, Blue Valley School District, 2010.

Hypothesis Testing

Since the purpose of the study consisted of evaluating the effectiveness of Study Island as a formative assessment tool, four chi-square (X^2) tests of independence with a significance of level of .05 were conducted to analyze the relationship between student participation in the Study Island program and success on the Kansas Reading and Math Assessment. Students who take the Kansas Reading and Math Assessments are scored within five performance levels. However, because of the limited sample size, this study evaluated student success by using the following two categories:

- Met Standard (students who scored in the Meets Standard, Exceeds Standard, or Exemplary performance levels)
- Did Not Meet Standard (students who scored in the Academic Warning or Approaches Standard performance levels).

The remainder of this section consists of the answers to the study's research questions as well as the results of the hypothesis testing.

RQ1.To what extent does the online formative assessment program, Study Island, impact the performance of academically at-risk Blue Valley Southwest High School 10th and 11th graders on the Kansas Reading Assessment?

The sample used to address the first research questions were the 17 students who, according to their previous performance on the CETE diagnostic assessment, were placed on the reading at-risk list. The following hypothesis addressed these 17 students:

H1. BVSW students who were at-risk in reading and participated in the Study Island program performed better on the Kansas Reading Assessment than the BVSW students who were at-risk in reading and did not participate in the program.

Table 13 contains a comparison of the observed and expected frequencies of the 10 participants in the Study Island program who were at-risk in reading and the 7 non-participants who were at-risk in reading. Support for the hypothesis is evidenced when the higher observed count for the participants are in the Met Standard column and higher counts for non-participants are in the Did Not Meet Standards column. The results of the chi-square test did not indicate a statistically significant relationship between participation in the Study Island program and their success on the Kansas Reading Assessment ($X^2 = 1.52$, $p = .22$, $df = 1$). This finding did not support the hypothesis that students who were at-risk in reading and participated in the Study Island program performed better on the Kansas Reading Assessment than the students who were at-risk in reading and did not participate in the program.

Table 13

Observed and Expected Frequencies of Success on the Kansas Reading Assessment for Students Who were Academically At-Risk in Reading

	Met Standards	Did Not Meet Standards	Total
Participated	10	0	10
	(9.41)	(0.58)	
Did Not Participate	6	1	7
	(6.58)	(0.41)	
Total	16	1	17

Note. Expected frequencies are in parentheses.

A second test was conducted for the 28 students who were at-risk in both reading and math. The following hypothesis was tested for these students:

H2. BVSW students who were at-risk in both reading and math and participated in the Study Island program performed better on the Kansas Reading Assessment than the BVSW students who were at-risk in both reading and math and did not participate in the program.

Table 14 compares the observed and expected frequencies of the 13 Study Island program participants with the 15 non-participants. Support for the hypothesis is evidenced when the higher observed count for the participants are in the Met Standards column and the higher count non-participants are in the Did Not Meet Standards column. The results of the chi-square test did not indicate a statistically significant relationship between participation in the Study Island program and the success on the Kansas Reading Assessment (X^2= 1.26, p = .26, df = 1). This finding did not support the hypothesis that students who were at-risk in both reading and math and participated in the Study Island program performed better on the Kansas Reading Assessment than the students who were at-risk in reading and math and did not participate in the program.

Table 14

Observed and Expected Frequencies of Success on the Kansas Reading Assessment for Students Who were Academically At-Risk in both Reading and Math

	Met Standards	Did Not Meet Standards	Total
Participated	9	4	13
	(10.21)	(2.79)	
Did Not Participate	13	2	15
	(11.79)	(3.21)	
Total	22	6	28

Note. Expected frequencies are in parentheses.

The hypothesis tests in both Table 13 and Table 14 provided evidence that participation in the Study Island program did not have a statistically significant effect on student success on the Kansas Reading Assessment. The second research question focused on the at-risk students who took the Kansas Math Assessment.

RQ2. To what extent does the online formative assessment program, Study Island, impact the performance of academically at- risk Blue Valley Southwest High School 10th and 11th graders on the Kansas Math Assessment?

The second research question was addressed using the math results for the 41 students who were solely placed on the math at-risk list and 28 students who were placed on both the reading and math at-risk lists. The following hypothesis addressed 41 students placed on the math at-risk list:

H3: BVSW students who were at-risk in math and participated in the Study Island program performed better on the Kansas Math Assessment than the BVSW students who were at-risk in math and did not participate in the program.

