

THE DEVELOPMENT AND IMPLEMENTATION OF COMMON FORMATIVE  
ASSESSMENTS TO INFORM THE INSTRUCTIONAL PRACTICES OF  
MATHEMATICS TEACHERS

by

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(Under the Direction of Karen C. Bryant)

ABSTRACT

The purpose of this action research study was to develop and implement common formative assessments for mathematics teachers to inform instructional practices. To address the purpose of this action research study, the following research questions guided this study:

1. How can the district instructional leadership team support professional learning for math teachers to develop and implement common formative assessments to inform instructional practices?
2. How do mathematics teachers describe the impact of professional learning on their capacity to utilize common formative assessments as a tool to inform instructional practices?
3. What do Action Research Design Team (ARDT) members learn in the process of leading the design and implementation of common formative assessments in mathematics?

To address the research questions, the instructional leadership team designed and facilitated professional learning sessions on developing and implementing common formative assessments to inform the instructional practices of mathematics teachers. The following themes

emerged from the study: 1) Cyclical and relevant professional learning models desired instructional practice; 2) Time, relevance, and reflection are key; and 3) Clarity in the framework, processes, and expectations positively influence implementation. The findings illustrated that instructional leaders have the ability to impact collaborative planning in the development and implementation of common formative assessments, teacher efficacy in the implementation of the assessment, and reflective discussion in the analysis of the assessment results.

INDEX WORDS: Common formative assessments, Instructional practices, Mathematics teachers, Job-embedded professional learning, Instructional leaders

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## DEDICATION

*“I can do all things through Christ who strengthens me.”*

Phillippians 4:13

**To my husband, Tom:** Thank you for always believing in me and supporting me throughout this journey. You are my rock that keeps me balanced in the chaos. I love you!

**To my children, Blake and Lauren:** I did this for you! I believe in you and want you to achieve your dreams. Never give in; never give up!

**To my parents, Jimmie and Patsy:** Thank you for your example of faithfulness to each other, to family, to the Lord, and others. You have instilled in me a love for learning that I hope will inspire others.

**To my sister, Laura:** Thank you for your listening ear, kind words of encouragement, and cheering me on through each semester. You are my sunshine!

*“Trust in the LORD with all thine heart; and lean not into thine own understanding.*

*In all thy ways acknowledge him, and he shall direct thy paths.”*

Proverbs 3: 5 & 6

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## CHAPTER 1

### INTRODUCTION

The topic of assessments has received both positive and negative attention in school districts, small and large. While there is a consensus that evaluation is a necessary part of the learning process, a contentious debate exists over the methods of administering assessments (Abbakumov, D., Desmet, P., & Van den Noortgate, W., 2020). Numerous researchers attempt to understand the impact of common formative assessments on student learning in the classroom (Abbakumov et al., 2020; Aubrecht et al., 2015; Lin & Lai, 2013; Moore et al., 2017; Moss & Brookhart, 2019; Young & Jackman, 2014). Moss and Brookhart (2019) indicate common formative assessments are implemented in classrooms worldwide using a myriad of teaching methods and strategies in a concerted effort toward closing the equity gap in student learning. These methods and strategies should be compared through a critical research analysis to understand the impact of common formative assessments on student learning.

Common formative assessments provide feedback to students and data to teachers to improve learner knowledge and skill acquisition (Lin & Lai, 2013). While the definition of common formative assessments, as indicated by Clark (2011), seems logical, the process often requires clarity. As cited by Abbakumov et al. (2020), "accurate conclusions on students' proficiency via formative, however, face several challenges: (a) students are typically allowed to make several attempts; and (b) student performance might be affected by other variables, such as interest" (p. 113). González-Gómez et al. (2020) contribute to the idea that common formative

assessments embedded in the teaching and learning process are among the most potent ways to enhance student motivation and achievement.

Additionally, Aubrecht II et al. (2015) conclusively state, "the use of common formative assessment in the classroom as a way for teachers to gauge student understandings, prepare and alter instruction methods, and foster more reflective teaching practices is a growing practice in the field of education" (p. 16). Further analysis of the intentional educational practice of using common formative assessments reflects learning activities designed to impact student learning and align with assessment quality through analysis of student data and classroom observations.

This action research study incorporates Aubrecht II et al.'s (2015) framework parameters to define common formative assessments as "research-based pedagogical approaches to design and differentiate instruction that is specific to the needs of the students rather than a 'one-size-fits-all' model" (p. 2). By design, formative assessments should reflect student learning while simultaneously preparing students for summative assessments. Gulikers et al. (2013) further assert that formative assessments allow teachers to assess student learning and adjust instructional practices with summative assessment expectations. Moore et al. (2017) state, "it is a set of interconnected strategies designed to scaffold student learning in lessons aligned to standards, organize your students for complex tasks, measure their incremental progress, and draw on the shared experience of your colleagues as you continue to plan and revise your teaching" (p. 5). Additionally, common formative assessments allow the teacher to reflect and refine instruction quickly to promote student learning simultaneously.

Common formative assessment is a process driven by and dependent upon the functional bond among six elements (Moss & Brookhart, 2019). These six elements consist of understanding the whole learning target, setting student goals, engaging students in asking

effective questions, providing strategic teacher questioning, facilitating self- and peer-assessment modules, and profiting from feedback. "Like an effective windmill, the formative assessment process derives its power from the fusion of its elements as they work together at the highest level to produce the greatest impact" (Moss & Brookhart, 2019, p. 151). The research of Moss and Brookhart (2019) emphasizes the influence of each of these six elements while simultaneously acknowledging the barriers to the formative assessment process. Arguably, van der Kleij (2019) identifies feedback as one of the most potent influences on student learning, and teacher and student perception of feedback impact learning.

