The Relationships between Scores on FastBridge aReading and aMath and Scores on the Kansas English Language Arts and Mathematics Assessments in Grades 3-8

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Abstract

The initial purpose of this non-experimental, quantitative study was to determine the extent relationships exist between the winter and spring FastBridge aReading composite scores and summative Kansas Assessment Program (KAP) English Language Arts (ELA) scores in Grades 3-8. An additional purpose of this study was to determine the extent relationships exist between the winter and spring FastBridge aMath assessment composite scores and summative KAP mathematics scores in Grades 3-8. Determining the status of these relationships could be used to validate the importance of benchmark assessments used as universal screening to pinpoint which students may be at-risk of failure to meet grade-level expectations and to intervene early. The participants in this study included approximately 18,000 students enrolled in Grades 3-8 in an urban Kansas school district during the 2018-2019 school year. At the time of this study, there was no literature found in which studies have been conducted on the correlation of FastBridge benchmark scores to the KAP scores in either reading or mathematics. Pearson correlation coefficients were calculated to determine the relationship between winter FastBridge composite scores and summative KAP scores for both subjects and between spring FastBridge composite scores and summative KAP scores for both subjects. The results indicated strong positive relationships exist between both the winter and spring FastBridge aReading composite scores and the summative KAP ELA scores and winter and spring FastBridge aMath assessment composite scores and summative KAP mathematics scores at Grades 3-8. Previous studies have been conducted that showed strong evidence of the correlation of benchmark assessment scores to state assessment scores. Evidence from this study supports the use of high-quality commercially

developed benchmark assessments which provide educators with the necessary data that is needed to provide early interventions for students and prevent failure on summative state assessments.

Dedication

"Never give up on a dream just because of the time it will take to accomplish it. The time will pass away."
-Earl Nightingale

I have been incredibly blessed with such a supportive and caring husband, father to our children, and friend. This dissertation is dedicated to Mark. Without his selflessness and encouragement over the past few years, I may have quit before even starting this journey. He has pushed me to continue when taking a break is all I wanted to do. I appreciate all that you have given up or taken on so that I can go to class, study, and write. I also dedicate this dissertation to my two daughters Makenna Lyn and Makeila Avery. The world is yours, no matter what journey you take. I am proud of who you are now and who you will become during your adventures into adulthood. I promise you that life will be challenging and unfair, but it will also be rewarding and worth the wait. Do not give up on your dreams or let time pass by you. Finally, I wish to dedicate this dissertation to my parents, Lewis and Loretta Gray, who have shown me that nothing can be accomplished without hard work and perseverance.

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Chapter 1

Introduction

According to the United States Department of Education (USDE, 2002), the No Child Left Behind Act (NCLB) of 2001 initiated a standards-based reform movement, which resulted in the widespread use of assessments designed to measure all students' performance at specific points in time. Generally, student performance is measured using summative state assessments administered to students at the end of the school year. In the era of accountability, schools rely on comprehensive assessment systems to support student learning and maintain growth on state assessments. Comprehensive assessment systems encompass the assessment tools and practices that occur from the beginning of a school year to the end of a school year and include universal screeners or benchmark assessments, progress-monitoring assessments, diagnostic assessments, and summative state assessments. Herman, Osmundson, and Dietel (2010) made the point, "Benchmark assessment can provide data to predict whether students, classes, schools and districts are on course to meet specific year-end goals—or commonly, be classified as proficient on the end-of-year state test." (p. 4). Universal screening assessments, sometimes known as benchmark, are utilized to gather student data and determine which students are at-risk of not meeting grade-level goals or standards. Additionally, educators commonly refer to benchmark assessment as interim assessment, as it measures growth or proficiency in the interim.

Universal screeners or benchmark systems are usually commercially published for the educational market. Babo, Tienken, and Gencarelli (2014) identified three claims that commercially prepared interim assessments have been marketed to target. The primary

claim indicated that students would perform better on state accountability measures due to more frequent interim measures of similar nature. The second claim indicated that the data retrieved from interim commercial measures would provide educators with the necessary information to make instructional decisions. The final claim made by vendors was that "post-test interim assessments can predict with a high degree of accuracy which students might score proficient" (Babo et al., 2014, p. 2). Typically, the universal screening system has an additional component used for progress-monitoring students for intervention monitoring.

The significance of a comprehensive assessment system with a strong universal screener is to support the intervention and prevention system to ensure that students improve in their skills and are most successful when measured at the end of the year for accountability measures on the Kansas Assessment Program (KAP). Kansas uses a summative assessment measure created by the University of Kansas Achievement & Assessment Institute (AAI), known as the KAP, for students in Grade 3 and above. The KAP "fulfills a mandate from the Kansas Legislature. KAP provides general education assessments, alternate assessments, career and technical education assessments, and an English language proficiency assessment" (Kansas State Department of Education [KSDE], n.d.-a).

Studies have been conducted that indicate a relationship between the success of various commercially published universal screener or benchmark assessments and different state assessments. Some commercial publishers even produce their own analysis of their benchmark tool. One example of this is the Measure of Academic Progress (MAP) published by the Northwest Evaluation Association (NWEA). "NWEA

completed a concordance study to connect the scales of Smarter Balanced Assessment Consortium's (Smarter Balanced) English Language Arts (ELA) and mathematics with those of the MAP Growth reading and mathematics assessments" (NWEA, 2017b, p. 2). Additionally, NWEA reported, "along with a series of tables that estimate the probability of receiving a Level 3 or higher score on the Smarter Balanced assessments, based on the observed MAP Growth scores taken during the same school year" (NWEA, 2017b, p. 2). In 2005, FastBridge Learning (2021) was created using competitive funding from the USDE to "build and improve assessments" (FastBridge Learning, p. 1). FastBridge Learning continued their work in 2010 out of the University of Minnesota where the Formative Assessment System for Teachers (FAST) was created "to make it easier for teachers to collect and use data to improve student outcomes" (FastBridge Learning, 2021, p. 1). Although studies can be found regarding the relationships between various benchmark assessments and state assessments, little was found specifically on the relationship between FastBridge benchmark assessments and state assessments. Due to this issue, the current study was developed.

Background

According to the USDE (2002), since the mid-1960s, federal regulations have provided guidance and accountability to state and local school systems. The Elementary and Secondary Education Act (ESEA) was enacted in 1965. The funding provided through ESEA offered more equitable opportunities to support disadvantaged students in public schools. This provision under the law is what we know today as Title 1. In 2002, ESEA was reauthorized as NCLB, and was an enhancement to the original education act and required increased accountability for schools. Finally, in December of 2015, the

NCLB's governance ended and the federal government authorized a new educational act under ESEA. This new governance was known as the Every Student Succeeds Act (ESSA), which required state and local schools to remain accountable for student achievement; however, it provides them more flexibility and control over their accountability measures (USDE, 2020).

KSDE (2017a) submitted a plan to the USDE in March 2017 that detailed how public schools in Kansas would meet ESSA guidelines. This plan, known as the Kansas Consolidated State Plan (KSDE, 2017a), detailed statewide goals and accountability measures for Kansas public schools. The Kansas Consolidated State Plan highlighted the initiative "Kansas Can" (KSDE, 2017a, p. 6) and was enhanced with the vision, "Kansas leads the world in the success of each student" (KSDE, 2017a, p. 6). This consolidated plan emphasized the importance of student achievement.

The Kansas Consolidated State Plan (KSDE, 2017a) posed a challenge requiring rigorous core academic standards for ELA, mathematics, social studies, and science that required a review every seven years and an assessment plan that met the federal requirements of ESEA. In this plan, the KAP was identified as the assessment platform that measured student achievement in these core subjects. Additionally, the plan identified proficiency of grade level standards for Grades 3 through 8 and once in high school measured through KAP. To meet ESEA guidelines that required growth in student achievement, the following goal was proposed by KSDE in their 2017 consolidated plan and approved by the federal government. "At the state, district, school and subgroup level, 75 percent of students score in performance levels 3 and 4 combined

on the Kansas state assessments in English language arts and mathematics by 2030" (KSDE, 2017a, p. 14).

In October of 2017, officials at KSDE reviewed state assessment results for the three previous years, as well as data trends prior to 2015. They recognized that students were performing at less than 40% proficiency on the 2015, 2016, and 2017 assessments in ELA and mathematics, which measured proficiency on assessments created for the newer and more rigorous Common Core standards that were adopted in Kansas for use beginning the 2014-2015 school year (KSDE, 2017b). However, prior to 2015, 80% of students scored at the proficient level based on a less rigorous state assessment when measured by an older state assessment that assessed earlier editions of ELA and mathematics standards written and published by KSDE (Llopis-Jepsen, 2017).

In 2010, KSDE established a support agency for Kansas schools, known as the Kansas Technical Assistance System Network (TASN), to increase student achievement and prevent failure to meet expectations (Kansas Multi-Tiered System of Supports [MTSS] and alignment specialist, personal communication, January 29, 2021). TASN is funded by KSDE Special Education and Title Services to align their system with MTSS. An MTSS framework allows schools to focus on system-level change, improve academic achievement, use research-based practices to guide instruction and instructional decision-making, and provide a system for prevention and intervention. Systems for prevention and intervention are guided by using a comprehensive assessment system to prevent future failure and address specific skill needs in reading, mathematics, and social-emotional areas (TASN, n. d.).

The district in this study is referred to as District A. According to the KSDE Report Card (2020), District A showed a decline in the percentage of students at performance levels 3 and 4 on the KAP summative assessment in ELA and mathematics from 2015 to 2018. At the beginning of the 2017-2018 school year, District A selected FastBridge to benchmark and progress-monitor students to determine how well students were progressing towards proficiency. The KAP is administered in the spring as a summative assessment measure to determine proficiency.

According to the executive director of assessment and research in District A (personal communication, July 14, 2020), teachers in the lower elementary grades used the AIMSWeb universal screening as their benchmark system from 2010 to 2017. AIMSWeb screeners were developed and commercially produced by Pearson in 2000 to universally screen reading, mathematics, spelling, and writing (Pearson, n.d.). Additionally, the NWEA MAP was being used in the upper elementary grades and secondary level as universal screeners for their benchmark assessment to efficiently assess student learning in reading and mathematics (District A executive director of assessment and research, personal communication, June 14, 2020). The NWEA MAP was released in 2000 out of the University of Oregon (NWEA, 2021). This benchmark assessment data was used to guide instruction and determine how well students were progressing towards proficiency in District A. This step was part of the district's structuring and alignment to Kansas MTSS to increase student proficiency of high academic standards as measured on the state assessment.

Furthermore, the executive director of assessment and research in District A (personal communication, July 14, 2020) indicated that during the 2016-2017 school

year, Pearson began adjusting their AIMSWeb system and did not continue to provide product support for the digital platform after the 2018-2019 school year for the version that was being used in District A. Therefore, before the 2018-2019 school year, districts using the AIMSWeb system had to decide whether to select a newer commercially marketed assessment system produced by AIMSWeb or a different commercial system through another vendor. Eventually, Pearson republished a newer version of AIMSWeb and discontinued the support of this older system. This change made it challenging to continue to use the product and obtain necessary information for instructional decision-making and determination of progress towards grade level standards. Ultimately, educators using the AIMSWeb assessment tools could not efficiently use the product without the online management system. At that time, District A administrators reviewed the assessments being utilized within the comprehensive assessment plan and evaluated the benchmark assessment tools being used in the district to come up with a common system. Requiring all district schools to utilize the same assessment tools would enable universal conversations across the district and allow for a seamless design from lower elementary to the secondary levels. Finding an assessment tool to evaluate broad reading and mathematics was also an important factor in evaluating the comprehensive assessment plan. District A teachers using the AIMSWeb tools and NWEA assessments could not determine if these assessment options were providing educators with the data they needed to support student achievement through the school year and meet end-of-year proficiency for students in Grades 3-8 as it is measured from the state assessment (District A executive director of assessment and research, personal communication, June 17, 2020).

Therefore, in 2016, District A leadership formed a committee of teachers, curriculum leaders, and principals to study available assessment tools on the market to benchmark broad reading and mathematics that could be implemented in all K-12 District A schools. The committee was comprised of approximately 35 educators from within the district. After studying available assessment systems, the team decided to pilot the FastBridge system, a relatively new universal screener. FastBridge came with mostly positive reviews from other Kansas schools that also work with TASN and had structured for MTSS. Additionally, the cost of the FastBridge system was more affordable than previous benchmark systems (District A executive director of assessment and research, personal communication, June 17, 2020). Ninety teachers in District A piloted FastBridge during the spring of the 2016-2017 school year. After the successful pilot, the committee recommended adopting the FastBridge system. Full implementation began in the fall of the 2017-2018 school year (District A executive director of assessment and research, personal communication, June 17, 2020).

Statement of the Problem

According to the USDE (2017), ESSA required students to be taught using high academic standards to prepare them for success in college and in their careers. This act, also required states to submit plans to meet ESSA and document accountability through annual state assessments that measure student proficiency on these high academic standards. KSDE (2018) noted that "an academic measurement of proficiency to summarize state, district, and subgroup performance across all performance categories, as stated by ESEA" (p .13). The identified goal of 75% proficiency should be obtained by the year 2030" (KSDE, 2018, p. 14).

Commonly, school districts look to enhance their assessment systems with commercial or locally developed assessment tools that benchmark students' progress through the year and determine proficiency towards age-appropriate expectations and/or year-end standards. At that time, District A chose to begin implementing an assessment system that included diagnostic assessments, benchmarking, formative progress-monitoring, and summative state assessments (District A executive director of assessment and research, personal communication, June 17, 2020). This decision supported recommendations made by TASN (n. d.), "Frequent data-based monitoring informs instructional decision making to empower each Kansas student to achieve high standards" (para. 2).