Table 15 contains a comparison of the observed and expected frequencies of the 14 participants in the Study Island program and the 27 non-participants. Support for the hypothesis is evidenced when the higher observed count for the participants are in the Met Standards column and higher observed counts for the non-participants are in the Did Not Meet Standards column. The results of the chi-square test did not indicate a statistically significant relationship between participation in the Study Island program and the success on the Kansas Math Assessment (X^2= .20, p = .65, df = 1). This finding did not support the hypothesis that students who were at-risk in math and participated in the Study Island program performed better on the Kansas Math Assessment than the BVSW students who were at-risk in math and did not participate in the program.

Table 15

Observed and Expected Frequencies of Success on the Kansas Math Assessment for Students Who were Academically At-Risk in Math

	Met Standards	Did Not Meet Standards	Total
Participated	10	4	14
	(10.59)	(3.41)	
Did Not Participate	21	6	27
	(20.41)	(6.59)	
Total	31	10	41

Note. Expected frequencies are in parentheses.

An additional chi-square test was conducted using the 28 students who were at-risk in both reading and math. The following hypothesis was tested for these 28 students:

H4: BVSW students who were at-risk in both reading and math and participated in the Study Island program performed better on the Kansas Math Assessment than the BVSW students who were at-risk in both reading and math and did not participate in the program.

Table 16 compares the observed and expected frequencies of the 13 Study Island program participants with the 15 non-participants. The results of the chi-square test did not indicate a statistically significant relationship between participation in the Study Island program and the success on the Kansas Math Assessment ($X^2 = 2.22$, $p = .14$, $df = 1$). This finding did not support the hypothesis that students who were at-risk in both reading and math and participated in the Study Island program performed better on the Kansas Math Assessment than the students who were at-risk in reading and math and did not participate in the program.

Table 16

Observed and Expected Frequencies of Success on the Kansas Math Assessment for Students Who were Academically At-Risk in both Reading and Math

	Met Standards	Did Not Meet Standards	Total
Participated	5	8	13
	(6.96)	(6.04)	
Did Not Participate	10	5	15
	(8.04)	(6.96)	
Total	15	13	28

Note. Expected frequencies are in parentheses.

The hypothesis tests in both Table 15 and Table 16 provided evidence that participation in the Study Island program did not have a statistically significant effect on student success on the Kansas Math Assessment. In addition to the chi-square hypothesis tests, the researcher also conducted additional analyses. The results of those analyses are presented in the following section.

Additional Analyses

The purpose of these additional analyses was to determine the amount of improvement of the entire sample from the CETE diagnostic reading and math assessments to Kansas Reading and Math Assessments. This section contains two frequency tables for students located on the reading at-risk list as well as the students located on both the reading and math at-risk lists. Table 17 contains data about the former group and includes the 10 Study Island participants and the 7 non-participants. Although the sample size was small, Table 17 includes data that shows that a greater percentage of participants (90%) than non-participants (71.4%) improved on the Kansas Reading Assessment. In addition, 82% of the students (both participants and non-participants) experienced an improvement from the CETE reading test at the beginning of the year to the Kansas Reading Assessment at the end of the year.

Table 17

Frequency Table of Improvement from the CETE to the Kansas Reading Assessment for Students who were Academically At-Risk in Reading

	Improved	Did Not Improve	Total
Participants	9	1	10
	(90%)	(10%)	(100%)
Non- Participants	5	2	7
	(71.4%)	(28.6)	(100%)
Total	14	3	17

Note. Percentages conditioned on participation status were calculated and are presented in parentheses.

Table 18 contains data from the 28 students who were at-risk in both reading and math, including the 13 students who participated in the Study Island program and the 15 who did not. The data in Table 18 also indicates a greater percentage of non-participants (80%) improved from the CETE reading assessment to the Kansas Reading Assessment than the participants (69.2%). However, there was a 75% improvement when combining both participation groups.

Table 18

Frequency Table of Improvement from the CETE to the Kansas Reading Assessment for Students who were Academically At-Risk in both Reading and Math

	Improved	Did Not Improve	Total
Participants	9	4	13
	(69.2%)	(30.8)	(100%)
Non- Participants	12	3	15
	(80%)	(20%)	(100%)
Total	21	7	28

Note. Percentages conditioned on participation status were calculated and are presented in parentheses.

The following frequency tables are focused on the improvement from the CETE math assessment to the Kansas Math Assessment for the students who placed on the math at-risk list and students who were placed on both the reading and math at-risk lists. Table 19 contains data from 41 students who were only on the math at-risk list. This includes the 11 Study Island participants and the 20 non-participants. In addition, Table 19 contains approximately equal data that indicates 78.6% of the Study Island participants and 74.1% of non-participants improved from the CETE math assessment to the Kansas Math Assessment. Moreover, 75.6% of the overall sample experienced improvement regardless of participation status.