In contrast, Lin and Lai (2013) provide evidence for adopting a collaborative feedback model incorporating students and teachers to develop significantly enhanced learning achievements. Abbakumov et al. (2020) suggest using the Rasch model to improve students' proficiency measurement accuracy via formative assessments by considering the effect of attempts and the effect of interest. Additionally, Heredia et al. (2016) suggest a possible way to decrease variations in common formative assessment practices and maximize student learning may be to engage teachers as co-designers of common formative assessment tools. The authors acknowledge that teacher collaboration does not always lead to changed classroom practices or increased student learning. Sach (2010) further defines the impact of teacher perception of common formative assessments using a qualitative thematic analysis identifying five key themes as highly relevant to the process. These themes were: accountability, prescription and ownership, school context, culture and collaboration, leadership and management, and the complexity of teaching and learning. Alignment of the six elements of formative assessments as defined by Moss and Brookhart (2019) and the five themes identified by Sach (2010) support a more

consistent development of common formative assessment practices designed to bring real and lasting improved student learning.

As educators continue to refine the process and implement common formative assessment practices in digital and face-to-face classroom environments, research continues to provide evidence of the impact of common formative assessments on student learning. González-Gómez et al. (2020) highlight the online formative assessment tool as an effective and efficient digital educational instrument that affects teaching and learning processes and improves students' motivation and achievement in the classroom. Sondergaard and Mulder (2012) attribute computer-based formative tools as enabling comprehensive functionality while providing instructors with the ability to gauge student understanding or identify student misconceptions. This results in a responsive curriculum that deepens student learning. Both Care et al. (2016) and Genlott and Grönlund (2016) further support the use of online formative assessments as a means for educators to gather assessment data on their students to gain insight into their proficiencies in 21<sup>st</sup>-century skills. Lin and Lai (2013) claim that online common formative assessments result in feedback to improve learner knowledge and skill acquisition rather than evaluative course grades.

In 2014, Young and Jackman wrote, "formative assessment provides the reinforcing support between learning and instruction and has proven to be a central component in improving student achievement and instilling students with a passion for life-long learning" (p. 398). The discussion of Abbakumov et al.'s (2020) and Moss and Brookhart's (2019) research supports this statement. These studies identify several possible theoretical explanations for educators to identify and implement common formative assessments in the classroom while remaining cognizant of potential discrepancies.

Additional research that examines all aspects of how common formative assessments directly correlate to student achievement holds the potential to provide a more comprehensive understanding of the effects of common formative assessments. This action research study serves to provide additional research that will include but not be limited to accountability; prescription and ownership; school context; culture and collaboration; leadership and management; and the complexity of teaching and learning in the mathematics classroom. As each method or strategy of implementing common formative assessments becomes prevalent in the classroom, the evidence of student learning may be observable through six elements defined by Moss & Brookhart (2019). Students may exhibit an understanding of the whole learning target through their ability to set goals. By engaging students in asking effective and strategic questions, teachers facilitate self- and peer-assessment that provides effective feedback that can establish a robust learning trajectory.

### **The Problem**

The Grantham School District recognized the need to develop, align, and implement common formative assessments by course in each classroom to provide teachers with a tool for measuring student growth during the learning process. The suboptimal growth in student achievement in K-12 mathematics classrooms prompted a renewed focus and commitment to understanding student learning through common formative assessments to inform teachers' instructional practices.

#### *Overview of the Research Site Context*

In 2019, before the COVID-19 pandemic, the Grantham School District began defining a five-year strategic plan. This plan was an inclusive process that solicited input from all stakeholders: students, parents, community leaders, teachers, and administrative staff. Under the

guidance of representatives from a statewide leadership institute, the inclusive team identified five pillars that exemplified the district's mission and vision values. Student achievement, readiness, and engagement was one of five pillars that focused on providing access to appropriately personalized and challenging learning opportunities, facilitating and valuing student voice and choice, and utilizing useful and engaging instructional and assessment strategies. This last objective led the team to develop an action step to create and implement common formative assessments in grade level and department teams over a five-year phase-in period.

Since 2016, the district has administered the Measures of Academic Progress (MAP) to all students in kindergarten through eighth grade as well as to high school students identified for support in math and reading instruction or special education services. The MAP is an adaptive assessment that measures student growth in reading, math, and language skills. While this assessment provides teachers with immediate results that can be utilized in the classroom to target student learning and focus on student needs, MAP is only administered three times a year in the fall, winter, and spring. As a result, teachers do not have enough data to act in time to adjust day-to-day instruction to impact student learning.

This study focuses on implementing common formative assessments in identified K-12 mathematics classes using a purchased, open, all-access online program as the common formative assessment tool. The overarching goal is to provide a replicable format to use in other mathematics classes and to create the conditions for collaborative conversations to occur horizontally within grade levels and vertically across grade bands for all district mathematics teachers. As part of the five-year strategic plan goals, the collaborative action research

methodology replicates the creation and implementation of common formative assessments in all grade-level and department teams throughout the district.

### **Purpose of the Study**

The purpose of this action research study was to develop and implement common formative assessments for mathematics teachers to inform instructional practices. To provide identified K-12 mathematics teachers with a tool for measuring student growth during the learning process, the Grantham School District recognized the need to develop, align, and implement common formative assessments in every classroom. This study sought feedback from two teams, one identified at the district level and one at the school level. The district-level instructional leadership team provided feedback regarding the district's common formative assessment tool development, alignment, and implementation. Additionally, the school-level team provided feedback regarding implementing the common formative assessment tool and the impact on the horizontal and vertical alignment of mathematics instruction between grade levels in the school.

The researcher approached the study with some overall questions: Can an online formative assessment tool provide teachers with the capacity to inform instructional practices while simultaneously facilitating horizontal and vertical alignment in mathematics classrooms throughout the district? How will the district instructional leadership team impact the capacity to develop, align, and implement the use of a common formative assessment tool to inform instructional practices in all classrooms district-wide?