At the time of this study, there was little available information detailing the relationships between the winter and spring FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grades 3-8 and the winter and spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grades 3-8. District A was unsure how well this new assessment provided the necessary data to determine to what extent students were meeting year-end standards as measured on the KAP since FastBridge was a relatively new benchmark assessment on the market (District A executive director of assessment and research, personal communication, June 17, 2020). Little research was found about how well FastBridge assessments correlate with summative assessment measures.

Purpose of the Study

The first purpose of this non-experimental quantitative study was to investigate the relationship between the winter FastBridge aReading benchmark assessment

composite scores and the summative KAP ELA scores for grades 3-8. The second purpose was to investigate the relationship between the spring FastBridge aReading benchmark assessment composite scores and the summative KAP ELA scores for Grades 3-8. The third purpose was to investigate the relationship between winter FastBridge aMath benchmark assessment composite scores and summative KAP mathematics scores for Grades 3-8. Finally, the fourth purpose was to investigate the relationship between the spring FastBridge aMath benchmark assessment composite scores and summative KAP mathematics scores for Grades 3-8.

Significance of the Study

As educators continue to seek ways to increase student achievement and utilize their assessment systems to improve instruction for all students who are at-risk of not meeting end-of-year standards, benchmark assessment systems continue to be critical measures of student performance through the school year. The significance of this study was to contribute to the body of research related to the correlation between success on specific benchmark assessment measures and success on the KAP ELA and mathematics assessments. This study considered the relationship of the FastBridge benchmark assessments for broad reading and broad mathematics to the KAP. FastBridge Learning identifies concepts of print, phonological awareness, phonics, orthography and morphology, vocabulary, and comprehension as categories of broad reading skills (Christ et al., 2018). Additionally, FastBridge Learning identifies counting and cardinality, operations and algebraic thinking, number and operations in base-10, number and operations with fractions, measurement and data, and geometry as categories of broad mathematics (Christ et al., 2018). This could be more significant to Kansas schools, as

the number of Kansas school districts selecting FastBridge has been growing. During the school year 2019-2020, 48 districts in Kansas working with TASN utilized FastBridge for Grades Kindergarten through Grade 8 (Kansas MTSS and alignment specialist, personal communication, 2019). Knowing the extent of the relationship between FastBridge composite scores and summative KAP scores could allow educators to consider the effectiveness of the FastBridge system to predict whether students are at-risk of not meeting proficiency on the KAP and provide educators with greater access to pinpoint intervention needs for students.

Delimitations

To limit the focus, specific boundaries were created for this study. First, this study was quantitative in nature. At the time of the study, the researcher did not seek qualitative data regarding the relationship between benchmark and state assessment. Secondly, the data were retrieved from one urban school district in the Midwestern United States. Third, data were collected in the subjects of ELA/reading and mathematics. The sample included students in Grade 3 through Grade 8 who were administered the winter and spring FastBridge benchmark assessments in reading and mathematics and the spring KAP state assessment in ELA and mathematics. Last, the data was collected over the course of one academic year (2018-2019).

Assumptions

When conducting research, there may be certain elements that the researcher must accept as operational for purposes of the research (Lunenburg & Irby, 2008). In conducting this quantitative study, the following assumptions were made.

- The student data for FastBridge performance and KAP performance retrieved from the school district were accurate.
- Assessment proctors received test security and assessment protocols training for the administration of FastBridge and KAP assessments.
- Assessment proctors followed protocols and administered FastBridge and KAP using ethical practices as they are intended to be administered.
- The results of the assessments were an accurate measure of student ability.

Research Questions

The research questions that guided this quantitative correlational study to determine if there is a significant relationship between the FastBridge benchmark winter and spring composite scores and the summative KAP state assessment scores in ELA and mathematics are listed in this section. Composite scores represent the broad reading and broad mathematics from the FastBridge aReading and aMath assessments. Research questions (RQs) used in this study are presented below.

RQ1. To what extent is there a relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at each grade level (Grades 3-8)?

RQ2. To what extent is there a relationship between the spring FastBridge aReading assessment composite scores and the summative KAP ELA scores at each grade level (Grades 3-8)?

RQ3. To what extent is there a relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at each grade level (Grades 3-8)?

RQ4. To what extent is there a relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at each grade level (Grades 3-8)?

Definition of Terms

The following definitions were provided to ensure consistency of understanding of these terms throughout the study:

Benchmark assessment. Hicks (2013) indicated that benchmark assessments are formative assessments administered periodically throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

Formative assessment. Popham (2008) stated that formative assessments are administered formally or informally during a lesson, unit, or course that can be used to improve instruction while learning is taking place and providing feedback to students.

Interim assessment. According to Perie, Marion, Gong, and Wurtzel (2007), interim assessments occur between formative and summative assessments and are used to evaluate a student on a set of outcomes designed to inform teachers and school leaders at the classroom, school, and district level, so that instructional decisions may be made.

Multi-tiered System of Supports (MTSS). TASN (2020) indicated that MTSS is a coherent continuum of evidence-based, system-wide practices to support a rapid response to academic and behavioral needs.

Performance level descriptors. KSDE (n.d.-b) indicated four categories to distinguish student performance on the KAP state assessments for each grade level and

subject. The levels of performance are Level 1, Level 2, Level 3, and Level 4. To be college and career ready, students must score in the categories of Level 3 or 4.

Scale score. According to KSDE (n.d.-b), to provide consistent reporting of results for students who take an assessment for multiple grade levels, the total points earned on an assessment must be translated into a score represented along a predefined scale.

Summative assessment. Perie et al. (2007) stated that summative assessments are used to evaluate student learning at the end of a unit, course, semester, program, or school year.

Organization of the Study

This correlational research study is presented in five chapters. Chapter 1 included the background of the study, statement of the problem, purpose of the study, delimitations, assumptions, research questions, and definition of terms of the study. In Chapter 2, a review of literature is presented, which includes ESSA and high-stakes assessments, formative assessments in an MTSS system, and the correlation of formative assessments to summative assessments. Chapter 3 describes the methodology used in this study, which includes the research design, selection of participants, instrumentation, data collection procedures, data analysis and hypothesis testing, and the limitations of the study. The findings of the study are presented in Chapter 4. Provided in Chapter 5 are a study summary, findings related to the literature, and the conclusions.

Chapter 2

Review of the Literature

A lack of empirical research exists that explains to what extent interim pretest and posttest assessments predict future achievement on state-mandated standardized tests in language arts and mathematics (Babo et al., 2014). Little research was found regarding the relationship or predictive ability of the FastBridge aReading and FastBridge aMath to the Kansas Assessment Program in ELA and mathematics. This literature review includes an investigation of ESSA and the history of high-stakes assessment accountability and the purpose of formative assessment as it is used in an MTSS system. Provided in Chapter 2 is a comprehensive review of literature, which describes previous studies that support the use of benchmark assessment as a measure to ensure that all students reach proficiency on high-stakes summative assessments. The chapter begins with a historical and legislative perspective in the first section, describing ESSA and high-stakes assessments. The second section, formative assessment in an MTSS system, is presented through an instructional perspective. The third section, correlation of formative assessments to summative assessments, provides the reader a comprehensive review of studies conducted on the relationship between student performance on commercial and state written benchmark measures and their state assessments.

ESSA and High-Stakes Assessments

According to Brown, Boser, Sargrad, Marchitello, and the Center for American Progress (2016), high-stakes assessment can be traced back to ancient Greece, where students were tested orally for the mastery of skills using the Socratic method. The Chinese government had used assessment as early as 605 A.D. to determine which

individuals would be most strongly suited for government service. The Western world expanded the concept of assessment to written form, and in the early 1800s, England began implementing a written exam to screen individuals most suited for government positions. The standardized IQ test was presented to the world in 1905 by the French psychologist, Alfred Binet. In 1926, this new assessment practice gave way to the first high-stakes assessment prepared to determine knowledge and college readiness, known as the Scholastic Aptitude Test (SAT). The American College Testing (ACT) followed in 1959 (Brown et al., 2016). Today, assessment is federally mandated to be performed as a measure of accountability under ESSA (USDE, 2017).

According to the USDE (2016), on December 10, 2015, President Obama signed the ESSA, a reauthorization ESEA. ESSA replaced the 2002 version of the law, formally recognized as NCLB. This educational act was an effort to improve student outcomes for the future. Among many other improvements to the law, ESSA mandated schools to provide greater protections to disadvantaged students, teach students college and career-ready standards, be accountable to these standards through assessment, provide evidence-based intervention practices, increase access to preschool, and require accountability and support to lower-performing schools (USDE, 2016).

Under ESSA, each state has the flexibility to define how they intend to meet ESSA requirements, known as a consolidated state plan, and submit this plan to the USDE. According to the USDE (2019), "The purpose of the consolidated State plan is to provide parents with quality, transparent information about how the ESEA, as amended by the ESSA, will be implemented in their State" (ESSA Consolidated State Plans section, para. 1). In March 2017, each state department of education was provided with a

template to design their state plan with the requirement that it be submitted by September 2017 for approval and peer review (USDE, 2019). In ESEA section 1111(c)(4)(A), State Educational Agency (SEA) plans must indicate their academic achievement indicator and the establishment of long-term goals. According to KSDE (2017), proficiency of grade-level standards for Grades 3 through Grade 8 and once in high school would be measured through the KAP. To meet ESEA guidelines that required growth in student achievement, the following goal was proposed by KSDE in their 2017 consolidated plan. "At the state, district, school, and subgroup level, 75 percent of students score in performance levels 3 and 4 combined on the Kansas state assessments in English language arts and mathematics by 2030" (KSDE, 2017a, p. 14).

Another facet of ESSA was the importance placed on using multiple measures of student achievement. ESSA encouraged schools to measure student growth as opposed to merely looking at proficiency. "Among the many important provisions, this law shifts from a single measure - grade-level proficiency - under No Child Left Behind (NCLB), to multiple measures under ESSA" (Chapman, 2016, p. 1). ESSA provided state education systems with the flexibility of selecting their state assessment and encourages schools to use multiple measures to provide educators with guidance to make instructional decisions to support individual student progress toward end-of-year goals and outcomes focusing on student growth. Brown et al. (2016) identified that "there are a number of new tests aligned with the Common Core" (p. 16). Smarter Balanced Assessment Consortium and PARCC assessments are among the predominant assessments selected by states to use as their accountability measure; however, individual states may create an assessment tool (Brown et al., 2016). Multiple measures can include a wide variety or combination of

interim assessments, district-created pre- and post-assessments, benchmark assessments, formative assessments, and screening and diagnostic measures. "High-quality assessments are a critical tool that can help educators, parents, and policymakers promote educational equity by highlighting achievement gaps, especially for our traditionally underserved students, and that can spur instructional improvements that benefit all our children" (USDE, 2017, p. 1). Instructional improvements may be made in many different ways to benefit student learning. Teachers may make improvements to lesson delivery, format, content, and pace. They may select materials based on the needs of the student. Intervention and prevention are strategies that improve student learning are typically a part of a framework referred to as MTSS.

Formative Assessments in an MTSS System

The MTSS framework is an evidence-based, comprehensive model that integrates many levels of support within a school system, which are used to address academic achievement and social-emotional learning for all students. School districts often partner with agencies that help school systems structure for MTSS alignment and integrate school improvement efforts. Under ESSA, MTSS is recognized as an effective tool for addressing student academic achievement, and thus school systems may utilize federal funding to support and sustain the MTSS framework. "States and districts can use various funding streams (e.g., Title I, Title II, and Title IV) to support the implementation of MTSS and provide all school staff with the necessary and ongoing professional development" (National Association of School Psychologists, 2016, p. 1).

Kansas provides support to state schools and districts through an agency operating under the direction of KSDE, known as TASN. The purpose of TASN "is to increase the

capacity of districts to implement and sustain the use of evidence-based practices addressing KSDE Special Education and Title Services (SETS) identified priority areas and practices" (TASN, 2018, p. 1), thus meeting federal requirements under ESSA. These practices are based on using data to improve outcomes for students. In Kansas, TASN is responsible for providing support and training to schools and districts wishing to structure their system to MTSS and guide accreditation processes.

Several components make up a system of support. However, each component is individualized to fit the need of each MTSS aligned school. "MTSS is not a prepackaged, one size fits all program. Rather, a framework for providing comprehensive systems of differentiated support based on the unique needs of individual schools and districts" (National Association of School Psychologists, 2016, p. 1). Components of MTSS include varying levels of support known as tiers, screening, progress monitoring, and data-driven decision making for instruction, prevention, and intervention.

MTSS in Kansas schools incorporates a system of assessment, curriculum, and instruction that supports all learners through a sequence of responsive interventions. This problem-solving process encourages early intervention to prevent future failure. Early intervention is also the best use of time for continual learning (TASN, 2020). The Kansas MTSS framework supports three levels of support to students, exemplified in a triangle graphic (See Figure 1).