Table 19

Frequency Table of Improvement from the CETE to the Kansas Math Assessment for Students who were Academically At-Risk in Math

	Improved	Did Not Improve	Total
Participants	11	3	14
	(78.6%)	(21.4%)	(100%)
Non- Participants	20	7	27
	(74.1%)	(25.9%)	(100%)
Total	31	10	41

Note. Conditional percentages were calculated for participants and non-participants and are presented in parentheses.

Table 20 contains data regarding the Kansas Math Assessment improvement experienced by the 28 students who were placed on both the reading and math at-risk lists. This included the 13 participants in the Study Island program and the 15 who did not. The data in Table 20 also indicates a greater percentage of non-participants (86.7%) improved from the CETE reading assessment to the Kansas Reading Assessment than the participants (69.2%). However, there was a 78.6% improvement when combing both participation groups

Table 20

Frequency Table of Improvement from the CETE to the Kansas Math Assessment for Students who were Academically At-Risk in both Reading and Math

	Improved	Did Not Improve	Total
Participants	9	4	13
	(69.2%)	(30.8%)	(100%)
Non- Participants	13	2	15
	(86.7%)	(13.3%)	(100%)
Total	22	6	28

Note. Conditional percentages were calculated for participants and non-participants and are presented in parentheses.

Although hypothesis testing provided evidence that participation in the Study Island program did not have a statistically significant effect on student success on the Kansas Reading and Math Assessments as defined by whether or not they met standards, the four frequency tables contain data that indicates an increase in student performance in both reading and math regardless of their participation in the Study Island program. Tables 17-20 illustrate that for both participants and non-participants, a greater percentage improved than did not improve.

Summary

Chapter four focused on the results of this study. It began with an introduction and an explanation of the descriptive statistics including information regarding the population and sample. Statistical data was provided regarding to what extent the Study Island program had an impact for academically at-risk students on the Kansas Reading and Math Assessments. Four chi-square tests of independence with a significance of level of .05 were conducted to analyze the relationship between student participation in the Study Island program and success on the Kansas Reading and/or Math Assessment. The findings from all four chi-square tests indicated no statistically significant relationship between the participation of the Study Island program and achievement on the Kansas Reading and/or Math Assessments.

Chapter four also contained additional analyses consisting of four frequency tables to determine if the performance of the entire sample improved from the CETE diagnostic reading and math assessments to Kansas Reading and Math Assessments. Ultimately, all four frequency tables indicated a greater percentage of improvement than non-improvement, regardless of participation status. Chapter five consists of a summary of the study, overview of the findings, explanation of the findings in connection to the literature, the researcher's conclusions and recommendations for future research, and concluding remarks.

Chapter Five

Interpretation and Recommendations

During the 2010-2011 school year, the Blue Valley Southwest High School leadership team purchased the online formative assessment program, Study Island, as an intervention tool to improve student achievement on both the Kansas Reading and Math Assessments. This study was conducted to determine whether Study Island positively impacted the academically at-risk 10th and 11th graders who participated in the program. Chapter five provides a summary of the study, overview of the findings, explanation of the findings in connection to the literature, the researcher's conclusions and recommendations for future research, and concluding remarks.

Study Summary

This study took place in Blue Valley Southwest High School in Overland Park, Kansas' Blue Valley School District (USD 229). In order to evaluate the impact of Study Island on the Kansas Reading and Math Assessments, the sample consisted of 86 sophomores and juniors who were deemed academically at-risk in reading and/or math according their performance on CETE diagnostic assessments. The content in this section will provide a description of the initial problem, the purpose statement, research questions, a review of the methodology, and the major findings of the study.

Overview of the Problem. Prior to this research, Blue Valley Southwest had never used Study Island as an intervention tool and the leadership team wanted to know if Study Island was effective as an intervention tool for high school students struggling in the areas of reading and math. The leadership team wanted data that measured Study

Island's impact upon the 37 at-risk reading and/or math students who participated in the program (Blue Valley Southwest School Learning Plan, 2010, p. 1).

Purpose Statement and Research Questions. The purpose of this study was to evaluate the effectiveness of the online formative assessment tool, Study Island, for Blue Valley Southwest High School students who had been deemed academically at-risk in reading and/or math during the 2010-2011 school year. In order to achieve this purpose, the researcher collected data to determine to what extent Study Island impacted these students' performance on the Kansas Reading and Math Assessments.

Review of the Methodology. This quantitative study focused on one independent variable consisting of two categories based upon participation status: chose to participate and did not choose to participate. The dependent variables were the 2011 Kansas Reading and Math Assessment performance levels of Met Standards and Did Not Meet Standards. Four chi-square tests of independence were used to address the hypotheses that academically at-risk students who participated in the Study Island program performed better on the Kansas Reading and Math Assessments than the academically at-risk students who did not participate.