## **Research Questions**

The following research questions guided the analysis to address the purpose of this research action study:

1. How can the district instructional leadership team support professional learning for math teachers to develop and implement common formative assessments to inform instructional practices?
2. How do mathematics teachers describe the impact of professional learning on their capacity to utilize common formative assessments as a tool to inform instructional practices?
3. What do Action Research Design Team (ARDT) members learn in the process of leading the design and implementation of common formative assessments in mathematics?

As this study examined the development and implementation of common formative assessments in mathematics classrooms, the researcher used specific terms to define key concepts.

The next section includes an overview of the definition of key terms specifically related to this action research study in mathematics classrooms in this district. While these terms are used in research, this section defined the terms as they pertained to this study at Grantham School District.

## **Definition of Terms**

For a better understanding of this study, operationally defined are the following key terms:

- “Common formative assessment” in the district context is a team-designed, intentional measure used to monitor student progress to inform the instructional process.

- “Mathematics teacher” is a teacher who plans and delivers mathematics instruction in the classroom.
- “Instructional leadership team” refers to the district instructional team, consisting of the executive director of curriculum and instruction, the instructional technology director, the assessment/CTAE director, the special education director, two school psychologists, and the virtual school coordinator. The executive director of curriculum and instruction is the primary researcher.
- “Math research team” refers to the school team consisting of mathematics teachers, an instructional coach, the principal, and the assistant principal of instruction.
- “Instructional practice” is closely related to instructional strategies but focuses on the teacher’s ability to provide effective and accurate feedback to students in the mathematics classroom.
- “Guiding principle” is a belief or ideal that defines the work of an organization and transcends changes in circumstances, leadership, or any other working parts of that organization.
- “Job-embedded professional learning” is an activity that provides practical steps to support school leaders and teachers in applying and growing professional learning activities (Zepeda, 2019).

The following section provides the context of the theoretical framework.

### **Theoretical Framework**

One purpose of this study was to design and implement professional learning designed to impact the ability of mathematics teachers to utilize common formative assessments to inform and improve instruction. The *framework for leadership in mathematics education* developed by

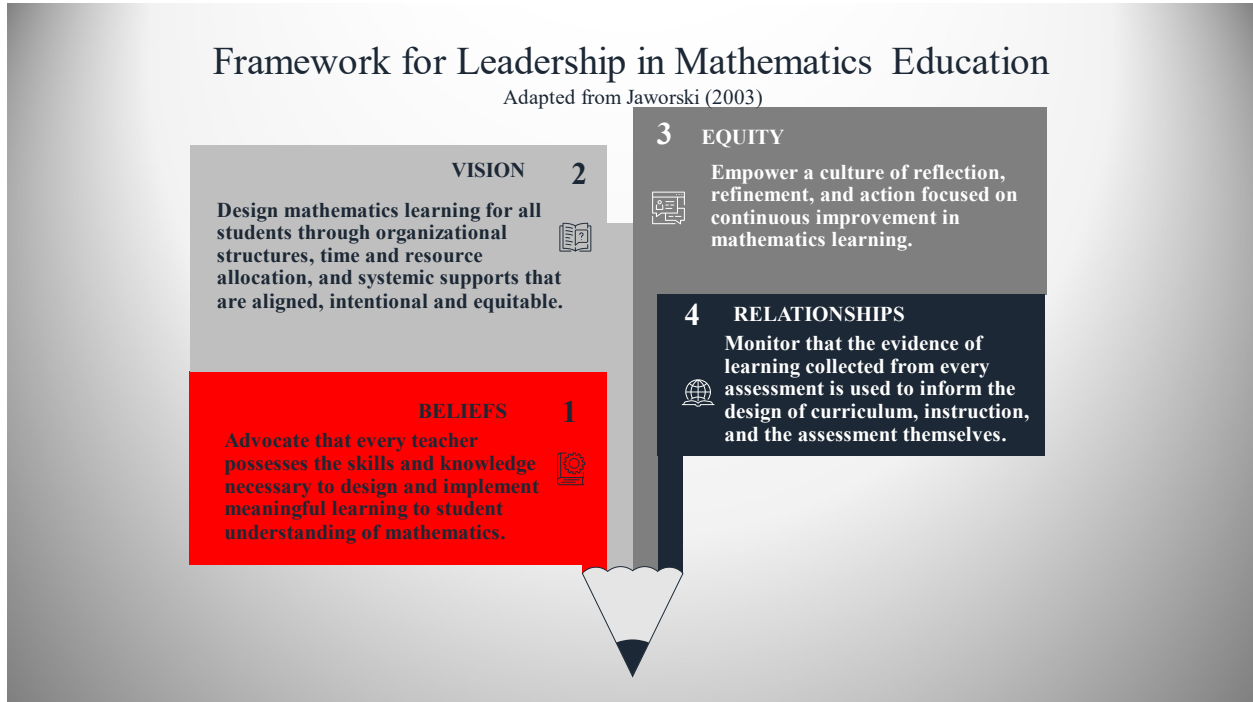
Dynarski (2008) provides clarity and focus on leading PreK-12 mathematics professional learning. Through a combined focus on Dynarski's (2008) four guiding principles and Moss and Brookhart's (2019) six foundational elements, the framework defines the roles of individuals who lead mathematics instruction in a classroom, school, or district.

Dynarski (2008) asserts that guiding principles are appealing because they enable decision-makers to create a method for assessing the extent of evidence in syntheses to determine the magnitude of the effects of policies, programs, and practices on student achievement. Furthermore, Kannel-Ray (2006) argues that the emerging process of sustainable education directly results from a set of guiding principles to inform theoretical framework and pedagogical processes. Using guiding principles within a framework for problem-solving and change can facilitate change by clarifying thinking (Kanuka, 2002).