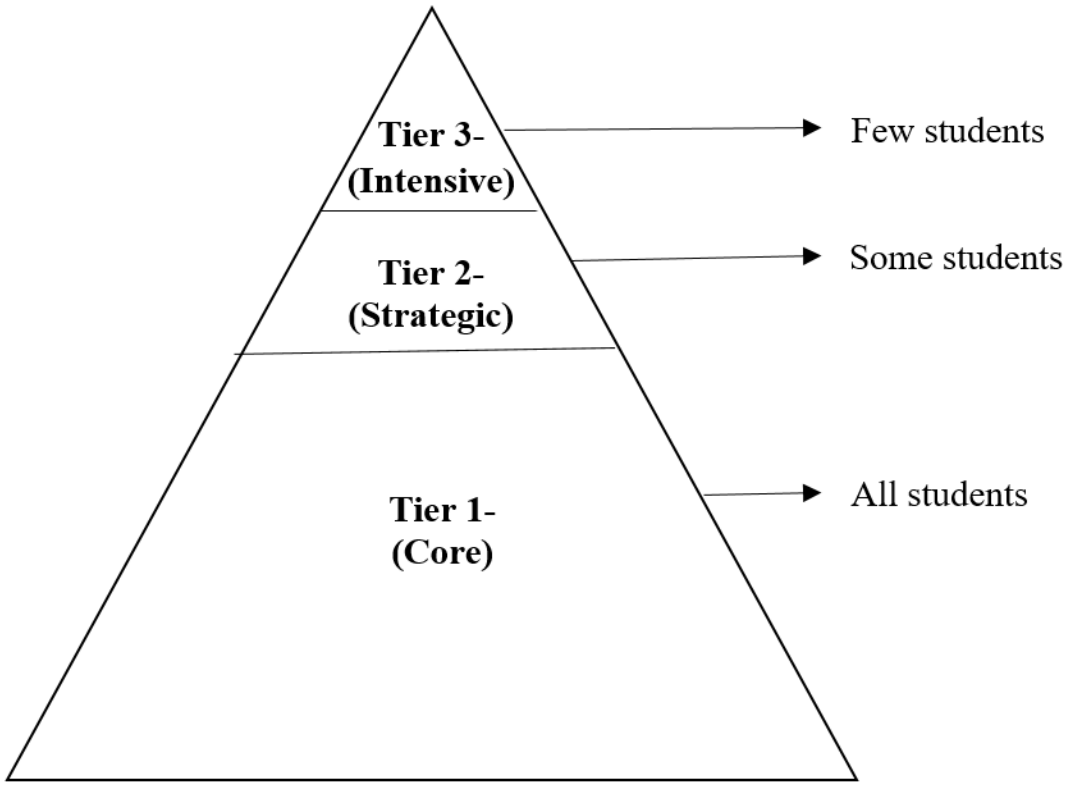

Figure 1. The Kansas MTSS framework supports three levels of support to students. Adapted from "Kansas Multi-Tier System of Supports: Structuring Guide for Systems," by TASN, 2020. Retrieved from https://ksdetasn.s3.amazonaws.com/uploads/resource/upload /2776/2020-

The first level and base of the triangle graphic symbolizes support for all students or the core level. The first level is known as Tier 1. "This level of the system is the foundation for the educational experience for all students… practices are evidence-based and are designed so that a maximum number of students will be successful, thereby minimizing the need for additional intervention" (TASN, 2020, p. 9). The middle portion of the triangle graphic represents the level of support for some students. This level is known on Tier 2 or the strategic level. At this level, data-based decisions are made to

group students based on their needs. "The goal remains consistent: to analyze student data obtained through universal screening and diagnostic assessments to make informed intentional decisions that match interventions to student needs" (TASN, 2020, p. 9). Finally, Tier 3 is the most intensive intervention available within this tiered system. Tier 3 represents the top of the triangle graphic. Interventions for students at this level are customized to provide this intensive support and may require an individual student plan. Like in Tier 2, student data from screening and diagnostic assessments are discussed in collaborative teams and analyzed. Student groupings are even smaller, and instruction is "even more systematic and explicit than in Tier 2" (TASN, 2020, p. 9).

Collaborative teams review data and determine instructional adjustments and intervention placement for all students. This data is derived from assessments dictated by the comprehensive assessment system of the school or district. TASN assists schools and districts to identify what assessments are a part of this comprehensive assessment system for the district. "Creating a comprehensive assessment system is one of the major structuring tasks completed by the leadership team...and is used for data-based decision-making" (TASN, 2020, p. 29). Comprehensive assessment systems include formative and summative assessment measures. Summative assessments are required of Kansas schools to be administered one time a year for accountability. Formative assessments (universal screening, progress monitoring, and diagnostic tests) are administered periodically, and the data is used to inform teachers about instruction. According to the comprehensive assessment system recommended by TASN, universal screeners for reading and mathematics should be administered 2-3 times per year, and diagnostic

assessment is administered to gather additional information about specific skill deficits to fine-tune the instructional focus (TASN, 2020).

Correlation of Formative Assessments to Summative Assessments

This subsection is dedicated to research conducted to investigate the relationship of performance on benchmark assessment to student performance on a state assessment. Although the scope changes over time, as evidenced in the literature, the need to guide instructional decisions using benchmark assessment to prevent failure on state assessment is apparent through history (Brown et al., 2016). In the following sub-sections, a review of benchmark tools that have been uniquely created by individual school districts or state departments of education and benchmark tools that have been commercially produced and used nationally are included.

State and locally developed benchmark assessments. In a rural school district in northwest Georgia, teachers struggled to create high-quality benchmark assessments that could predict success on state assessments due to the changing of various district assessments, updates in state standards, and curricular changes. Viness (2017) examined the relationship of locally developed benchmark assessments to the summative state assessment for third-grade students enrolled in one Georgia elementary school. Viness sought to determine how the benchmark assessments could be used to identify students who might be at-risk of not meeting grade-level outcomes before the end of the school year. Data were disaggregated by the subgroups of race, gender, free- and reduced-lunch status, and English language learners. The results of the study indicated there were statistically significant relationships between the locally developed benchmark assessments and the Georgia Criterion Referenced Competency Test (CRCT) for the first

two years of the study (2012-2013 and 2013-2014) and between the Georgia CRCT and the Georgia Milestones Assessment (GMA) for last two years of the study (2014-2015 and 2015-2016). Regression analysis identified that office referrals and attendance were not predictors of success on the GMA. However, gender, race, free- and reduced-lunch status, and English language learner status were significant predictors of performance on the GMAs.

Teachers from one school in central Florida struggled to determine the strength of a locally developed benchmark assessment to predict tenth-grade students' state assessment performance. Martin (2018) sought to identify if there was a correlation between the locally developed assessment for Algebra 1 and the Algebra 1 Florida Standards Assessment (FSA) and the locally developed assessment for Grade 10 ELA and the Grade 10 ELA Reading FSA using data from the 2017-2018 school year. The study involved approximately 1,000 students from eight high schools in one mid-size school district in Central Florida. A linear regression analysis was applied to the data sets to determine the relationship between the district benchmark scores and the state assessment scores. The results of the study indicated a moderately strong positive correlation between the scores of the district benchmark for Algebra 1 and the scores for Algebra 1 FSA. Additionally, a strong positive correlation was found between the Grade 10 ELA benchmark assessment scores and the Grade 10 FSA for reading. The researcher contributed to the existing body of research on formative assessment and recommended using this knowledge to inform decisions about curriculum, resources, and professional development.

Arizona schools have used a state-specific benchmark tool to guide instruction and intervention decisions, which maintain student growth toward Arizona state assessments given at the end of each year. Teachers from one elementary school in Arizona had a particular interest in the extent to which the benchmark assessment related to success on the state assessment for students with disabilities. Ketcham (2018) conducted a quantitative correlational study based on formative assessment theory in which she sought to identify if there was a correlation between the benchmark assessment and the state assessment in Arizona for students in special education. This study was meant to guide special educators in assessment and instruction. Ketcham investigated the correlation of test scores from 526 students in Grades 3-8 attending 15 schools from one district in Arizona. The students in the study were identified as receiving special education services and took the Arizona Assessment Collaborative (AZAC) district benchmark assessment and Arizona's Measurement of Educational Readiness to Inform Teaching (AzMERIT) state achievement test in reading and math. Results from this study indicated a statistically significant positive correlation between the district (AZAC) benchmark assessment scores and the AzMERIT ELA reading scores for the students with disabilities in Grades 3-8 who have an assessment score for each of the assessments, meaning that the variables move in the same direction. There was a positive correlation between the district (AZAC) benchmark assessment mathematics scores and the AzMERIT mathematics scores for the students with disabilities in Grades 3-8 who had an assessment score for each of the assessments.

Matsanka (2017) conducted a quantitative, non-experimental study to investigate the relationship between student performance on the Pennsylvania Classroom Diagnostic

Testing (CDT) and student performance on the Pennsylvania System of School Assessment (PSSA) for students in Grades 6-8 in literacy and mathematics. Data were collected from 864 students attending one middle school in southeastern Pennsylvania during the 2015-2016 school year. Linear regression equations were used as models to predict student performance on the PSSA assessments based on CDT student performance. Results of this study indicated that there were strong positive correlations between the two assessments in literacy and mathematics. Based on the study results, recommendations included using CDT assessment to target students who need additional instruction that might increase performance on the PSSA.

Commercially produced benchmark assessments. Wiley and Deno (2005) discuss the growing trend to explore whether curriculum-based measurement (CBM) oral reading measures can be used to predict success on standardized assessments. In their research, Wiley and Deno (2005) sought to determine if CBM is a useful tool to predict performance state assessment for English learner (EL) students. In their study, Wiley and Deno studied the General Outcome Measures (GOM) of oral reading and maze, which are traditionally used in the school for their research in this study. During the 2001-2002 school year, the GOM maze and CBM oral reading fluency fall scores for 36 third-grade and 33 fifth-grade students from an urban elementary school in St. Paul, Minnesota, were utilized. Out of the Grade 3 sample, 21 students were classified as non-EL, and 15 students were classified as EL. The Grade 5 sample included 19 non-EL students and 14 students who were classified as EL.

Students were screened using the Basic Academic Skill Samples (BASS), which the school identified as their GOM maze. From this screening, the bottom 50% of the

readers were identified as at-risk. These students received the GOM oral reading every two weeks to monitor their progress. The oral reading CBM used in this study was the Standard Reading Passages produced in 1985 by Children's Educational Services. In the spring, The Minnesota Comprehensive Assessment (MCA) in reading was administered to all students in Grade 3 and 5 in Minnesota. Proficiency was identified as achieving a score higher than 1420 (Level 2b or higher). According to Wiley and Deno (2005), "Overall, at the elementary school identified in this study, 26% of the third graders and 40% of the fifth-graders scored proficient or higher on the test" (p. 210). Multiple regression measures were used to determine if the GOM maze added to the predictive validity of GOM oral reading and if the GOM maze had predictive validity of the MCA. According to Wiley and Deno (2005), non-EL students in Grade 3 and 5 who performed well on the maze task performed well on the MCA. However, Wiley and Deno (2005) could not make predictions for performance on the MCA for EL students based on their maze performance. Wiley and Deno (2005) inferred that the maze appeared "to access aspects of reading by native English speakers that are not reflected in their oral reading performance" (p. 22).

Brown and Coughlin (2007) conducted a study in a small Mid-Atlantic school district whose students struggled to improve reading and mathematics skills, as evidenced by their state assessment results. Prior to Brown and Coughlin's (2007) research, administrators in this Mid-Atlantic middle school sought to find a program that would provide a computer-assisted instructional intervention for these struggling students. Using grant money, a commercially produced computer-based instructional program was purchased for low-performing students that would deliver reading and mathematics skills

instruction. This program would benchmark assess and progress monitor students regularly, and provide instructional adjustments as they were necessary. At this Mid-Atlantic middle school, the students continued to show progress on the benchmark assessments, which predicted significant gains on the upcoming state assessments. However, the students did not show such gains once the state assessment results were revealed. The administrators were released from their duty, consultants for the commercially produced program were dismissed, and the commercial tool was removed. Brown and Coughlin (2007) became interested in this problem, which sparked their research for the quality of predictive validity of benchmark assessment scores to state assessment scores.

Brown and Coughlin (2007) sought in their study to find evidence of validity in benchmark assessments used to predict success on state assessments for the Mid-Atlantic region due to a large variance in benchmark assessments being used in the region. The region's various benchmark assessments included locally developed and commercially developed measures. Brown and Coughlin indicated their concern that "locally developed assessments are not usually adequately validated, but commercially available testing products should provide evidence of validity for the explicit purposes for which the assessment has been developed" (Brown & Coughlin, 2007, p. iii). They began by consulting approximately 40 stakeholders to determine that more than 20 assessments were being used in the Mid-Atlantic region. They used three criteria to narrow the study to four different assessment tools in which to review.

> The assessments were used in more than one jurisdiction, the assessments were not developed for a single district or small group of districts but would be of

> interest to many schools and districts in the jurisdictions, and there was evidence, anecdotal or otherwise, of significant levels of use of the assessments within the region. (Brown & Coughlin, 2007, p. 6)

Using this criteria, Brown and Coughlin (2007) found that four assessments met the criteria for their study, which included Study Island's Study Island reading and mathematics assessments, Renaissance Learning's STAR Math and STAR Reading assessments, NWEA Measures of Academic Progress (MAP) mathematics and reading assessments, and CTB/McGraw-Hill's TerraNova mathematics and reading assessments. Brown and Coughlin (2007) identified in their study that all the assessments except Study Island assessments for reading and mathematics showed documentation of criterion validity, while only the TerraNova showed strong evidence of predictive validity (p. iv). Brown and Coughlin's (2007) conclusions included the need for further research linking benchmark assessments from this study and current versions of the state tests currently used. Brown and Coughlin (2007) noted the contribution that additional research could make to schools today by using the predictive validity evidence, "to make informed decisions about which benchmark assessments correspond to state assessment outcomes, so that instructional decisions meant to improve student learning as measured by state tests have a reasonable chance of success" (p. iv).