Major Findings. The four chi-square tests of independence compared tables of observed and expected frequencies for the participants and non-participants who met standards and did not meet standards. Chi-square tests were conducted with data from:

- the Kansas Reading Assessment for students who were academically at-risk in reading
- the Kansas Reading Assessment for students who were academically at-risk in both reading and math

- the Kansas Math Assessment for students who were academically at-risk in math
- the Kansas Math Assessment for students who were academically at-risk in both reading and math.

None of the four chi-square tests supported a statistically significant relationship between the participation in the Study Island program and success on the Kansas Reading or Math Assessment.

An additional four frequency tables were used by the researcher to determine if the performance of the entire sample improved from the CETE diagnostic reading and math assessments to Kansas Reading and Math Assessments. Ultimately, all four frequency tables indicated a greater percentage of improvement than non-improvement, regardless of participation status. Across all the lists of students above, the percentage of students who improved on the Kansas Reading and Math Assessments was greater than the percentage of students who did not improved for both participants and non-participants.

Findings Related to the Literature

While there was no statistically significant relationship between participation in the online, formative assessment tool, Study Island, and success on the Kansas Reading and Math Assessments, the overall improvement of the participants was clearly evident. The findings of this study may not have been entirely consistent with the literature that was reviewed but there are noteworthy connections that can be made. This section provides some of these connections, specifically, in the areas of staff training, PLC collaboration, and intervention implementation in the classroom.

Specific factors may exist that led to the lack of a difference in reading and math achievement between the two groups of students. One possible explanation for the lack of impact is that at the time of this study, Blue Valley Southwest High School had the Study Island program over the course of only one school year. Stiggins (2008) stressed the importance of pre-training both educators and students about any new assessment implementation (p. 7). As with any new technological intervention, time is required to familiarize both students and teachers with the program. Since this was the first year of the intervention, limited training and evaluation opportunities took place in order to adjust and improve the overall implementation of the program. The necessity for training coincides with Heritage's (2007) assertion that teachers should not only learn how to integrate formative assessment within their classrooms, but also how to "ensure that the evidence from the formative assessment and the inferences they draw from it are of sufficient quality" (p. 144). If the implementation of the Study Island program had been used in Blue Valley Southwest for more than one year, more professional development would have been required as well as more data analysis within the Communication Arts and Math professional learning communities.

The findings in this study supports Cavucci's (2009) conclusions regarding computer technology integration into daily curriculum. After conducting her study, she found that certain barriers exist that prevent effective integration. Three of these barriers consisted of a lack of training, the lack of time to fully integrate the software into the desired classes, and minimal student familiarity with the software as well as limited technology access in their homes (Cavucci, 2009, p. iii). These barriers may have been present in this study due to the limited time it was conducted. Additionally, teachers cannot simply assign Study Island to students without clearly articulating the purpose of why they should do it (Boyle & Hutchison, 2009, p. 315). Future PLC collaboration of the Blue Valley Southwest teachers should focus on this as they continue using the Study Island program within their classes.

Another factor that may have had an impact on the study was the fact that the Study Island intervention was an intervention by invitation and participation was not mandatory among all at-risk. In the book *Leaders of Learning*, DuFour and Marzano (2011) state, “an effective plan of intervention will not invite students to devote additional time to their learning or to utilize additional layers of support- it will require them to do so” (p. 182). Relying upon students to volunteer for a specific intervention is an unreliable way to reach students who lack skill. In fact, a majority of the time, students who struggle are usually the least likely to pursue interventions (DuFour & Marzano, 2011, p. 183). In this study, the student motivation and the individual academic determination within the sample may have influenced their participation in the Study Island program. Because not all students will voluntarily participate in specific programs, interventions must be individually assigned (Buffum, Mattos, & Weber, 2010 p. 15). It is the job of the Blue Valley Southwest staff to develop a variety of interventions to meet the needs of all of their students and not just those who accept intervention invitations.

Although there were limited differences between the Study Island program participants and non-participants, the data from this study supports the fact that Blue Valley Southwest was successful in increasing student achievement from the CETE reading and math diagnostic assessments at the beginning of the year to the end of the year Kansas Reading and Math Assessments (as indicated in Tables 15, 16, 17, and 18). This could be interpreted to mean that Southwest teachers addressed the needs of all of their academically at-risk students. For effective RTI implementation to become a reality, all educators within a school must collaboratively seek out various solutions to address their students' needs (Hoover & Love, 2011 p. 42). Since the Blue Valley School District adheres to Stiggins and DuFour's (2009) Professional Learning Community philosophy, every teacher operates within the collaborative environment conducive to ongoing formative assessment practices. This study demonstrates that Blue Valley Southwest educators are effective in identifying academically at-risk students and modifying their instructional activities to meet their individual needs. The emphasis on formative assessment tools to monitor student growth and the focus on collaboration in the PLC process helped address student learning needs. (Blue Valley Southwest School Learning Plan, 2010, p. 1). Ultimately, the Study Island program was just one component during Blue Valley Southwest's 2010-2011 school year that helped enhanced student learning.