Jawaroski (2003) emphasizes the idea that a theoretical framework based upon guiding principles should potentially have a three-pronged effect:

1. Look in two directions simultaneously: a) at research into mathematics learning, teaching, and/or teaching development from insider and outsider perspectives; b) at mathematics teaching development occurring in parallel with such research and provide an approach to analyzing relationships between the two.
2. Contribute to a conceptualization of such relationships.
3. Contribute to developing mathematics teaching and learning. (p. 252)

**Figure 1.1**



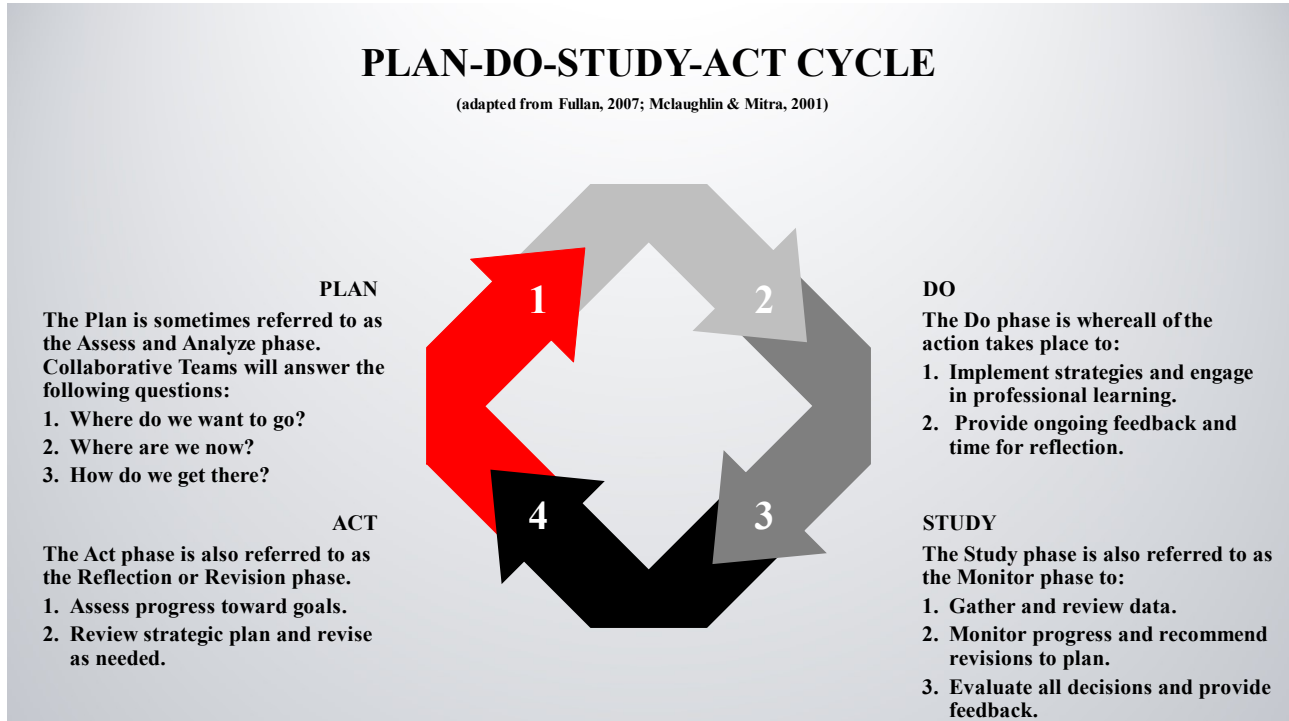
*Theoretical Framework*

*Note.* Adapted from the work of Jaworski (2003).

**Logic Model**

The logic model for this study utilized a theory of change to articulate how we believe change will happen, and as a result, we plan to invest time and resources to contribute to that change. Implementing the theory of change will utilize a cycle of Plan-Do-Study-Act statements to test logical connections and communicate the vision, plan, and outcomes. Without first understanding and articulating the change the organization wants to achieve, assessing the impact of the work (and the accuracy of the theory) is impossible; as a result, so is the opportunity to communicate the impact internally or externally.

**Figure 1.2**



*Logic Model*

*Note.* Adapted from the works of Fullan (2007); McLaughlin & Mitra (2001).

*Theory of Change*

Having a well-articulated theory of change is crucial to creating change. Connell and Kubisch (1998) state the theory of change framework should contain the following characteristics:

1. It should be plausible. Do evidence and common sense suggest that the activities, if implemented, will lead to desired outcomes?
2. It should be doable. Will the economic, technical, political, institutional, and human resources be available to carry out the initiative?
3. It should be testable. Is the theory of change specific and complete enough for an evaluator to track its progress in credible and valuable ways? (p. 3)

The research of both Fullan (2007) and McLaughlin and Mitra (2001) further supports that a sustainable change theory or change knowledge can be compelling in informing education reform strategies and, in turn, getting results by adhering to the following guiding principles:

1. A clearly articulated vision and commitment to a system for all students are continually the subjects of communication in the district.
2. A system-wide comprehensive plan and framework for continuous improvement.
3. Using data to inform instruction and determine resources.
4. Building administrator and teacher capacity to use common formative assessments to inform instructional practices for all students.
5. Establishing professional learning communities at all levels of the system and beyond the district (McLaughlin & Mitra, p. 301).

To create a sustainable theory of change, the action research team employed the district strategic plan action step regarding student achievement in mathematical competency in all classrooms. The strategic plan also defined a system-wide framework for implementing common formative assessments in mathematics classrooms to inform instructional practices. Additionally, the action research team used vertical data from K-12 mathematics classrooms to determine resources and further inform the need for additional professional learning to implement common formative assessments to inform instructional practices. The desired results included that school leaders learn best practices in supporting data-driven instruction, and teachers learn the process and importance of implementing common formative assessments to inform instructional practices to impact student learning in the mathematics classroom and build the capacity to meet students' personalized needs in all mathematics classrooms. At the end of the process, school leaders and teachers defined common formative assessments and instructional practices and

implemented both effectively in the mathematics classroom with fidelity. The action research team shared a goal of increasing a sense of ownership among administrators and teachers, resulting in buy-in to the action research process.