EasyCBM is a benchmark assessment tool developed by researchers at the University of Oregon to provide teachers with information about which of their students need additional instructional support in a broad range of reading skills (University of Oregon, 2021). Nese, Park, Alonzo, and Tindal (2011) examined the predictive validity of the easyCBM in a Response-to-Intervention (RTI) system as they related to state

assessment performance on the Oregon Assessment of Knowledge and Skills (OAKS) assessment. Their study was conducted using two school districts in the Pacific Northwest that included samples from 3,599 students in Grades 4 and 5 during the 2009-2010 school year. Three easyCBM criterion measures were used in this study: oral passage reading fluency, vocabulary, and multiple-choice reading comprehension. The criterion variable used from the OAKS assessment was the student Rasch unit (RIT) score achieved during the same study year. A RIT score of 204 (Grade 3) and 211 (Grade 4) is required for satisfactory reading performance. Multiple regression was used to examine the relationship between the variables from each assessment. Receiver operating characteristics (ROC) analysis was also conducted to determine the needed cut score for all three easyCBM measures to classify students as at-risk for failing the OAKS assessment. The results from the study completed by Nese et al. (2011) indicated a strong correlation between the easyCBM and OAKS reading assessment. The fluency measure was a significant predictor of state test scores across grades in this study; however, the vocabulary and comprehension measures were better predictors, indicating that perhaps other reading measures may be better indicators of reading proficiency in the upper elementary grades. This finding supports the emphasis placed on reading comprehension and vocabulary skills used primarily after Grade 3, where reading fluency had been of a greater emphasis prior to Grade 3.

McMillen (2012) examined the relationship between a mid-year benchmark assessment administered to students in Grades 3 through 5 during the 2010-2011 school year and the North Carolina End-of-Grade (EOG) tests for both reading and mathematics for Wake County schools. The study sample included nearly 10,000 students from each

grade level. In McMillen's (2012) study, the benchmark assessment scores for reading and mathematics were presented in a score ranging from 0 to 100 based on percent correct. Student performance on the EOG was represented in scaled scores for reading and mathematics. Students were then assigned an achievement level (I-IV) based on the scale score achieved. Levels III and IV were considered proficient on the EOG for both subjects. Regression analysis was used to correlate the benchmark test to the EOG in both subjects for each grade level. In the area of reading, there was a correlation range of 0.71-0.82 for Grades 3 through 5. The correlations for mathematics in Grades 3-5 ranged from 0.71 to 0.86. McMillen (2012) reported that correlations indicated significant positive relationships between the benchmark and EOG in both subjects for all grades included in the study. "We can reasonably expect that a student who received a high score on one of the exams also received a high score on the other (and vice versa)" (McMillen, 2012, p. 4). Based on the results of this study, McMillen suggested the continued use of benchmark assessment to identify the bottom 25% of students to provide assistance and remediation prior to the spring EOG.

Kirkham and Lampley (2014) conducted a study in one Eastern Tennessee school district to investigate the relationship between the three AIMSWeb reading benchmark CBM's (fall, winter, and spring) and the Tennessee Comprehensive Assessment Program (TCAP) of third-grade students for the 2010-2011 school year. Data were collected from 770 third-grade students, of whom 47% were economically disadvantaged. Inquiry for this study stemmed from schools' concern in Tennessee to meet adequate yearly progress and a 100% proficiency rate on the TCAP by 2014, especially in specific subgroups. At the time, there were "progressively rigid penalties for failing to move a sufficient number

of students in each identified subgroup to proficiency in the areas of reading/language arts, mathematics, and graduation rate" (Kirkham & Lampley, 2014, p. 38). The results of this study indicated a significant relationship between the fall, winter, and spring AIMSWeb CBM measures and the TCAP for reading and mathematics.

NWEA is a non-profit research organization that produces academic assessments that measure academic growth and proficiency. NWEA produces the MAP interim assessment measure that is vertically scaled across grades with scores reported in Rasch Units (RIT). In 2016, researchers from NWEA completed a study to connect the KAP scales in ELA and mathematics with those of the MAP reading and mathematics assessments in Grades 3 through 8 and Grade 10 with corresponding classifications on the KAP ELA and mathematics tests. Student data were collected for the 2015 school year from 80 schools in Kansas. This study provided the estimated MAP cut scores that may be associated with the four performance levels on the KAP for the fall and winter MAP benchmark periods when the KAP was taken in the spring of that school year. For more refined interpretation, NWEA periodically studies the norms and publishes updated benchmarking scales. The norm scale used for this study was completed in 2015.

Researchers from NWEA used a consistency rate of classification to determine the predictive validity of the MAP tests. The consistency rate was figured by determining if each pair of scores is classified in the same performance category. Higher consistency rates were indicative of stronger congruence between KAP and MAP scores. Consistency rates for ELA/Reading ranged from 0.82 to 0.87 for Grades 3 through 8 and Grade 10. For example, the consistency rate for a Grade 3 student was 0.85, or 85% of the students in this study met the Level 3 or 4 classification on the KAP for ELA based

on their similar performance on the MAP reading assessment. According to NWEA, consistency rates for mathematics ranged from 0.86 to 0.93 for Grades 3 through 8 and Grade 10. "Those numbers are high, suggesting that both MAP reading and mathematics tests are great predictors of the students' proficiency status on the KAP tests" (NWEA, 2016, p. 8). Proficiency projection and the probability of passing KAP based on the MAP performance percentile are provided based on this finding for fall and winter. For example, at Grade 3, a student who scores at the 60th percentile (RIT score of 192) on the MAP reading assessment in the fall benchmark window is projected to score at least a 202 (Level 3) on the spring KAP. Additionally, using descriptive statistics, NWEA (2016) was able to determine that a strong positive relationship exists among the NWEA MAP reading and mathematics scores and KAP ELA and mathematics scores for Grades 3-8. "The correlation coefficients between MAP reading and KAP ELA scores range from .83 to.85, and the correlation coefficients between MAP mathematics and KAP mathematics scores range from 0.79 to 0.88" (NWEA, 2016, p. 24).

Another study was conducted by NWEA (2017a) on the alignment of their MAP interim assessments in ELA and mathematics for Grades 3 through 8 using spring 2015 MAP and Pennsylvania System of Assessment (PSSA) assessment data from 18 Pennsylvania schools. Classification accuracy of performance level was studied on the NWEA MAP to that of the PSSA using 6,232 samples in ELA and 6,275 samples in mathematics. Researchers at NWEA sought to determine the consistency rate of the classification of student scores on the MAP assessment to that of the corresponding classification of scores on the PSSA in reading and mathematics using correlation coefficients between MAP reading and PSSA ELA. NWEA (2017a) reported that "MAP

reading scores can consistently classify students' proficiency (Level 3 or higher) status on PSSA reading test 86-91% of the time and MAP mathematics scores can consistently classify students on the PSSA reading test 85-88% of the time" (p. 8).

FastBridge Learning commercially produces the benchmark system known as FAST. FastBridge Learning (2019) published a report about using FAST assessments to determine the probability of meeting or exceeding proficiency for all students taking the Partnership for Assessment of Readiness for College and Careers (PARCC) state assessments. PARCC states included in the study were Illinois, Minnesota, Michigan, New York, and Wisconsin. Researchers from FastBridge used logistic regression using data from various school districts for students in Grades 3-8 for the 2016-2017, 2017-2018, and 2018-2019 school years to determine the probability of meeting expectations or specific cut scores on the PARCC reading and mathematics assessments. Data were presented in four categories: scores below 25% of the cut score (high risk), scores between 25% and 50% (high to moderate risk), scores between 50% and 75% (moderate risk), and scores above 75% (low risk) (FastBridge Learning, 2019). A Pearson correlation was used to indicate the strength of the association between each state assessment scaled score and the FAST aReading or FAST aMath scores. FastBridge researchers calculated coefficients in the range of .70-.79 for reading, representing a strong association, and .80-.89 for mathematics, representing a very strong association (FastBridge Learning, 2019).

Renaissance Learning produces benchmark assessments for the areas of reading and mathematics. Renaissance Learning (2019) conducted a study to link their Star Reading and Star Math to that of the Missouri Assessment Program in reading and

mathematics using data from the 2017-2018 school year. A sample of student data was analyzed from 103 schools in Missouri. The purpose of the study was to identify the STAR scale scores that fall in each achievement classification on the Missouri Assessment Program. To do this, researchers from Renaissance Learning, Inc. applied an equipercentile linking analysis. Researchers achieved their intended results after evaluating the scale linkage. Renaissances Learning (2019) researchers noted, "On average, students were correctly classified (i.e., overall classification accuracy) using classification accuracy 87% of the time for reading and 88% of the time for math" (p. 6). The results of the study indicated that there was a "strong relationship between the test scales, averaging .85 and .79 between Missouri Assessment Program and STAR Reading and STAR Math, respectively" (Renaissance Learning, 2019, p. 4).

Zheng, Fancsali, Ritter, and Berman (2019) cited the value of decreasing the number of time-consuming state assessments required of Florida students. "When formative assessment is embedded within high-quality, effective instruction, the potential to increase instructional time and enhance learning outcomes is substantial" (Zheng et al., 2019, p. 170). A study was conducted by Zheng et al. (2019) using data from the Miami-Dade County Public School system to determine the possibility of utilizing instruction-embedded formative assessment from the Carnegie Learning MATHia instructional system to replace state assessments. Researchers wanted to determine if the MATHia embedded assessments would correlate or have predictive value with the Florida Comprehensive Assessment Test (FCAT). Their study was conducted over three academic years (2013-2014, 2014-2015, and 2015-2016), using data from 23,374 students in Grades 6 through 8. Zheng et al. determined that when students score "on

track" on the Adaptive Personalized Learning Score, they were over 95% likely to pass the FCAT.

Another similar study was published by NWEA (2020a) using scores from the 2017 spring benchmark and 2017 spring scores on the Ohio State Test (OST) using scores from students in 272 Ohio schools and over 11,000 individual students from Grades 3-8. The purpose of the study was to link the NWEA spring MAP Growth RIT scores in ELA and mathematics for Grades 3-8 to the OST using the equipercentile linking procedure. NWEA provided study findings for educators to make linking conclusions between the NWEA MAP Growth measures and OST. NWEA provided MAP Growth score predictions in which the OST score ranges for each achievement level and the corresponding MAP Growth RIT cut scores and percentile ranges may be determined. According to NWEA (2020a), a strong relationship exists among the NWEA MAP growth RIT scores for ELA and mathematics and the OST scores for the same subjects. Correlations range .78 to .89 among the content areas of the study. NWEA (2020a) indicated, "Validity evidence for the claim that MAP Growth scores are good predictors of performance on the OST assessments" (p. 6). Additionally, NWEA (2020a) identified that classification accuracy can be determined as early as Grade 2. NWEA determined this correlation by linking Grade 2 MAP Growth scores to the Grade 3 OST in ELA/reading and mathematics assessments. The classification rate for Grade 2 from MAP reading to OST in ELA assessment in Grade 3 is 0.79. The classification rate is 0.84 for the Grade 2 MAP mathematics assessment to the OST mathematics assessment in Grade 3. Both rates suggest strong classification accuracy.

Researchers at NWEA conducted a similar study in Florida. According to NWEA (2020b), research members from NWEA "are committed to providing partners with useful tools to help make inferences about student learning from the MAP Growth test scores" (p. 4). Schools may purchase digital assessment tools such as the MAP Growth assessment to gauge whether a student is on track in their learning to meet state standards by the end of the year. With this information, educators can identify students at risk of failing to meet state proficiency standards early in the year and provide tailored educational interventions (NWEA, 2020b, p. 4). NWEA MAP Growth Rasch Unit (RIT) scores from the 2018 spring term were linked to the 2018 Florida State Assessment (FSA) scores in the subject areas of ELA/reading and mathematics using an equipercentile linking procedure. In this study, the updated 2020 NWEA MAP Growth norms were used. NWEA provided study findings for educators to make linking conclusions between the NWEA MAP Growth measures and FSA. NWEA provided MAP Growth score predictions in which the FSA scale score ranges for each achievement level and the corresponding MAP Growth RIT cut scores and percentile ranges may be determined. According to NWEA (2020b), a strong relationship exists among the NWEA MAP growth RIT scores for ELA and mathematics and the FSA scores for the same subjects. Correlations range .82 to .89 among the content areas of the study. NWEA (2020b) indicated, "validity evidence for the claim that MAP Growth scores are good predictors of performance on Florida's statewide assessments" (p. 6).

Summary

Literature continues to show the emphasis that has been placed on assessment practices in our nation's history. Mandates for the utilization of assessment have been

shown to evolve. Current assessment practices incorporate the use of a comprehensive assessment model where educators and educational systems continually seek ways to improve their use of assessment and availability of assessment tools that provide guidance on instruction and progress towards end-of-year goals. Over time, research has shown an improvement in the relationship between benchmark assessments and state assessment tools. Presented in the following chapter are the methodology and procedures that were used to analyze scores on the FastBridge aReading and aMath assessments and the KAP assessments in ELA and mathematics to determine what relationship exists between the two types of assessments.

Chapter 3

Methods

The motivation for educators to intervene more efficiently for all students who may be at-risk of not achieving grade level outcomes serves as justification for this study. The focus of this study was to determine how strongly scores from the FastBridge assessment system in reading and mathematics, as measures of academic performance, showed a relationship with scores on the KAP in ELA and mathematics in Grades 3-8. This chapter includes the research design, selection of participants, measurement, data collection procedures, data analysis and hypothesis testing, and limitations of the study.