Conclusions

Because this was the first study conducted in the Blue Valley School District regarding the implementation of Study Island at the secondary level, the findings have specific implications for future action. In addition, various recommendations can also be made regarding future study in this area. These implications for actions and recommendations for research are described within this section.

Implications for Action. The findings of this study have strong implications for the members of the leadership team at Blue Valley Southwest High School as they decide which investments should considered be when purchasing intervention tools for their struggling students. The Blue Valley School District can also use the data to determine if Study Island should be used beyond the elementary and middle school levels. This would be especially important when considering the types of instructional strategies used in various at-risk programs within the district such as the Read 180 and Math Strategies programs.

Reevaluation regarding the continuation of the Study Island program may be necessary since the data did not provide statistically significant differences between the program's participants and non-participants. Because the Study Island program was only used during one school year, limited training was provided for the Blue Valley Southwest teachers who utilized it in their classrooms. As Hixon (2010) noted, "teachers will need to learn the function of many of Study Island's features to effectively use these programs with their students." The results of this study support the notion that it is not enough to simply prompt struggling students to use Study Island; Blue Valley Southwest teachers must also fully integrate it within their daily classroom instruction.

The findings from this study could also have strong implications for parents who are looking for online learning tools for their academically struggling students. As Byrd (2011) stressed, parents should be more knowledgeable about strategies within the RTI multi-tiered process so that they can become stronger partners in the learning process (p. 34). The data from this study could help both educators and parents decide if their students should participate in the Study Island program.

Recommendations for Future Research. After examining the results of this study and understanding its implications, recommendations can be made regarding further research. The following recommendations all pertain to further research related to the integration of the Study Island program within the secondary level.

1. This study could be conducted over multiple years to enhance the likelihood that teachers receive more training and professional development on how to integrate Study Island into their classrooms. This training could also help them interpret their students' data from Study Island in order to modify instruction.
2. Additional dependent variables should be used to compare with previous years' assessment scores. This could include data from national standardized assessments such as the ACT (taken by 11^{th} and 12^{th} graders), the PLAN (an ACT diagnostic exam given to all Blue Valley 9^{th} graders), and the EXPLORE (another ACT diagnostic given to all Blue Valley 7^{th} graders). In addition, the Kansas Reading and Math Assessments will no longer be used after 2013; therefore, data from upcoming Common Core State Standard (CCSS) assessments could be used in future research. The CCSS assessments will be based on standards written on the national level and adopted by the Kansas Department of Education. ("Archipelago Up as Study Island Grows," 2010).
3. This study should be modified in the future by using a variety of participation incentives for students rather than just offering extra credit in their English and Math courses.
4. This study could be modified in the future by increasing the sample size by including all Blue Valley School District high schools. This would be

contingent that all Blue Valley high schools used Study Island during the same school year.

Concluding Remarks. As the United States educational system enters into a new assessment paradigm, the Common Core State Standards, more strategies will be required when meeting the needs of all students. Just as Black and Wiliam (1998) stressed the importance of the bridging “the learning gap,” daily classroom practices must continually adapt to the ever changing world, most notably in technology. This study focused on one of those technological tools, Study Island. While the data indicated that there was not a statistically significant relationship between participation in the program and achievement on the Kansas Reading and Math Assessments, future studies should be conducted within the Blue Valley School District to monitor its effectiveness over a longer period of time in connection with a variety of pre and post assessments. In a larger context, this study can add to the body of research regarding the effectiveness of Study Island at the secondary level. Salend (2009) emphatically stressed that educators who use technological assessments must fully demonstrate how they align with their instructional program and curricular goals (p. 57). Therefore, as new e-assessments continue to become available on an ongoing basis, future data analysis will be necessary to evaluate to what extent they impact student achievement.

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Appendix A: Assessed Indicators on the 2011 Kansas Reading Assessment

1.3.1: determines meaning of words or phrases using context clues (e.g., definitions, restatements, examples, descriptions, comparison-contrast, clue words, cause-effect) from sentences or paragraphs.

1.3.3: determines meaning of words through structural analysis, using knowledge of Greek, Latin, and Anglo-Saxon roots, prefixes, and suffixes to understand complex words, including words in science, mathematics, and social studies.

1.3.4: identifies, interprets, and analyzes the use of figurative language, including similes, metaphors, analogies, hyperbole, onomatopoeia, personification, idioms, imagery, and symbolism.