### **Overview of the Methodology**

This action research was a qualitative case study comprised of an Action Research Design Team (ARDT) and an Action Research Implementation Team (ARIT). The ARDT was comprised of the Executive Director of Curriculum and Instruction, the Instructional Technology Director, the Assessment/CTAE Director, the K-12 Mathematics Lead, and four assistant principals. The ARIT comprised K-12 mathematics teachers and instructional coaches. Data collection for this case study incorporated numerous qualitative methods, including surveys, focus groups, interviews, and data reports. The research design team, who collaborated on the findings with the ARIT, administered, collected, and analyzed the qualitative methods throughout three cycles.

The ARIT focused on using the common formative assessment tool to identify student learning and inform instructional practices in mathematics classrooms. Yin et al. (2014) support the debate that embedding formative assessments within the curriculum are an effective and productive method to gauge student learning and instruction in the classroom. Embedding formative assessments explicitly or implicitly involve the following four common steps: determine the expected level that students should reach, collect data on what students know and can do, identify the gap between the actual level and the expected level, and take action to close the gap (Yin et al., 2014). Additional use of a learning progression serves to provide a framework for the following five functions in guiding formative assessment design and implementation:

1. Determine critical junctures to embed formative assessments.
2. Clarify the learning goals.
3. Elicit student responses to reflect student understanding.
4. Provide a framework for teachers to interpret student responses.
5. Guide teachers to close the gap in student understanding at each critical juncture (Yin et al., 2014, p. 535).

Clark (2011), Black and Wiliam (2010), and Yin et al. (2014) focus on the process of implementing common formative assessments rather than the instrument of common formative assessments. By embedding the process of common formative assessments into instructional practices, teachers can better understand where students are in the learning process and what they do and do not know.

Jaworski (2003) recommends leaders advocate for the development of teacher knowledge and skills and that they design mathematics learning for each student through structures, processes, and support. The ARDT focused on data results that aligned with the four guiding principles of this study:

1. Advocate that every teacher possesses the skills and knowledge necessary to design and implement meaningful learning to student understanding of mathematics.
2. Design mathematics learning for all students through organizational structures, time and resource allocation, and systematic supports that are aligned, intentional and equitable.
3. Empower a culture of reflection, refinement, and action focused on continuous improvement in mathematics learning.

4. Monitor that the evidence of learning collected from every assessment informs the design of the curriculum, instruction, and the assessments themselves.

### **Interventions**

The research interventions were centralized around the Plan-Do-Study-Act theory of change to guide continuous improvement and sustainability. The primary intervention took place in professional learning communities at each school level. These professional learning communities were comprised of mathematics teachers, instructional coaches, assistant principals, members of the district instructional team, and the researcher. The focus of the group was to analyze data on the use of common formative assessments as they impacted the teacher's ability to adjust instruction to meet the learning needs of students. During weekly meetings, the group reflected on the professional learning designed around using the common formative tool and its reporting features. Participants completed surveys designed to give feedback regarding the impact of professional learning on improving instructional practices using common formative assessments. Additional interventions included a focus group and individual interviews focused on using common formative assessments to inform instruction and impact student learning. The focus group was conducted at the end of the first intervention cycle. Individual interviews were conducted using a staggered schedule during the action research process. The ARDT and ARIT met at the beginning and end of each cycle to define the action research using the Plan-Do-Study-Act theory of change.

### **Significance of the Study**

Carroll (2016) clearly articulates, "if we have expectations for student learning that is rigorous, independent, and applicable in the real world, teachers need to be able to plan instruction that will help their students meet those goals" (p.9). The ability to prepare and

seamlessly adjust instruction allows teachers the flexibility to meet the needs of all students without sacrificing relevance and high expectations.

This study examined explicitly how the use of common formative assessment in a small public school district informed the instructional practices of K-12 mathematics teachers to impact student learning. It contributed to educational leadership and provided instructional leaders with a framework for designing and implementing professional learning using a common formative assessment tool that informed teachers' instructional practices and impacted student learning in the mathematics classroom. The framework for a sustainable model employed Jaworski's (2003) four fundamental tenets. The belief was every teacher possessed the skills and knowledge necessary to design and implement meaningful learning to students' understanding of mathematics. The vision was designed around mathematics learning for all students through organizational structures, time and resource allocations, and systematic supports that are aligned, intentional and equitable. The equity-empowered culture of reflection, refinement, and action focused on continuous improvement in mathematics learning. The fourth tenet focused on the importance of relationships that impact the ability to monitor the evidence of learning collected from every assessment to inform the curriculum design, instruction, and assessment.

### **Organization of the Dissertation**

Chapter 1 provides an overview of this action research study and introduces the action research questions, the problem of practice, and an overview of the methodology. Chapter 2 reviews the related literature for this action research study and discusses common formative assessments, instructional practices, and job-embedded professional learning in the mathematics classroom. Chapter 3 describes the methodology involved in the action research, amplifies the context in which the study occurred, and articulates the qualitative methods related to this case

study. Chapter 4 examines the findings from the action research case and describes the interventions the research and the action research design team implemented. Chapter 5 details the analysis of the findings from the case study based on the action research cycles and the action research questions that guided the study. The data and findings used a thematic approach for analysis. Chapter 6 summarizes the study, discusses the findings, and offers implications for practitioners, policymakers, and researchers.