Research Design

A non-experimental quantitative correlational research approach was utilized to study student performance data for the 2018-2019 school year in District A. In this study, the researcher sought to determine whether a relationship existed between student scores on the reading and mathematics district benchmark assessment (FastBridge) and the ELA and mathematics state summative assessment (KAP), which warranted the correlational quantitative research design. Lunenburg and Irby (2008) identified correlational research design as "research grounded in the interactions of one variable to another" (p. 35). Correlational research relates scores from two or more variables from the same sample. The strength and direction of the relationship between the two variables is measured by the correlation coefficient. A positive relationship is represented by a correlation coefficient that ranges between 0 and +1, whereas a negative relationship is represented by a correlation coefficient that ranges between 0 and -1 (Lunenburg & Irby, 2008). The method of correlation was appropriate in this study,

because the data from one sample was used to correlate the scores for reading/ELA and mathematics between FastBridge and KAP. The independent variables in this study were the FastBridge winter aReading and aMath assessment composite scores and the FastBridge spring aReading and aMath assessment composite scores for the school year of 2018-2019 for Grades 3-8. The dependent variables were the 2018-2019 summative KAP scores in ELA and mathematics for Grades 3-8.

Selection of Participants

The population for this study was Grades 3-8 students enrolled in Kansas. Purposive sampling was utilized in this study. Lunenburg and Irby (2008) defined purposive sampling as "selecting a sample based on the researcher's experience or knowledge of the group to be sampled" (p. 175). The participants in this study were students enrolled in Grades 3-8 in District A during the 2018-2019 school year. Students in Grades 3-8 with winter and spring FastBridge aReading and aMath composite scores and summative KAP ELA and mathematics scores were included in the sample.

Measurement

Four instruments were used to collect student performance data for this study. Student scores on the winter and spring FastBridge aReading assessment and FastBridge aMath assessment and KAP ELA and mathematics assessments were utilized. Students completed all FastBridge benchmark assessments and summative KAP assessments on a computer.

FastBridge aReading. According to Christ et al. (2018), the FastBridge aReading assessment is a universal screener created for students in kindergarten through twelfth grade. The aReading assessment is presented to students in a question-and-response

format in multiple-choice that is computer adaptive and measures broad reading for an individual student. Broad reading concepts include the concepts of print, phonological awareness, phonics, orthography and morphology, vocabulary, and comprehension. Christ et al. (2018) have provided a crosswalk between Common Core State Standards in ELA and FastBridge aReading to ensure alignment. The item development followed the process and standards for assessment item writing presented in the fourth edition of *Educational Measurement* by Schmeiser and Welch (Christ et al., 2018). The items were written and reviewed by a team of research assistants, teachers, and content experts. The development of the assessment required three levels of analysis to determine the number of items that needed to be administered on this adaptive assessment. The first level was developed for a hybrid simulation using computer adaptive testing (CAT) software, the CATSim program. Participants were split into two groups. There were 3,520 participants in Group 1 and 3,519 participants in Group 2. Next, simulations to determine mean ability estimates and standard error of measurement (SEM) estimates for the conditions for 20, 25, 30, and 40 item tests were performed on both groups of participants. Christ et al. (2018) determined that aReading CAT's were similarly precise at different test lengths until there were more than 30 test items. Finally, SEM was calculated for participants when their tests were terminated sooner than 30 items at Grades 1-5. The calculations confirmed that a 30-item test for aReading was most accurate since SEM estimates inflated as the test items completed decreased.

FastBridge aReading scores are calculated automatically based on an Item Response Theory (IRT) logit scale. IRT is an approach to testing based on item analysis and involves the consideration of the chance of getting particular items right or wrong

(Magno, 2009, p. 2). The IRT logit scale is mathematically transformed to student scores or a scaled score from completed aReading tests that can range between a minimum score possible of 350 and a maximum score of 650, with a mean value of 500 and a standard deviation of 50 across all grade levels, kindergarten through Grade 12. Normative data is provided through benchmark scores, presented at three points (fall, winter, spring). "FastBridge reports include normative data compared to the group (e.g., class), school, district, and national distributions which characterize typical performance for each grade level, by season." (Christ et al., 2018, p. 51). As a universal screener, the cut scores are intended to predict whether a student is identified as being "At-Risk" by scoring below the 20th percentile of the normed scores within each grade level and "Somewhat At-Risk" for reading difficulties scoring below the 40th percentile of the normed scores within each grade level. At or above the 40th percentile indicate that the student is predicted to have a "low risk" for reading difficulties. With each benchmark window (fall, winter, spring), an increasing set of cut scores are expected to be achieved. The aReading scores for the three risk levels for each grade and benchmark window (fall, winter, spring) are presented in Table 1.

Table 1

FastBridge aReading 2018-2019 Benchmark Assessment Norms

Grade	Risk level percentile	Fall	Winter	Spring
Grade 3				
	At or above 40th	≥501	≥509	≥516
	Below the 40th	<487	<497	<503
	Below the 10th	<475	<482	<489
Grade 4				
	At or above 40th	≥513	≥520	>526
	Below the 40th	<500	<507	<513
	Below the 10th	<486	<494	<499
Grade 5				
	At or above 40th	≥523	≥529	≥534
	Below the 40th	<509	<517	<522
	Below the 10th	<497	<503	<507
Grade 6				
	At or above 40th	≥530	≥535	≥539
	Below the 40th	<516	<523	<527
	Below the 10th	<502	<508	<512
Grade 7				
	At or above 40th	≥535	≥537	≥543
	Below the 40th	<520	<525	<531
	Below the 10th	<504	<509	<514
Grade 8				
	At or above 40th	≥540	≥541	≥546
	Below the 40th	<526	<530	<536
	Below the 10th	<508	<515	<518

Note: Adapted from *Benchmark: aReading,* by FastBridge Learning, LLC, (2019). Retrieved from file:///C:/Users/misty.straub/Downloads/2018-19%20FastBridge%20aReading%20Benchmarks.pdf

Validity is the degree to which an instrument measures what it is intended to measure (Lunenburg & Irby, 2008). Criterion-related validity evidence was determined using the Gates MacGinitie Reading Tests-4th Edition (GMRT-4th) with a sample of 1,382 participants from two schools for Grades 1 through 5 (Christ et al., 2018). The Gates MacGinitie Reading Tests-4th Edition uses two subtests to yield a composite score for Grade 1, three subtests for Grade 2, and two subtests for Grades 3-5. However, Christ et al. (2018) indicated that "due to time constraints, one GMRT-4th subtest could not be administered to second-grade students (the only grade that requires three subtests to yield a composite score)," therefore, a composite score could not be calculated (p. 55). Christ et al. (2018) reported evidence for a strong positive correlation between composite scores from the GMRT-4th and FastBridge aReading scaled scores with some variability among the grade levels. No information was reported for Grades 6-12. See Table 2 for validity coefficients.

Table 2

Correlations Between FAST aReading Scaled Scores and GMRT-4th Subscale and Composite Scores

	Decoding	Vocabulary	Comprehension	Composite
Grade	Correlation (*N*)	Correlation (*N*)	Correlation (*N*)	Correlation (*N*)
1	.82 (131)	-[a]	.73 (130)	.83 (125)
2	.68 (163)	-[b]	.75 (215)	-[b]
3	-[a]	.79 (170)	.81 (168)	.84 (165)
4	-[a]	.76 (182)	.72 (180)	.78 (175)
5	-[a]	.65 (182)	.58 (187)	.64 (181)
1-5	.75 (348)	.74 (534)	.82 (881)	.86 (646)

Note: Sample size is denoted by (*N*). Christ et al. indicated that time constraints did not allow for the completion of all subtests, which could not yield a composite score. Adapted from *Formative Assessment System for Teachers Technical Manual*, by T. J. Christ et al., 2018, p. 53. Copyright by T. J. Christ et al.

[a]Area not tested. [b]No data were available.

Reliability is the consistency of a measure. "Test data are reliable to the degree that repeated measures of the same trait remain stable as long as the relevant conditions are also stable" (Tanner, 2012, p. 391). A test-retest was performed over a three-month period to determine reliability coefficients for 2,038 students in Grades 1-5. The reliability coefficient for "Grade 1 was .71, Grade 2 was .87, Grade 3 was .81, Grade 4 was .86, and Grade 5 was .75" (Christ et al., 2018, p. 54).

FastBridge aMath. Christ et al. (2018) described the aMath test development in their technical manual. The FastBridge aMath is a computer adaptive assessment that measures mathematics achievement for students in kindergarten through eighth grade.

The adaptive nature of the test allows the assessment tool to function for students at, above, or below grade level. The broad mathematics component was matched directly to the CCSS mathematics domains and National Council for Teachers of Mathematics (NCTM) focal points and includes the following categories: counting and cardinality, operations and algebraic thinking, number and operations in base-ten, number and operations-fractions, measurement and data, and geometry. According to Christ et al. (2018), "aMath is designed to identify those students with deficits in mathematics achievement in need of additional instruction and predict performance on state accountability measures" (p. 87).

Christ et al. (2018) indicated that item development for multiple-choice questions followed standards recommended by Schmeiser and Welch (2006) in the fourth edition of *Educational Measurement*. Items were written and reviewed by a team of research assistants, teachers, and content experts. The development required three levels of analysis to determine the number of items that needed to be administered on this adaptive assessment to achieve an acceptable level of accuracy. The first level completed was a hybrid simulation performed to ensure responses from each participant. The second level required researchers to conduct simulations using the CATSim program for 20, 25, 30, 35, and 40 item tests. Finally, from these simulations, researchers calculated mean ability and standard error estimates. According to Christ et al. (2018), "Most precise estimates (across ability levels) are available for students in grades four and five" on 30 item tests. FastBridge aMath also generates an IRT logit score. This score is translated into an aMath scaled score. Scaled scores range between 150 and 250, with a mean of 200 and a standard deviation of 15. The FastBridge scaled scores for winter and spring are the

measurement used to calculate the relationship to the KAP assessments. Since FastBridge aMath is used as a universal screener, it was developed to be administered as a benchmark assessment two times a year (fall and spring) or three times a year (fall, winter, spring), and results are presented in normative scores by percentile range. As a screener, the cut scores are intended to predict whether a student is "At-Risk" scoring below the 10^{th} percentile of the normed scores for each grade level and "Somewhat At-Risk" or mathematics difficulties scoring below the 40^{th} percentile of the normed scores for each grade level. See Table 3 for the correlations of percentile range to benchmark score on the aMath assessment.

Table 3

FastBridge aMath 2018-2019 Benchmark Assessment Norms

Grade	Grade and risk level	Fall	Winter	Spring
Grade 3				
	At or above 40th	≥207	≥211	≥215
	Below the 40th	<203	<207	<2012
	Below the 10th	<198	<201	<205
Grade 4				
	At or above 40th	≥213	≥216	≥223
	Below the 40th	<209	<212	<217
	Below the 10th	<202	<206	<211
Grade 5				
	At or above 40th	≥220	≥225	≥230
	Below the 40th	<214	<220	<223
	Below the 10th	<207	<211	<214
Grade 6				
	At or above 40th	≥226	≥230	≥232
	Below the 40th	<220	<223	<223
	Below the 10th	<210	<214	<215
Grade 7				
	At or above 40th	≥227	≥230	≥232
	Below the 40th	<220	<222	<223
	Below the 10th	<209	<211	<213
Grade 8				
	At or above 40th	≥229	≥231	≥233
	Below the 40th	<223	<224	<225
	Below the 10th	<211	<213	<214

Note: Adapted from *Benchmark: aReading*, by FastBridge Learning, LLC, (2019). Retrieved from file:///C:/Users/misty.straub/Downloads/2018-19%20FastBridge%20aMath%20Benchmarks%20(1).pdf

Validity evidence for FastBridge aMath was determined by using the Measures of Academic Progress (MAP) and the Group Mathematics Assessment and Diagnostic Evaluation (GMADE) (Williams, 2004) and a sample of 432 participants enrolled in kindergarten through fifth grade in one elementary school in the Midwestern United States. Christ et al. (2018) summarized their validity evidence,

> Overall, the strongest correlations were observed between FastBridge aMath and MAP scores. This is likely due to the similar nature and purpose of the two assessments. Correlations between FastBridge aMath and the GMADE were slightly lower but generally provide adequate criterion-related validity evidence. In both cases, correlations varied across grades, with the strongest correlations in fifth grade. (pp. 94-95)

See Table 4 for the correlation coefficients.

Table 4

Correlation Coefficients Between FastBridge aMath and MAP and FastBridge aMath and GMADE

	MAP	GMADE
Grade	Correlation (*N*)	Correlation (*N*)
K	.76 (89)	.62 (81)
1	.71 (77)	.66 (72)
2	.81 (91)	.67 (67)
3	.76 (89)	.76 (86)
4	.84 (74)	.67 (60)
5	.88 (76)	.84 (65)

Note: Sample size is denoted by (*N*). Adapted from *Formative Assessment System for Teachers Technical Manual*, by T.J. Christ et al., 2018, p. 94. Copyright by Theodore J. Christ et al.

KAP assessments. In Kansas, KAP assessments are summative assessments for the content areas of ELA and mathematics and are required to be taken in Grades 3-8 and Grade 10 for state accountability under ESSA (KSDE, 2017b). According to the University of Kansas AAI (2019), the KAP ELA and Mathematics assessments are evaluated statistically for reliability and performance every year and published for educators in the updated technical manuals. However, the test development for the most current state assessments was completed in 2017 and is described in the 2017 edition of the *Kansas Assessment Program Technical* Manual. The most current statistics are provided to educators in the 2019 edition of the *Kansas Assessment Program Technical Manual* (University of Kansas AAI, 2019).