1.4.2: understands the purpose of text features (e.g., title, graphs/charts and maps, table of contents, pictures/illustrations, boldface type, italics, glossary, index, headings, subheadings, topic and summary sentences, captions, sidebars, underlining, numbered or bulleted lists, footnotes, annotations) and uses such features to locate information in and to gain meaning from appropriate-level texts.

1.4.5: uses information from the text to make inferences and draw conclusions.

1.4.6: analyzes and evaluates how authors use text structure (e.g., sequence, problem-solution, comparison-contrast, description, cause-effect) to help achieve their purposes.

1.4.7 compares and contrasts varying aspects (e.g., characters' traits and motives, themes, problem-solution, cause-effect relationships, ideas and concepts, procedures, viewpoints, authors' purposes, persuasive techniques, use of literary devices, thoroughness of supporting evidence) in one or more appropriate-level texts.

1.4.8: explains and analyzes cause-effect relationships in appropriate-level narrative, expository, technical, and persuasive texts.

1.4.9: uses paraphrasing and organizational skills to summarize information (stated and implied main ideas, main events, important details, underlying meaning) from appropriate-level narrative, expository, technical, and persuasive texts in logical or sequential order, clearly preserving the author's intent.

1.4.10: identifies the topic, main idea(s), supporting details, and theme(s) in text across the content areas and from a variety of sources in appropriate-level text.

1.4.11: analyzes and evaluates how an author's style (e.g., word choice, sentence structure) and use of literary devices (e.g., foreshadowing, flashback, irony, symbolism, tone, mood, imagery, satire, point of view, allusion, overstatement, paradox) work together to achieve his or her purpose for writing the text.

1.4.14: identifies the author's position in a persuasive text, describes techniques the author uses to support that position (e.g., bandwagon approach, glittering generalities, testimonials, citing authority, statistics, other techniques that appeal to reason or emotion), and evaluates the effectiveness of these techniques and the credibility of the information provided.

1.4.15: distinguishes between fact and opinion, and recognizes propaganda (e.g., advertising, media, politics, warfare), bias, and stereotypes in various types of appropriate-level texts.

2.1.1: identifies and describes different types of characters (e.g., protagonist, antagonist, round, flat, static, dynamic) and analyzes the development of characters.

2.1.2: analyzes the historical, social, and cultural contextual aspects of the setting and their influence on characters and events in the story or literary text.

2.1.3: analyzes and evaluates how the author uses various plot elements (e.g., problem or conflict, climax, resolution, rising action, falling action, subplots, parallel episodes) to advance the plot and make connections between events.

Appendix B: Assessed Indicators on the 2011 Kansas Math Assessment

1.2.K3: Names, uses, and describes these properties with real number system and demonstrates their meaning including the use of concrete objects: a) commutative (a + b = b + a and ab = ba), associative [a + (b + c) = (a + b) + c and a(bc) = (ab)c], distributive [a (b + c) = ab + ac], and substitution properties (if a = 2, then 3a = 3 x 2 = 6); b) identity properties for addition and multiplication and inverse properties of addition and multiplication (additive identity: a + 0 = a, multiplicative identity: a □ 1 = a, additive inverse: +5 + -5 = 0, multiplicative inverse: 8 x 1/8 = 1); c) symmetric property of equality (if a = b, then b = a); d) addition and multiplication properties of equality (if a = b, then a + c = b + c and if a = b, then ac = bc) and inequalities (if a > b, then a + c > b + c and if a > b, and c > 0 then ac > bc); e) zero product property (if ab = 0, then a = 0 and/or b = 0.

1.3.A1: Adjusts original rational number estimate of a real-world problem based on additional information (a frame of reference).

1.4.A1: Generates and/or solves multi-step real-world problems with real numbers and algebraic expressions using computational procedures (addition, subtraction, multiplication, division, roots, and powers excluding logarithms), and mathematical concepts with: a) applications from business, chemistry, and physics that involve addition, subtraction, multiplication, division, squares, and square roots when the formulae are given as part of the problem and variables are defined; b) volume and surface area given the measurement formulas of rectangular solids and cylinders; d) application of percents.

2.2.A2: Represents and/or solves real-world problems with: a) linear equations and inequalities both analytically and graphically.

2.2.K3: classify sequences as arithmetic, geometric, or neither.

2.3.A2: Interprets the meaning of the x- and y- intercepts, slope, and/or points on and off the line on a graph in the context of a real-world situation.

2.3.K6: recognizes how changes in the constant and/or slope within a linear function changes the appearance of a graph.

3.1.A1: Solves real-world problems by: b) applying the Pythagorean Theorem.

3.3.A1: Analyzes the impact of transformations on the perimeter and area of circles, rectangles, and triangles and volume of rectangular prisms and cylinders.