## **CHAPTER 2**

### **REVIEW OF THE RELATED LITERATURE**

Despite the contentious debate among numerous scholars and practitioners regarding the fundamentals of administration and accountability measures that currently stigmatize assessments, particularly in this COVID-19 pandemic environment, there is a consensus among students, parents, and educators that evaluation is necessary for the learning environment (Aubrecht II et al. 2015, Carroll 2016, Moore et al. 2017). As Moore et al. (2017) articulate, "if we have expectations for student learning that is rigorous, independent, and applicable in the real world, teachers need to be able to plan instruction that will help their students meet those goals" (p. 9). While the purpose of common formative assessments is clearly defined, the implementation process needs clarity. Aubrecht II et al. (2015) define common formative assessments using three parameters to provide clarity. The assessment is considered common when (1) all students at a given grade level receive the same questions, (2) written answers that build teacher awareness of student thinking through comparison of pre-and post-assessment results to inform and influence teaching are formative, and (3) assessment comprises the content questions that illuminate student ideas and how they change from pre- to post-application.

#### **Purpose of the Study**

The purpose of this action research study was to develop and implement common formative assessments for mathematics teachers to inform instructional practices. To provide identified K-12 mathematics teachers with professional learning using an online resource for measuring student growth during the learning process, the Grantham School District recognized

the need to develop, align, and implement common formative assessments in every classroom. This study sought feedback from two teams identified at the district level and the school level. The district-level instructional leadership team provided feedback regarding the development, alignment, and implementation of the district's common formative assessment online resource. Additionally, the school-level teams provided feedback regarding implementing the common formative assessment online resource and the impact on the instructional practices of mathematics teachers reflected in horizontal and vertical collaborative conversations between grade levels in each school.

The researcher approached the study with some overall questions: Can an online formative assessment tool provide teachers with the capacity to inform instructional practices while simultaneously facilitating horizontal and vertical alignment in mathematics classrooms throughout the district? How will the district instructional leadership team impact the capacity to develop, align, and implement the use of a common formative assessment tool to inform instructional practices in all classrooms district-wide?

### **Research Questions**

The following research questions guided this analysis to address the purpose of this research action study:

1. How can the district instructional leadership team support professional learning for math teachers to develop and implement common formative assessments to inform instructional practices?
2. How do mathematics teachers describe the impact of professional learning on their capacity to utilize common formative assessments as a tool to inform instructional practices?

3. What do Action Research Design Team (ARDT) members learn in the process of leading the design and implementation of common formative assessments in mathematics?

To examine the research questions, the researcher collaborated with an ARIT to analyze a framework for designing and implementing a common formative assessment tool that informs teachers' instructional practices and impacts student learning in the mathematics classroom. Data collection for this case study incorporated numerous qualitative methods, including surveys, focus groups, interviews, and data reports.

A review of the literature on common formative assessments was conducted and organized into three sections to achieve the objective. The first section provides a definition of common formative assessments, a historical overview, and a discussion of the impact of politics and policy on common formative assessments in the mathematics classroom. The second section aligns common formative assessments to instructional practices by defining instructional practices and describing the implementation of common formative assessments in the classroom to promote teacher collaboration to inform instructional practices and impact student learning outcomes in mathematics. The third and final section outlined the framework of job-embedded professional learning designed to develop, align, and implement common formative assessments, identify barriers, and promotes collaboration. This section further analyzes the educational leader's role in facilitating a sustainable model using common formative assessments to inform instructional practices by defining norms, setting expectations, and removing barriers.

### **Common Formative Assessments**

#### *Overview and Definitions*

Clark (2011) asserts there is a false, widespread assumption that formative assessments are a measurement of the instrument rather than a process essential to the fundamental practice

of teaching and learning. Clark (2011) defines the meaning, purpose, and application of formative assessment in the classroom to impact student learning. Through referencing a report in New Zealand, he supports the idea that substantial professional development includes observations, intensive cultural immersion programs, parent meetings, and monthly meetings as necessary to implement formative assessments with fidelity. In conclusion, he asserts that the demand for accountability has skewed our vision to improve the education system and can be interpreted as; we cannot seem to get out of our way.

By focusing on the classroom concept as the "black box," Black and Wiliam (2010) apply the black box analogy to classrooms worldwide. Inputs from the outside include pupils, teachers, other resources, management rules and requirements, parental anxieties, standards, high-stakes testing, and so on, feeding into the box. The expectation from students who are more knowledgeable and competent is better test results and reasonably more satisfied teachers. However, little regard is given to what is occurring inside the black box. Black and Wiliam (2010) advocate it is the government's responsibility to take the lead in raising standards by implementing changes to include using formative assessments that are directly put into effect by teachers and students in the classroom.

Furthermore, Yin et al. (2014) support the position that embedding formative assessments within the curriculum is an effective and productive method to gauge student learning and instruction in the classroom. Embedding formative assessments explicitly or implicitly follow four common steps: determine the expected level that students should reach, collect data on what students know and can do, identify the gap between the actual level and the expected level, and take action to close the gap (Yin et al., 2014, p. 533). Additional use of a learning progression

serves to provide a framework for the following five functions in guiding formative assessment design and implementation:

1. Determine critical junctures to embed formative assessments.
2. Clarify the learning goals.
3. Elicit student responses to reflect student understanding.
4. Provide a framework for teachers to interpret student responses.
5. Guide teachers to close the gap in student understanding at each critical juncture (Yin et al., 2014, p. 535).

In summation, Clark (2011), Black and Wiliam (2010), and Yin et al. (2014) focus on the process of implementing common formative assessments rather than the instrument of common formative assessments. By embedding the process of common formative assessments into instructional practices, teachers can better understand where students are in the learning process and what they do and do not know.