According to the University of Kansas AAI (2017), assessment items are created and reviewed by staff at the Center of Educational Testing and Evaluation (CETE), University of Kansas graduate research assistants, content experts, and Kansas teachers in the field. Item writers are trained to write items that address the Kansas College and Career Ready Standards (KCCRS) and address the validity and reliability. Test items are evaluated for complexity and difficulty, evidence-centered design, accessibility, bias and sensitivity, type and stem structure, and answer choice development (University of Kansas AAI, 2019). Additionally, reading passages are commissioned from regional and national authors or are selected from public domains. CETE analyzes passages for text complexity, bias and sensitivity, and accessibility. "CETE uses the Flesch-Kincaid score as a quantitative measure for longer passages…and looks at each set for vocabulary, knowledge demands, topic familiarity, and interest level" (University of Kansas AAI, 2019, p. 21). According to Readable (2020), the Flesch-Kincaid is a standardized system widely used to determine the readability of the approximate reading grade level of text. Using this system will provide a score between 1 and 100 that correlates to particular grade levels of readability.

New items are field tested in an embedded-model within the existing KAP assessment, which does not allow the examinee to know the difference between actual scored items and field test items. Field test items do not count towards the test score. Field test items completed on the KAP assessments are analyzed using item analysis. This includes IRT (interactive response technology) calibration and differential item functioning (DIF) analysis. Items are flagged for showing a statistical difference between two groups of students. (University of Kansas AAI, 2019).

Reliability analysis was conducted on the KAP ELA and KAP mathematics for Grades 3-8 using marginal reliability instead of coefficient alpha. Marginal reliability can be used to provide evidence for the reliability of an adaptive assessment. As noted in the table below, all reliability values are above .80, which is strong evidence for the reliability of the tests. The values fall between .90 and .93 for ELA and between .92 and .94 for Mathematics. See Table 5 for reliability statistics.

Table 5

Test Reliability by Subject and Grade 2019

	ELA		Mathematics	
Grade	*N*	Reliability	*N*	Reliability
3	37,098	.93	37,184	.92
4	37,698	.90	37,771	.94
5	38,372	.91	38,413	.93
6	38,281	.91	38,329	.93
7	37,424	.91	37,456	.92
8	36,779	.90	36,785	.92

Note: Adapted from *Kansas Assessment Program Technical Manual Addendum 2019*, by University of Kansas AAI, July 2019, pp. 2, 21, Lawrence, Kansas.

KAP assessments in ELA. According to Kansas University AAI (2019), the KAP ELA assessment for Grades 3-8 consists of 55 total multiple-choice questions consistent with the ELA claims and targets presented by Common Core identified in the assessment framework. Claims are researched- and evidence-based statements that describe the skills the student should be able to perform. There are two claims (reading-literary and

informational texts and writing). The claim of reading includes 14 targets, while writing includes five. The ELA assessment is divided into two stages. Stage 1 is of medium difficulty and consists of 30 multiple-choice questions. The assessment is adaptive, which moves the examinee into easy or hard difficulty for stage 2, consisting of 25 multiple-choice questions (University of Kansas AAI, 2019). See Table 6 for KAP ELA cut scores.

Table 6

Cut scores for KAP Summative Assessments in ELA

Grade	Level 1	Level 2	Level 3	Level 4
3	220-275	276-299	300-326	327-380
4	220-270	271-299	300-334	335-380
5	220-274	275-299	300-325	326-380
6	220-276	277-299	300-335	336-380
7	220-274	275-299	300-334	335-380
8	220-264	265-299	300-333	334-380
10	220-268	269-299	300-333	334-380

Note: Adapted from *Kansas Assessment Program Scale Scores, Performance Level Descriptors, Cut Scores 2019,* by KSDE, (n.d.-b). Retrieved from https://ksassessments.org/sites/default/files/documents/scorereports/Scale_Scorces_Performance_Level_Descriptors_Cut_Scores.pdf.

KAP assessments in mathematics. The KAP assessment in mathematics is multiple-choice and consists of 50 questions taken from the mathematics claims and targets identified in the assessment framework. The four claims include concepts and procedures, problem solving, communicating reasoning, and modeling and data analysis.

Nine targets are categorized under concepts and procedures. Stage 1 includes 30 multiple-choice questions of medium difficulty. The test is adaptive and progresses students to Stage 2 for 30 multiple-choice questions denoted as easy or hard difficulty levels. See Table 7 for KAP mathematics cut scores.

Table 7

Cut scores for KAP Summative Assessments in Mathematics

Grade	Level 1	Level 2	Level 3	Level 4
3	220-275	276-299	300-328	329-380
4	220-265	266-299	300-330	331-380
5	220-272	273-299	300-325	326-380
6	220-272	273-299	300-328	329-380
7	220-265	266-299	300-341	342-380
8	220-273	274-299	300-335	336-380
10	220-274	275-299	300-332	333-380

Note: Adapted from *Kansas Assessment Program Scale Scores, Performance Level Descriptors, Cut Scores 2019*, by KSDE, (n.d.-b). Retrieved from https://ksassessments.org/sites/default/files/documents/scorereports/Scale_Scores_Performance_Level_Descriptors_Cut_Scores.pdf.

Data Collection Procedures

A proposal to conduct research was submitted to the executive director of assessments and research in District A on June 22, 2020. Permission for collection of data was provided on July 1, 2020 by the Research Council of District A through written consent for this study to be conducted using archival data from the 2018-2019 school year with the condition that the study was approved by Baker University's Institutional

Review Board (IRB). A consent form was signed by the executive director of assessment and research in District A. (see Appendix A). On September 2, 2020, the researcher submitted a request to conduct the study to Baker University's IRB committee. This was approved on September 17, 2020 (see Appendix B). The researcher received an Excel worksheet from the executive director of assessments and research in District A that included data that was coded to ensure student anonymity. The executive director provided anonymity by giving each student a new identification number (ID) prior to releasing the data to the researcher. Data in the Excel worksheet included the new student ID and composite scores for each of the six assessments. This data was then imported into IBM SPSS Statistics Faculty Pack 25 for PC for statistical analysis.

Data Analysis and Hypothesis Testing

Data from FastBridge and KAP were analyzed to address each research question in this study for both content areas of ELA and mathematics individually for each grade. A Pearson correlation coefficient was calculated to determine the strength and direction of the FastBridge assessment composite scores and the summative KAP assessment scores at each grade level and subject. Each research question is presented with six hypotheses, followed by the data analysis paragraph.

RQ1. To what extent is there a relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at each grade level (Grades 3-8)?

H1. There is a statistically significant relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 3.

H2. There is a statistically significant relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 4.

H3. There is a statistically significant relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 5.

H4. There is a statistically significant relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 6.

H5. There is a statistically significant relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 7.

H6. There is a statistically significant relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 8.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables, winter FastBridge aReading scores and summative KAP ELA assessment scores at each grade level (Grades 3-8). The statistical significance of the correlation coefficient for each was examined to test the hypothesis. The level of significance was set at .05. The effect size, as indexed by r^2, is reported when appropriate.

RQ2. To what extent is there a relationship between the spring FastBridge aReading assessment composite scores and the summative KAP ELA scores at each grade level (Grades 3-8)?

H7. There is a statistically significant relationship between the spring FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 3.

H8. There is a statistically significant relationship between the spring FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 4.

H9. There is a statistically significant relationship between the spring FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 5.

H10. There is a statistically significant relationship between the spring Fast-Bridge aReading assessment composite scores and the summative KAP ELA scores at Grade 6.

H11. There is a statistically significant relationship between the spring Fast-Bridge aReading assessment composite scores and the summative KAP ELA scores at Grade 7.

H12. There is a statistically significant relationship between the spring Fast-Bridge aReading assessment composite scores and the summative KAP ELA scores at Grade 8.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables, spring FastBridge aReading composite scores and summative KAP ELA assessment scores at each grade level (Grades 3-8). The statistical significance of the correlation coefficient for each was examined to test the hypothesis. The level of significance was set at .05. The effect size, as indexed by r^2, is reported when appropriate.

RQ3. To what extent is there a relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at each grade level (Grades 3-8)?

H13. There is a statistically significant relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 3.

H14. There is a statistically significant relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 4.

H15. There is a statistically significant relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 5.

H16. There is a statistically significant relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 6.

H17. There is a statistically significant relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 7.

H18. There is a statistically significant relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 8.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables, winter FastBridge aMath composite scores and summative KAP mathematics assessment scores at each grade level (Grades 3-8). The statistical significance of the correlation coefficient for each was examined to test the hypothesis. The level of significance was set at .05. The effect size, as indexed by r^2, is reported when appropriate.

RQ4. To what extent is there a relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at each grade level (Grades 3-8)?

H19. There is a statistically significant relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 3.

H20. There is a statistically significant relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 4.

H21. There is a statistically significant relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 5.

H22. There is a statistically significant relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 6.

H23. There is a statistically significant relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 7.

H24. There is a statistically significant relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 8.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables, spring

FastBridge aMath composite scores and summative KAP mathematics assessment scores at each grade level (Grades 3-8). The statistical significance of the correlation coefficient for each was examined to test the hypothesis. The level of significance was set at .05. The effect size, as indexed by r^2, is reported when appropriate.

Limitations

Limitations to any study may potentially impact the results. Lunenburg and Irby (2008) stated, "Limitations are factors that may have an effect on the interpretation of the findings or on the generalizability of the results" (p. 133). The researcher does not have control over the limitations, however stating them explicitly may prevent misconceptions of the results of the study (Lunenburg & Irby, 2008). Factors that could affect test administration and test taking include:

1. The 2018-2019 data used in this study represented the second year of implementing the FastBridge assessment system in the district. The experience level of the teachers proctoring the assessments and students taking the FastBridge assessments may have impacted the students' scores, having less familiarity with the format of this new assessment system.
2. Due to unforeseeable circumstances of the pandemic COVID-19, state assessments were halted for the 2019-2020 school year in Kansas. Therefore, data could not be collected, so the researcher decided to collect archived data from the previous school year. The data used in this study was collected from only one school year (2018-2019). Having the ability to collect from multiple years might have allowed the researcher to conduct a longitudinal study,

which may provide more valid and reliable data correlating the FastBridge aReading and aMath to the KAP assessments in ELA and mathematics.

Summary

This non-experimental quantitative correlational study was conducted to determine how strongly composite scores from the FastBridge assessment system in ELA and mathematics, as measures of academic performance, showed a relationship with summative assessment scores from the KAP in ELA and mathematics in Grades 3-8. Data collection processes and testing of the hypotheses was described. In Chapter 4, the results of the study are presented.

Chapter 4

Results

The first purpose of this non-experimental quantitative study was to investigate the relationship between the winter FastBridge aReading benchmark assessment composite scores and the summative KAP ELA scores for Grades 3-8. The second purpose was to investigate the relationship between the spring FastBridge aReading benchmark assessment composite scores and the summative KAP ELA scores for Grades 3-8. The third purpose was to investigate the relationship between winter FastBridge aMath benchmark assessment composite scores and summative KAP mathematics scores for Grades 3-8. The final purpose was to investigate the relationship between the spring FastBridge aMath benchmark assessment composite scores and summative KAP mathematics scores for Grades 3-8. This chapter includes the results of the data analysis.

Hypothesis Testing

This section contains the results from the data analysis to determine the strength and direction of the winter FastBridge aReading benchmark assessment composite scores and the summative KAP ELA assessment scores at each grade level. Results from a Pearson correlation coefficient calculated to determine the strength and direction of the spring FastBridge aReading benchmark assessment composite scores and the summative KAP ELA assessment scores at each grade level are presented. Additionally, results from a Pearson correlation coefficient calculated to determine the strength and direction of the winter FastBridge aMath benchmark assessment composite scores and the summative KAP mathematics assessment scores at each grade level are presented. Finally, results from a Pearson correlation coefficient calculated to determine the strength

and direction of the spring FastBridge aMath benchmark assessment composite scores and the summative KAP mathematics assessment scores at each grade level are presented. Each research question is followed by the associated hypotheses, the data analysis paragraph, and the results of the data analysis.

RQ1. To what extent is there a relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at each grade level (Grades 3-8)?

H1. There is a statistically significant relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 3.

H2. There is a statistically significant relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 4.

H3. There is a statistically significant relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 5.

H4. There is a statistically significant relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 6.

H5. There is a statistically significant relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 7.

H6. There is a statistically significant relationship between the winter FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 8.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables, winter FastBridge aReading composite scores and summative KAP ELA assessment scores at each grade level (Grades 3-8). The statistical significance of the correlation coefficient

for each was examined to test the hypothesis. The level of significance was set at .05. The effect size, as indexed by r^2, is reported when appropriate.

The correlation coefficient provided evidence for a strong positive relationship between the two numerical variables, winter FastBridge aReading and KAP ELA summative assessments, at each grade level (Grades 3-8). The hypothesis test for each correlation indicated a statistically significant relationship between winter FastBridge aReading composite scores and summative KAP ELA assessment scores. The correlations, hypothesis test statistics, and the effect sizes are included in Table 8 below for the six hypothesis tests. H1-H6 were supported. The effect size indicated a medium effect for each test.

Table 8

Correlations, Hypothesis Test Statistics, and Effect Sizes for H1-H6

Hypothesis	Grade	*R*	*n*	*p*	r^2
1	3	.748	3,460	.000	.560
2	4	.770	3,541	.000	.593
3	5	.770	3,554	.000	.593
4	6	.771	3,259	.000	.594
5	7	.698	2,401	.000	.487
6	8	.747	2,148	.000	.558

RQ2. To what extent is there a relationship between the spring FastBridge aReading assessment composite scores and the summative KAP ELA scores at each grade level (Grades 3-8)?

H7. There is a statistically significant relationship between the spring FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 3.

H8. There is a statistically significant relationship between the spring FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 4.

H9. There is a statistically significant relationship between the spring FastBridge aReading assessment composite scores and the summative KAP ELA scores at Grade 5.