3.4.K4: Finds and explains the relationship between the slopes of parallel and perpendicular lines.

3.4.K6: Recognizes the equation of a line and transforms the equation into slope-intercept form in order to identify the slope and y-intercept and uses this information to graph the line.

4.1.K3: Explains the relationship between probability and odds and computes one given the other.

4.2.A1: Uses data analysis (mean, median, mode, range, quartile, interquartile range) in real world problems with rational number data sets to compare and contrast two sets of data, to make accurate inferences and predictions, to analyze decisions, and to develop convincing arguments from these data displays: a) frequency tables and line plots; b) bar, line, and circle graph; c) Venn diagrams or other pictorial displays; d) charts and tables; e) stem-and-leaf plots (single and double); f) scatter plots; g) box-and-whiskers plots; h) histograms.

4.2.K4: Explains the effects of outliers on the measures of central tendency (mean, median, mode) and range and interquartile range of a real number data set.

4.2.K5: Approximates a line of best fit given a scatter plot and makes predictions using the equation of that line.

Appendix C: Baker IRB Application Form

BAKER UNIVERSITY

SCHOOL OF EDUCATION
GRADUATE DEPARTMENT

Date:________________
IRB PROTOCOL NUMBER ______________
(IRB USE ONLY)

IRB REQUEST
Proposal for Research
Submitted to the Baker University Institutional Review Board

I. Research Investigator(s) (Students must list faculty sponsor first)

Department(s) **School of Education Graduate Department**

Name	Signature	
1. Brad Tate, Ed.D.	________________,	Major Advisor
2. Margaret Waterman	________________,	Research Analyst
3. Dr. Dennis King	________________,	University Committee Member
4. Dr. Tonya Merrigan	________________,	External Committee Member

Principal Investigator: ________________, Tyson Ostroski
Phone: 816-752-8027
Email: tostroski@bluevalleyk12.org
Mailing address: 8319 Mackey St. Overland Park, KS 66212

Faculty sponsor:
Phone:
Email:
Expected Category of Review: ____Exempt _X_ Expedited ____Full

II: Protocol Title

Summary
The following summary must accompany the proposal. Be specific about exactly what participants will experience, and about the protections that have been included to safeguard participants from harm. Careful attention to the following may help facilitate the review process:

In a sentence or two, please describe the background and purpose of the research.

The focus of this study is to investigate the theory that the web-based, formative assessment program, Study Island, can improve secondary student performance on the Kansas Reading and Math Assessments. Study Island was used as an intervention for academically, at-risk sophomores and juniors at Blue Valley Southwest High School. Therefore, the study's primary goal is to evaluate the effectiveness of Study Island as a formative assessment tool.

Briefly describe each condition or manipulation to be included within the study.

This study is quantitative in nature and is quasi-experimental with one independent variable with two categories. These categories depend upon the participation status from the 86 academically at-risk Blue Valley Southwest 10th and 11th graders (p= participated in the Study Island program, np= did not participate in the Study Island program). The first category is the group of 37 academically at-risk Blue Valley Southwest students who participated in the Study Island during the 2010-2011 school year. The other category is the group of 49 academically at-risk Blue Valley Southwest students who did not participate in the Study Island program during the 2010-2011 school year. The dependent variables are the 2011 Kansas Reading and Math Assessment proficiency levels. Two chi square tests of independence will be conducted to determine to what extent the online formative assessment program, Study Island, impacted the performance of academically at- risk Blue Valley Southwest High School 10th and 11th graders on the Kansas Math Assessment and/or the Kansas Reading Assessment. The chi square analysis will be conducted with a significance level of .05.

What measures or observations will be taken in the study? If any questionnaire or other instruments are used, provide a brief description and attach a copy.
This is quantitative study using archival data. Therefore, qualitative questionnaires or surveys will not be used.

Will the subjects encounter the risk of psychological, social, physical, or legal risk? If so, please describe the nature of the risk and any measures designed to mitigate that risk.
No

Will any stress to subjects be involved? If so, please describe.
No

Will the subjects be deceived or misled in any way? If so, include an outline or script of the debriefing.
No

Will there be a request for information that subjects might consider to be personal or sensitive? If so, please include a description.
No

Will the subjects be presented with materials that might be considered to be offensive, threatening, or degrading? If so, please describe.
No

Approximately how much time will be demanded of each subject?
No time will be demanded because I will be using archival data from a previous school year.

Who will be the subjects in this study? How will they be solicited or contacted? Provide an outline or script of the information which will be provided to subjects prior to their volunteering to participate. Include a copy of any written solicitation as well as an outline of any oral solicitation.