#### *Politics and Policy Historical Context*

As early as the Ming dynasty, a competitive examination system existed, giving some students advantages over other candidates (Stobart & Eggen, 2012). Throughout history, the intention to reduce the security and reliability of high-stakes assessments has cost test validity. In addition to fairness and reliability issues, equity issues also exist that potentially undermine the validity of assessments by focusing on gender, geography, and assessment design. Stobart and Eggen (2012) analyzed the use of high-stakes testing from multiple case studies for selection and placement, raising standards, and accountability that negatively impacted teaching and learning, which became focused on teaching to the test.

Likewise, the use of assessments to publicly evaluate and improve schools' performance is widely recognized and historically documented. England introduced an incentive approach to combat the increasing demand for elementary schools in 1862. Although the payment-by-results incentive existed for over 30 years, the impact on teaching and learning resulted in a focus on teaching to the tests. A more recent high-stakes phenomenon has been how international comparative studies have become high-stakes using sampling methodologies to reflect the competency of standards resulting in national monitoring that does not significantly raise standards (Stobart & Eggen, 2012).

Similarly, policymakers' emphasis on high-stakes testing for accountability measures and school comparisons does not correlate to improved student learning and classroom instruction. Stobart and Eggen (2012) further assert that the consequences of high-stakes testing mean that the quality of the testing instruments, the awarding procedures, and the valid interpretation of the results must be of the highest quality. Their research indicates it is necessary to significantly establish valid assessment procedures when the test results impact students' life chances.

By examining the historical evolution of mathematics standards and assessments, Schoenfield (2015) is optimistic a fundamental change in the reporting of mathematics assessments will indicate how well a student performed and what the student did not know. Additional testing specifications will include knowledge of concepts and procedures, problem-solving, communicating reasoning, modeling, and data analysis, providing meaningful ways to demonstrate mathematical proficiency. Consequently, there are significant challenges to consider, including the ability to score a large number of student tests in a short time and the challenge of the teacher to help students develop the skills and understanding required to address

complex tasks. However, formative assessments can aid teachers in building the capacity for a rich mathematical classroom environment.

Reagan et al. (2016) assess state and national policy's implementation, impact, and evolution. They explore the political and policy implications and outline tensions that potentially drift from the original intent:

- Local control vs. professionalism: Implementation at a national level could propel student learning by establishing common standards and developing a uniform and impartial assessment. As a result, the scaling at a national level removes decision-making power from the local level.
- Marginalizing vs. privileging groups and ideas: Including teachers and school leaders in the design and implementation of assessments creates confusion and dissonance.
- Dual role as both formative and summative assessment: Without clarity, research argues, students are preparing for the assessment rather than learning.

In conclusion, there is value in the interplay of policies and politics on the impact of assessments in education. However, the race to implement uniform assessments must be tempered with input from all stakeholders to ensure student learning.

#### *Impact on Instructional Practices*

Phillips and Wong (2010) assert policymakers have begun moving academic performance forward in mathematics and literacy through the Common Core Standards. The No Child Left Behind Act helped set priorities, but the prescriptive accountability measures made it difficult for some districts and states to use assessments as levers for good practices (Phillips & Wong, 2010, p.37). The Common Core Standards is an educational initiative that began in 2010 that detailed what English language arts and mathematics courses K-12 students should master at the end of

every grade level to prepare students to enter two- and four-year college programs or the workforce. They further state that having a common set of standards is one step closer to having every high school graduate college-ready by preparing students to have specific skills. The Gates Foundation advocated for fewer and clearer standards designed to provide students with specific skills to prepare for the transition to college (Phillips & Wong, 2010). The standards include essential academic skills and content; cognitive skills, such as problem-solving, collaboration, and academic risk-taking; academic relationships, such as being engaged and motivated to work; and knowing how to apply for college successfully and navigate the system (Phillips & Wong, 2010).

Phillips and Wong (2010) assert the common core standards should take the guesswork out of determining what students know. Teachers and policymakers can implement these standards into next-generation assessments that track how much students know and how well they know it. By establishing additional partners and going to scale with common core standards with the influence of textbooks and vendors, the development of tools and resources will transfer learning in the classroom. The continued financial and political support of the common core standards and newly aligned assessments can impact the future stake of students throughout the country.

Spector (2013) analyzed the impact of politics and policy on new and emerging technologies and their impact on student learning and classroom instruction. Specifically, the analysis focused on enablers of (e.g., dynamic online formative assessment for complex learning activities) and barriers (e.g., accessibility and personal ability) to sustained and systemic success in effective student learning and classroom instruction. While there is a traditional view that assessments should align with objectives, Spector (2013) emphasizes using formative

assessments to improve student learning in activities that involve complex learning tasks.

Although technologies provide effective alternatives to the learning environment, some questions continue to require consideration in the development of assessment technologies, including:

- When does it make sense to interrupt a learner?
- What is the most effective method to offer learning advice (suggestive or directive)?
- Why do learners choose to follow or not follow the advice offered (Spector, 2013, p. 29)?

In conclusion, Spector (2013) notes that regardless of how powerful educational technologies are, there is no replacement for properly trained, persistent, and dedicated teachers.

Dorn (2010) highlights an astonishing gap between the special education literature on formative assessments and data-driven literature. He argues, "Formative assessment is a different way to organize a year; it involves planning around instructional decisions instead of discrete chunks of time" (Dorn, 2010, p. 333). The additional barriers of high-stakes testing impact the use of structured formative assessments. While not identifying whether or not policy stimulates the effective response to data, a key individual committed to structured formative assessment is crucial to implementing those assessments.

Botazakis et al. (2014) refer to balanced literacy as responding to how diverse learners bring their existing knowledge and practices to learning skills and concepts in new ways for new contexts and purposes. While formative assessments serve a purpose in understanding student learning, there is a danger in the overreliance on the autonomous model that fails to address the complexities of becoming college- or career-ready in the 21<sup>st</sup> century (Botazakis et al., 2014). Effective educational reform requires researchers, teachers, and policymakers to carefully examine students' needs and partner with them in their educational journey.