H10. There is a statistically significant relationship between the spring Fast-Bridge aReading assessment composite scores and the summative KAP ELA scores at Grade 6.

H11. There is a statistically significant relationship between the spring Fast-Bridge aReading assessment composite scores and the summative KAP ELA scores at Grade 7.

H12. There is a statistically significant relationship between the spring Fast-Bridge aReading assessment composite scores and the summative KAP ELA scores at Grade 8.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables, spring FastBridge aReading composite scores and KAP ELA summative assessment scores at each grade level (Grades 3-8). The statistical significance of the correlation coefficient for each was examined to test the hypothesis. The level of significance was set at .05. The effect size, as indexed by r^2, is reported when appropriate.

The correlation coefficient provided evidence for a strong positive relationship between the two numerical variables, spring FastBridge aReading composite scores and

summative KAP ELA assessment scores, at each grade level (Grades 3-8). The hypothesis test for the correlation indicated a statistically significant relationship between spring FastBridge aReading composite scores and summative KAP ELA assessment scores. The correlations, hypothesis tests statistics, and the effect sizes are included in Table 9 below for the six hypothesis tests. H7-H12 were supported. The effect size indicated a medium effect for each.

Table 9

Correlations, Hypothesis Test Statistics, and Effect Sizes for H7-H12

Hypothesis	Grade	*R*	*n*	*p*	r^2
7	3	.756	3,507	.000	.572
8	4	.762	3,585	.000	.581
9	5	.772	3,594	.000	.596
10	6	.747	3,282	.000	.558
11	7	.720	2,424	.000	.518
12	8	.697	2,176	.000	.486

RQ3. To what extent is there a relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at each grade level (Grades 3-8)?

H13. There is a statistically significant relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 3.

H14. There is a statistically significant relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 4.

H15. There is a statistically significant relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 5.

H16. There is a statistically significant relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 6.

H17. There is a statistically significant relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 7.

H18. There is a statistically significant relationship between the winter FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 8.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables, winter FastBridge aMath composite scores and summative KAP mathematics assessment scores at each grade level (Grades 3-8). The statistical significance of the correlation coefficient for each was examined to test the hypothesis. The level of significance was set at .05. The effect size, as indexed by r^2, is reported when appropriate.

The correlation coefficient provided evidence for a strong positive relationship between the two numerical variables, winter FastBridge aMath composite scores and

summative KAP mathematics assessment scores at each grade level (Grades 3-8). The hypothesis test for the correlation indicated a statistically significant relationship between winter FastBridge aMath composite scores and summative KAP mathematics assessment scores. The correlations, hypothesis tests statistics, and the effect sizes are included in Table10 below for the six hypothesis tests. H13-H18 were supported. The effect size indicated a medium effect for each.

Table 10

Correlations, Hypothesis Test Statistics, and Effect Sizes for H13-H18

Hypothesis	Grade	*R*	*n*	*p*	r^2
13	3	.730	3,447	.000	.533
14	4	.746	3,535	.000	.557
15	5	.783	3,531	.000	.613
16	6	.762	3,265	.000	.581
17	7	.751	2,401	.000	.564
18	8	.696	2,143	.000	.484

RQ4. To what extent is there a relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at each grade level (Grade 3-8)?

H19. There is a statistically significant relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 3.

H20. There is a statistically significant relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 4.

H21. There is a statistically significant relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 5.

H22. There is a statistically significant relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 6.

H23. There is a statistically significant relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 7.

H24. There is a statistically significant relationship between the spring FastBridge aMath assessment composite scores and the summative KAP mathematics scores at Grade 8.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables, spring FastBridge aMath composite scores and KAP mathematics summative assessment scores, at each grade level (Grades 3-8). The statistical significance of the correlation coefficient for each was examined to test the hypothesis. The level of significance was set at .05. The effect size, as indexed by r^2, is reported when appropriate.

The correlation coefficient provided evidence for a strong positive relationship between the two numerical variables, Spring FastBridge aMath composite scores and

summative KAP mathematics assessment scores, at each grade level (Grades 3-8). The hypothesis test for the correlation indicated a statistically significant relationship between spring FastBridge aMath composite scores and summative KAP mathematics assessment scores. The correlations, hypothesis tests statistics, and the effect sizes are included in Table 11 below for the six hypothesis tests. H19-H24 were supported. The effect size indicated a medium effect for each.

Table 11

Correlations, Hypothesis Test Statistics, and Effect Sizes for H19-H24

Hypothesis	Grade	*R*	*n*	*p*	r^2
19	3	.786	3,508	.000	.618
20	4	.797	3,586	.000	.635
21	5	.809	3,582	.000	.654
22	6	.779	3,299	.000	.607
23	7	.746	2,437	.000	.557
24	8	.711	2.190	.000	.506

Summary

In Chapter 4, the results of the data analysis used to determine if the FastBridge aReading and aMath at winter and spring and the KAP for ELA and mathematics provided evidence for a strong positive relationship between the variables. Results from the hypothesis tests indicated that there was a statistically significant relationship between winter and spring FastBridge aReading and aMath scores and KAP ELA and mathematics summative assessment scores at all grade levels. Chapter 5 includes the study summary, the findings related to the literature, and the conclusions.

Chapter 5

Interpretation and Recommendations

In 2021, the use of benchmark assessment systems has become increasingly more prevalent in schools. They are often found as part of a comprehensive assessment system aimed at decreasing the likelihood of failure of grade-level outcomes for school accountability. Selecting the right assessment system that can guide instructional decisions and correlate well with accountability testing is critical. Chapter 5 contains a study summary, findings related to the literature, and conclusions.

Study Summary

This section includes a summary of the current study, which examined the relationship between FastBridge benchmark assessment composite scores for reading and mathematics and summative KAP assessment scores in ELA and mathematics. The summary provides an overview of the problem as well as the purpose statement. Next, a review of the methodology used in the current study is provided. Finally, the major findings are presented.

Overview of the problem. According to the USDE (2016), ESSA requires that students be taught using high academic standards to prepare them for success in college and their careers. This act also requires states to document accountability through annual state assessments that measure student proficiency on these high academic standards. School districts commonly utilize benchmark assessment to determine at different points throughout the school year how well students are achieving to meet end-of-year outcomes. District A had been using AIMSWeb 1.0 until the 2011-2012 school year. Pearson, the commercial provider, discontinued the assessment tool. The discontinuation

of this tool left District A searching for a new benchmark system that would best provide teachers with data to monitor student progress toward end-of-year outcomes. Although District A chose the FastBridge assessment system, they were unsure whether the FastBridge assessment system was correlated to the KAP. At the time of the current study, no literature could be found correlating the assessments from the FastBridge system to other state assessments.

Purpose statement and research questions. The first purpose of this non-experimental quantitative study was to investigate the relationship between the winter FastBridge aReading benchmark assessment composite scores and the summative KAP ELA scores for Grades 3-8. The second purpose was to investigate the relationship between spring FastBridge aReading benchmark assessment composite scores and the summative KAP ELA scores for Grades 3-8. The third purpose was to investigate the relationship between the winter FastBridge aMath benchmark assessment composite scores and summative KAP mathematics scores for Grades 3 through 8. Finally, the fourth purpose was to investigate the relationship between the spring FastBridge aMath benchmark assessment composite scores and summative KAP mathematics scores for Grades 3-8. To address the purposes of this study, four research questions were posed, and 24 hypotheses were tested.

Review of the methodology. A non-experimental quantitative correlational research design was used to study student performance data for the 2018-2019 school year in District A. The participants in this study were students enrolled in Grades 3-8 in District A during the 2018-2019 school year. The independent variables in this study were the winter FastBridge aReading and aMath composite scores and the spring

FastBridge aReading and aMath composite scores for the school year of 2018-2019 for Grades 3-8. The dependent variables were the 2018-2019 summative KAP scores in ELA and mathematics for Grades 3-8. Pearson correlation coefficients were calculated to determine the strength and direction of the relationships between FastBridge assessment composite scores and the summative KAP assessment scores at each grade level and subject.

Major findings. Addressing the four research questions in the current study revealed the following noteworthy findings. The results of the data analyses related to all four research questions in the current study revealed a strong, positive, statistically significant relationship between each benchmark period (winter and spring) and the summative KAP for each grade level and subject. Although correlation values are statistically similar when comparing the winter and spring correlations for ELA, there was not a discernable difference between each grade level. Indicating that neither benchmark period was generally a stronger correlation than the other in ELA. However, the spring mathematics FastBridge benchmark scores show a stronger correlation to the summative KAP scores than the winter mathematics FastBridge benchmark scores except at Grade 7.

Findings Related to the Literature

The following section contains the findings of the current study related to the findings of previous studies on the correlation of benchmark scores and state assessment scores. There was no literature found in which research had been conducted to determine the correlation between the FastBridge benchmark assessment system and the KAP. However, countless examples of similar research were conducted on other benchmark

assessment systems and assessments for accountability from various states, including Kansas.

The literature reviewed in the current study related to the correlation between benchmark assessment and state assessment scores could be divided into two types: studies that review state or locally-developed benchmark assessments and studies that review commercially produced benchmark assessments. The studies in the literature review have addressed these relationships and how they vary for specific grade levels. The most common study focus in previous literature was for Grades 3-8, as opposed to single grade levels. ESEA requires accountability testing in Grades 3-8 (USDE, 2019). Studies regarding reading and ELA were more readily found than were studies related to mathematics.

Findings from the current study indicated strong, positive, statistically significant relationships existed between FastBridge aReading scores, the commercially developed benchmark assessment for broad reading, and state assessment ELA scores. The results of the current study support results found in the literature in which commercially developed benchmark assessment scores in broad reading are significantly related to performance on state assessments in ELA in several states. Brown and Coughlin (2007) determined that CTB/McGraw-Hill's TerraNova showed a strong predictive validity to the Mid-Atlantic state assessment in reading compared to the other three benchmark tools in their study. Kirkham and Lampley (2014) concluded that the winter and spring AIMSWeb reading CBM had a strong predictive relationship with the TCAP reading/language arts scale scores at Grade 3. Wiley and Deno (2005) concluded that

GOM measures in oral reading and maze for Grades 3 and 5 had predictive value for the MCA in reading/language arts.

NWEA conducted several studies on the relationship between MAP scores and various state assessment scores. NWEA (2016) studied the MAP benchmark in reading for students in Grades 3-8 and Grade 10 for the fall and winter benchmark in correlation to the KAP. Their conclusions indicated a strong correlation between the two assessments, identifying that students are predicted to score in the same performance category on the KAP ELA as predicted by fall and winter benchmark MAP reading scores. NWEA (2016) identified that students were correctly classified in their performance category 85% of the time. In another similar study conducted by NWEA (2017a) on classification accuracy of MAP reading to PSSA assessments in ELA, the researchers reported strong positive correlations of classification accuracy on MAP reading RIT percentile scores to the PSSA assessment in Grades 3-8. NWEA (2020b) conducted an additional study using MAP growth data from fall, winter, and spring benchmark windows to correlate scores in MAP reading to the FSA in ELA/reading. NWEA (2020b) concluded that a strong relationship existed between MAP reading scores and corresponding scores on the FSA for ELA. NWEA (2020b) claimed that validity evidence indicates that "MAP Growth scores are good predictors of performance on Florida's statewide assessments" (p. 6). Similarly, NWEA (2020a) concluded comparable results when studying the correlation of MAP RIT score percentiles to the OST in ELA.

FastBridge Learning (2019) conducted a study to determine the relationship between FastBridge aReading and the Partnership for Assessment of Readiness for

College and Careers (PARCC) state assessments. Data from the PARCC state assessments for Illinois, Minnesota, Michigan, New York, and Wisconsin were utilized for Grade 3-8. The results of the study indicated that there was a strong association between the FastBridge aReading achievement levels and state assessment achievement levels for students in Illinois, Minnesota, Michigan, New York, and Wisconsin. These correlations indicated that FastBridge assessments might be used to benchmark and screen students at-risk of meeting end-of-year outcomes.

The results of Renaissance Learning's (2019) study to correlate their Star Reading benchmark assessment to the Missouri Assessment Program in ELA for Grades 3-8 indicated strong relationships existed between the tests. Additionally, students were correctly classified as proficient on the Missouri Assessment Program as predicted by the Star Reading benchmark an average of 87% of the time for Grades 3-8. The results of the study provided evidence that the Star Reading assessment could be used to identify which students were not on track to meet the classification of proficiency on the Missouri state assessment.

Nese et al. (2011) reported a strong correlation between the easyCBM and the OAKS reading assessment at Grades 4 and 5. The easyCBM benchmark fluency measure was a significant predictor of state test scores across grades in this study. However, Nese et al. (2011) concluded that vocabulary and comprehension benchmark measures were better predictors, indicating that perhaps broad reading measures may be better indicators of reading proficiency in the Grades 3-8.

Brown and Coughlin (2007) also found similar results in CTB/McGraw-Hill's TerraNova reading to state assessment scores in the Mid-Atlantic region using the same

summative assessment. Brown and Coughlin stated (2007), "Although the MAP, STAR, and TerraNova assessments are all strong psychometrically regarding test score precision and their correlations with other measures, only TerraNova provided evidence of predictive validity" to that of only one state assessment in the Mid-Atlantic region (p. 7). Results from the current study support Brown and Coughlin's (2007). Brown and Coughlin (2007) determined that CTB/McGraw-Hill's TerraNova showed stronger evidence of predictive validity for the Mid-Atlantic state assessment in mathematics when compared to the three other benchmark tools evaluated in their study.