The population used in the study consists of 86 sophomore and junior students who were in enrolled in Blue Valley Southwest High School during the 2010-2011 school year. These 86 students will be targeted because of their performance on a Reading and/or Math CETE diagnostic assessment taken at the beginning of the school year. The population of 86 students was then divided into the following three groups:

- 41 sophomores and juniors were placed on the Math At-Risk list
- 17 sophomores and juniors were placed on the Reading At-Risk list
- 28 sophomores and juniors were on both the Reading and Math At-Risk lists.

The sampling procedure for this study is purposive criterion sampling. Blue Valley Southwest 10th and 11th graders who scored below the Meets Standard level on the CETE reading and/or math diagnostic assessments were the only students selected for the study because they were the only grade levels who participated in the Kansas Reading and Math Assessments. Of all of the Blue Valley Southwest 10th and 11th graders who were tested, 86 students were deemed academically at-risk in the sophomore and junior grade levels because they did not meet proficiency on the CETE reading and/or math diagnostic assessment. Therefore, the two sample criteria will consist of students who:

1. Were either in 10th or 11th grade
2. Scored below Meets Standard on the CETE reading (68%) and/or math (50%) diagnostic assessment

The 86 students who were on the at-risk lists were offered extra-credit incentives within their Math and Communication Arts classrooms if they participated in the Study Island program.

What steps will be taken to ensure that each subject's participation is voluntary? What if any inducements will be offered to the subjects for their participation?

The population has been selected by a previous school year and I will be using data that has already been collected. Ultimately, 69 students scored below 50% on the Math diagnostic and 45 students scored below 68% on the reading diagnostic. As a result, the Blue Valley Southwest leadership team elected to purchase subscriptions to the web-based, formative assessment program, Study Island. Students were offered extra-credit incentives within their Math and Communication Arts classrooms if they participated in the formative assessment program. This resulted in 37 students who participated in the program and 49 who did not.

How will you ensure that the subjects give their consent prior to participating? Will a written consent form be used? If so, include the form. If not, explain why not.

A written consent will not be necessary because I will use anonymous archival data.

Will any aspect of the data be made a part of any permanent record that can be identified with the subject? If so, please explain the necessity.

No

Will the fact that a subject did or did not participate in a specific experiment or study be made part of any permanent record available to a supervisor, teacher or employer? If so, explain.
No

What steps will be taken to ensure the confidentiality of the data?
No names will be used when presenting the data.

If there are any risks involved in the study, are there any offsetting benefits that might accrue to either the subjects or society?
No

Will any data from files or archival data be used? If so, please describe.
Archival Kansas State Assessment scores from the 2010/2011 school year will be used.

Appendix D: IRB Approval Letter

BAKER UNIVERSITY

August 17, 2012

Mr. Tyson Ostroski
8319 Mackey St.
Overland Park, KS 66212

Dear Mr. Ostroski:

The Baker University IRB has reviewed your research project application (E-0141-0725-0814-G) and approved this project under Expedited Review. As described, the project complies with all the requirements and policies established by the University for protection of human subjects in research. Unless renewed, approval lapses one year after approval date.

The Baker University IRB requires that your consent form must include the date of approval and expiration date (one year from today). Please be aware of the following:

1. At designated intervals (usually annually) until the project is completed, a Project Status Report must be returned to the IRB.
2. Any significant change in the research protocol as described should be reviewed by this Committee prior to altering the project.
3. Notify the OIR about any new investigators not named in original application.
4. Any injury to a subject because of the research procedure must be reported to the IRB Chair or representative immediately.
5. When signed consent documents are required, the primary investigator must retain the signed consent documents for at least three years past completion of the research activity. If you use a signed consent form, provide a copy of the consent form to subjects at the time of consent.
6. If this is a funded project, keep a copy of this approval letter with your proposal/grant file.

Please inform Office of Institutional Research (OIR) or myself when this project is terminated. As noted above, you must also provide OIR with an annual status report and receive approval for maintaining your status. If your project receives funding which requests an annual update approval, you must request this from the IRB one month prior to the annual update. Thanks for your cooperation. If you have any questions, please contact me.

Sincerely,

Carolyn Doolittle, EdD
Chair, Baker University IRB

Appendix E: District Research Approval

Ostroski, Tyson

Subject: Research approval

From: Parks, Elizabeth
Sent: Monday, October 25, 2010 10:38 AM
To: Ostroski, Tyson
Subject: RE: Research approval

Tyson,

I am sorry it has taken me some time to get back to you. Several of us involved in the review process have been out of town so it takes some time to get people together.

You have permission to proceed with your study.

Elizabeth

Elizabeth Parks
Director of Assessment and Research
Blue Valley School District
15020 Metcalf
Overland Park, KS 66283

Education Beyond Expectations