Findings from the current study indicated strong, positive, statistically significant relationships existed between FastBridge aMath scores, the commercially developed benchmark assessment for broad mathematics, and state assessment mathematics scores. The results of the current study support results found in the literature in which commercially developed benchmark assessment scores in broad mathematics are significantly related to performance on state assessments in mathematics in several states. Upon reviewing results from previous literature on commercially developed benchmark mathematics assessment and state assessment, the results of the current study were in support of the following study results.

Furthermore, the results of the current study support the findings in the following studies. NWEA (2016) conducted their research on the MAP benchmark in mathematics for students in Grades 3-8 and Grade 10 to determine the relationship between the fall benchmark assessment and summative KAP assessment and the winter benchmark assessment and the summative KAP assessment. NWEA (2016) found that a strong relationship existed among MAP mathematics and KAP mathematics test scores. In a

similar study, NWEA (2017a) reported strong positive correlations between MAP mathematics RIT scores and PSSA assessment scores in Grades 3-8. NWEA (2020b) conducted another similar study to determine the relationship between the spring MAP mathematics RIT scores and the FSA in mathematics scores. This study produced results that also showed a strong relationship existed among the benchmark and state assessment scores. NWEA (2020b) concluded that there were strong positive relationships between MAP mathematics the FSA in mathematics. Similarly, NWEA (2020a) concluded comparable results when studying the relationship between MAP RIT scores and the OST assessment in mathematics.

FastBridge Learning (2019) conducted a study to determine whether there was a strong association between the FastBridge aMath achievement levels and state assessment achievement levels for Illinois, Minnesota, Michigan, New York, and Wisconsin. These states participated in the PARCC mathematics test as their accountability measure. FastBridge Learning (2019) reported a strong association between the FastBridge aMath achievement levels and state assessment achievement levels for the PARCC states, Illinois, Minnesota, Michigan, New York, and Wisconsin. FastBridge Learning (2019) concluded that aMath could be used to benchmark and screen students for risk of meeting end-of-year outcomes on the PARCC state assessment.

Additionally, the results of the current study support the findings of the following studies. The findings of Renaissance Learning (2019) indicated a strong relationship between the test scores on the Star Math tests and the scores on the Missouri Assessment Program for Grades 3-8 in mathematics. A study was conducted by Zheng et al. (2019)

using data from the Miami-Dade County Public School system to correlate the Carnegie Learning MATHia instructional system assessment results in Grades 6-8 to the Florida state assessment scores. Sheng et al. (2019) determined that when students score "on track" on the Adaptive Personalized Learning Score, they are over 95% likely to pass the FCAT in mathematics for Grades 6-8.

The researcher found little information regarding studies whose findings indicated a lack of predictability or weak relationships between benchmark for broad reading and state assessments in ELA. Similarly, the results of the current study provided no evidence for a negative relationship or the absence of a relationship between any of the FastBridge composite scores and the KAP ELA reading and mathematics scores for Grades 3-8. While reviewing literature for the current study in which benchmark assessment for broad mathematics was examined in correlation to success on state assessment, no studies found that showed evidence of no predictability or no or low correlation value.

Conclusions

Publicly funded schools are held accountable to show evidence for meeting grade-level outcomes or achievement on standards taught. The source of evidence has changed for each state based on the academic standards and assessment tools available at the time. However, what remains consistent is when a valid and reliable benchmark or formative assessment is used, educators may determine a relationship of performance on these benchmark assessments and end-of-grade summative state assessments. Thus, the results from these benchmark assessments provide educators necessary information about skills for intervention. Schools seek commercially developed benchmark assessment tools that

can accurately predict performance on the summative assessment. The following subsections include implications for action, recommendations for future research, and concluding remarks.

Implications for action. The current study's results provide educators in District A direction for action on utilizing benchmark assessment to determine which specific students are at-risk of not meeting end-of-grade standards and expectations as evidenced on summative state assessment measures. Since the results of the current study indicated a strong positive relationship between the scores on the FastBridge aReading and aMath and the scores on the summative KAP assessment in ELA and mathematics at Grades 3-8, similar districts could feel confident in the usage of the two FastBridge assessments to identify students needing intervention and maintain progress for all other students.

Based on the results of the current study, there are implications for further action for utilizing the FastBridge aReading and aMath assessment system as a tool to correlate future performance on the KAP ELA and mathematics. These implications include professional development, alignment, and continued use of assessment features. Each area is explained in this section.

First and foremost, professional development must play a key role in the implementation of a benchmark assessment. It is recommended that continued training is provided to staff administering the FastBridge aReading and aMath assessments to ensure that they are administered to students consistently and reliably. New staff should be afforded initial training and ongoing support. Understanding how to read and analyze assessment results will also be important topics for professional development. Without this knowledge and understanding, the assessment would not be useful and would

consume valuable learning time. Therefore, a second layer of professional development should be added to provide thorough training to educators on reading and analyzing assessment results. FastBridge is a part of a comprehensive assessment model in which data-based decision making is pertinent. According to TASN (2020), "The quality of the decision-making process relies on the accuracy and usefulness of the data collected" (p. 29). Understanding the assessment results can lead educators to make valuable and efficient instructional decisions specific to an individual, small group, and school-wide needs. Finally, a third layer of professional development should be provided to educators that engage them in using additional diagnostic assessment resources that are a part of the FastBridge Learning package and others available through the district on the comprehensive assessment plan. The results from these diagnostic assessments could allow educators to make specific instructional decisions and drill down to individual skills.

Curriculum alignment is a vital future implication of the continued use of benchmark assessment. Curriculum alignment requires teachers to evaluate whether the curriculum that is taught is specifically being assessed. This alignment is critical because standards change over time. According to Christ et al. (2018), FastBridge aReading and aMath align with common core state standards; the aReading assesses components put forth by the National Reading Panel, and the FastBridge aMath assesses components of the mathematical focal points identified by the National Council for Teachers of Mathematics. Due to the broad focus and alignment to these standards, there is a close match to curricular standards specific to Kansas students. As curricular standards evolve and are adopted, it will be necessary for District A educators to evaluate the FastBridge

aReading and aMath assessment tools for alignment to most current state standards. Martin (2018) recommended an increased focus on using benchmark assessments for instruction and increasing complexity of the test items to remain consistent with the state accountability assessment. Additionally, data trends could indicate specific components that are stronger and weaker for groups of students, grade levels, schools, and the district as a whole. Curriculum leaders should use this information to establish focused conversations regarding district curricula.

Continued use of assessment features might enable District A educators to support growth and progress towards learning expectations, which includes an understanding of progress monitoring features in the FastBridge system. Results from individual student aReading and aMath assessments should provide the needed information that signifies whether a student is on a college pathway, low-risk, some-risk, or high-risk for meeting grade-level standards. When students receive a scaled score that indicates that they are at some- or high-risk, educators should select appropriate progress-monitoring assessment tools within the FastBridge system that monitor the success of additional support provided to individual students.

Recommendations for future research. At the time of this study, a lack of empirical research existed that evaluated how well the FastBridge aReading and aMath assessments predict future achievement on the KAP in ELA and mathematics. The current study has added to this gap in the literature; however, future studies should investigate other valid methods FastBridge may improve student learning as evidenced on the KAP. Future research may include the impact FastBridge benchmark assessment tools may play on planning and instruction for core or Tier 1 reading and mathematics,

not simply as a screening tool for intervention, which focus primarily on Tier 2 and Tier 3. Future studies should also address the limitations of the current study. Specific recommendations for future research include the following:

- Purposive sampling was utilized in this study. The participants in this study included students in Grades 3-8 who were enrolled in one Kansas district. Although the data set was substantial, stronger correlation models may be produced using data from more than one Kansas school district or all districts in Kansas utilizing the FastBridge benchmark system.
- The current study involved the use of FastBridge and KAP results from the 2018-2019 school year. The findings from this study come from one year of research. It would be important to study the correlation of the two variables over time. The study should be replicated using FastBridge and KAP data from multiple years, thus creating a longitudinal study. A longitudinal study may result in a stronger correlation.
- Subgroups were not identified to investigate from the sample in the current study. According to the Kansas TASN (2020), MTSS systems must meet the needs of all learners as well as provide intervention as early as possible. Identifying the subgroups of low-socioeconomic status, special education, and English language learner may provide greater insight into the learning gaps of these specific subgroups, thus prompt explicit strategies to address learning gaps.
- The current study involved the use of data from two benchmark windows (winter and spring) from the 2018-2019 school year. Future research may be

expanded to include fall data. Results indicated a stronger correlation between FastBridge and the KAP in both subjects for all Grades 3-8 in the spring window than from the winter window. Including fall data could allow the researcher to view trends for an entire school year.

- The results from the current study were intended to determine the strength and direction of the relationship from two numerical values (FastBridge composite score and summative KAP score). Of potential value to educators would be to conduct predictive validity studies in which performance levels on the KAP could be projected based on FastBridge score ranges.
- Due to unforeseeable circumstances of the pandemic COVID-19, state assessments were halted for the 2019-2020 school year in Kansas. Therefore, data could not be collected, so the researcher collected archived data from the previous school year. It would be of particular interest to conduct the same experiment using data from the 2020-2021 school year using the same sample parameters to determine if a disruption in schooling impacted student learning.

Concluding remarks. Federal legislation plays a key role in the accountability of schools at the state and local levels. One element of accountability that has remained consistent is achievement testing. Students have been held accountable for meeting end-of-grade outcomes for many years, even though achievement testing may have changed over time due to the availability of state assessments, testing practices, and curricular standards.

Since 2002 (USDE, n.d.), formative assessment has become increasingly prevalent in schools. It is used to guide instruction, provide feedback to students, prevent failure on end-of-grade outcomes, and support achievement on a state assessment. A multitude of formative assessment tools are available to educators. Traditionally formative assessment is embedded in the classroom. Benchmark assessment, which falls under the umbrella of formative assessment, is used to detect which students are on-track for meeting learning outcomes (Perie et al., 2007). Benchmark assessments are locally developed for schools, districts, or states or they may be commercially purchased. Due to the availability of a variety of benchmark assessments, the question exists which benchmark assessment tools are more predictive of success on future state assessment than others.

Babo et al. (2014) identified that a lack of empirical research existed that explains how well interim pretest and posttest assessments predict future achievement on state-mandated standardized tests in language arts and mathematics. At the time of this study, nearly 7 years later, this continues to be true for Kansas accountability assessment scores correlated to various benchmark systems on the market. Locally developed and commercially developed benchmark measures continue to become available as new tools are created or previous tools are revised and updated. Additionally, state assessment and other summative end-of-grade assessments evolve continually, as noted by Marion (2019). Although studies supporting the ability of various locally-developed or commercially developed benchmark assessments to predict student success on the state assessment in reading/ELA and mathematics, the correlation values vary based upon the benchmark and state assessment studied.

Although this study was limited to one school district in Kansas, the findings contribute to the developing body of research on benchmark assessment as it is related statistically to the state assessment. The current study, as well as previous studies in the literature, have confirmed there is value in benchmark assessment. Benchmark assessment continues to be a valuable source of information that allows educators to pinpoint which students may be at-risk of failure on state assessment or other summative end-of-grade measures. Benchmark assessment could be a critical tool that enables educators to gather student data and determine which students are at-risk of not meeting grade-level goals or standards to intervene or prevent future failure.

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Appendices

Appendix A: Approval of Research (District A)

[redacted] Public Schools
Assessment and Research

[redacted]

July 1, 2020

To: Misty Straub
[redacted]
Great Bend, KS 67530

Re: Dissertation Proposal

Dear Misty Straub,

This letter is in response to your recent request regarding your research titled: *The Relationship between FastBridge Scores and Kansas Assessment Program Scores* in the [redacted] Public Schools. The Research Council has approved your request with the following considerations:

- Due to working with the teacher's union re: work load issues, the district conceded to lessen testing and asked schools to use spring data to place students in interventions when school started; therefore most test scores are from winter and spring. As a result, de-identified data outside the parameters requested have been provided.
- Mobility and absenteeism can make data continuity challenging and impact performance, however these data are not a part of this study.
- It should not be assumed that [redacted] has not been running these data correlations.

As you proceed with your study, please note that this letter approves the research project as described above, and that it is incumbent upon the researcher(s) to negotiate distribution. The project also must not unduly increase the workload of any employee of the [redacted] Public Schools. The [redacted] Public Schools staff has the right to discontinue participation at any time. If for any reason it becomes necessary to modify what was originally presented in your proposal, the Research Council must be so informed and approve any changes in advance.

Please submit copies of any reports related to this research to the Office of Assessment and Research and if applicable, be made available to the participating school(s) as well.

On behalf of the USD [redacted] Research Council,

[redacted]

[redacted], Executive Director
Assessment and Research
[redacted] Public Schools

Appendix B: Approval of Research (Baker University)

BAKER UNIVERSITY
Own Confidence

Baker University Institutional Review Board

September 17th, 2020

Dear Misty Straub and Susan Rogers,

The Baker University IRB has reviewed your project application and approved this project under Exempt Status 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.

Please be aware of the following:

1. Any significant change in the research protocol as described should be reviewed by this Committee prior to altering the project.
2. Notify the IRB about any new investigators not named in original application.
3. When signed consent documents are required, the primary investigator must retain the signed consent documents of the research activity.
4. If this is a funded project, keep a copy of this approval letter with your proposal/grant file.
5. If the results of the research are used to prepare papers for publication or oral presentation at professional conferences, manuscripts or abstracts are requested for IRB as part of the project record.
6. If this project is not completed within a year, you must renew IRB approval.

If you have any questions, please contact me at npoell@bakeru.edu or 785.594.4582.

Sincerely,

Nathan D. Poell

Nathan Poell, MLS
Chair, Baker University IRB

Baker University IRB Committee
Sara Crump, PhD
Nick Harris
Christa Manton, PhD
Susan Rogers, PhD