Datnow et al. (2012) found that using data provided by common formative assessments revealed several challenges, such as the narrowing of the curriculum, an overreliance on state assessments, and a lack of data literacy. Policy implications included: guidance and support from the central office, development and implementation of job-embedded professional learning, teacher innovation and collaboration, and intentional funding to improve data literacy and instructional skills. Based on their study, access to data does not equate to improved practice.

## **Instructional Practices**

### *Overview and Definition*

Since ancient times, the Greek philosopher, Socrates, demonstrated the strategy of questioning the learner to facilitate the process of reflection and independent problem-solving (Aubrecht II et al., 2015). In the early nineteenth century, educators began to explore the application of instructional strategies to accommodate larger groups of students. While the overall premise would meet the basic needs of most learners, these instructional strategies were teacher-centered. This exploration led to the twentieth-century shift led by the philosophy of John Dewey (1859-1952) toward student-centered instructional methods focused on higher-order thinking and problem-solving skills. One might argue education returned full circle to Socrates' methods. However, the mid-twentieth-century instructional strategies took it further by emphasizing student-centered learning in an engaging and collaborative environment.

While various learning theories exist (i.e., behavioral, cognitive, and constructivist), for the purpose of this study, learning is defined as the process of causing a change in a learner's knowledge or behavior because of instruction. Effective classroom teachers recognize that a single method is insufficient to meet the multifaceted needs of today's learners. Real-Fernández et al. (2019) incorporate adaptive, personalized, and smart learning models to meet students'

individual needs through instructional strategies. Adaptive learning refers to adapting lessons and activities for learners based on their progress and learning styles. The personalized learning model focuses on the learner's ability to choose their learning path. While these learning models consider the different characteristics of the individual learner, the smart learning method is defined as a technology-based learning model that can dynamically detect and act upon the individual situation, context, needs, and learning style of students, as well as the state of their learning process (Real-Fernández et al., 2019). By distinguishing instructional content from instructional strategy, the smart learning method assigns activities to optimize the outcomes and success of the learner.

Using an adaptable online resource for common formative assessments is a strategy that provides tools for tracking student progress, scoring, and providing feedback to teachers and students. Jarvis (2015) examined the positive power of formative assessment practices as a critical part of the teaching and learning process that has a significant, positive impact on student achievement. By referring to formative assessment as a process rather than a specific task, Jarvis (2015) argues that participation in a variety of formative assessments aligns with three top strategies considered by professor John Hattie (2018) to have a significant effect size on student learning: providing formative evaluation with an effect size of .90, feedback with an effect size of .73, and questioning with an effect size of .46. Further supporting the claims of Black and Wiliam (2010) supports the notion that formative assessment is at the heart of effective teaching. By immersing in understanding the formative assessment as a natural instruction process rather than a summative judgment, educators become more proficient in making a difference in their instructional practices to lift student achievement (Jarvis, 2015, p. 4).

### *Impact of Student Learning*

Professor John Hattie (2018) provided evidence that feedback, with an effect size of .73, is among the most potent influences on student achievement when appropriately implemented and with fidelity (Jarvis, 2015, p. 1). Jarvis (2015) argues that feedback given with grades can have a negative impact, causing students to focus on the grade rather than the feedback. Providing individualized verbal or written feedback to students during an activity on the specific steps towards improvement without a grade allows time for students to self-assess and realign to the assignment.

Real-Fernández et al. (2019) incorporate the current advances in neuroscience and information technologies to provide real adaptive learning in which educational tools are adapted to a personalized learning experience called a Smart Learning system. While personalized learning systems supported by technology are criticized for their resemblance to a black box process of learning that excludes the intervention of the teacher, the research of the Smart Learning system contributes a fundamental role of teachers who are enhanced by technology resources to design personalized learning to facilitate student learning. The correct selection of instructional strategies helps students to focus their attention, motivates them, organizes information for understanding and remembering, and monitors and assesses their learning (Real-Fernández et al., 2019, p. 3). Using common formative assessments to provide feedback is intended to allow students to transfer skills and knowledge to real-life situations, be independent in showing what they know, and encourage self-monitoring and correction toward their own learning.

## **Job-Embedded Professional Learning**

### *Overview and Definition*

Visone (2018) defines the power of a learning school by referencing, "Senge (1990) outlined the tenets of any learning organization, whether the organization is a business, government agency, or school; his seminal work transformed how leaders viewed "the work" of their organizations, which should be focused on learning and growing together" (p. 66). The impact of collegial classroom visits reinforces collective learning and leadership through:

- Empowerment: Equip staff members to make decisions in the best interest of our students and school. Our teachers have sound ideas that can improve what we do.
- Collegiality: Our staff works together to solve problems of practice. We do not work in isolation. What we learn, we share.
- Risk-Taking: We do not advance if we do not try new things and experiment. We are not afraid to do things differently.

Visone (2018) further articulates that collegial visits can help schools deepen their learning and, more concretely, improve their practice. This article further accentuates the need to include collegial visits in the professional learning design and implementation at every school level in our district. By focusing on instruction, collegial visits can facilitate rich dialogue to promote teacher and student learning.

Loughland and Ryan (2021) focused on understanding the antecedents of teachers' sense of collective efficacy in professional learning. With an effect size of 1.57 on student achievement, teachers' sense of collective efficacy is the second most important school-based influence on student outcomes. Loughland and Ryan (2021) referred to five principles of effective teacher-professional learning: collaborative and dialogic, focused on current practice with an

emphasis on student well-being and learning, integrating theory and practice, possessing an explicit theory of action, and is an iterative process with continuous evaluation measures. They further aligned these five principles with the four key motivational sources of collective efficacy beliefs: mastery experiences, vicarious experiences, social persuasion, and affective states. The study concluded that school leaders must offer adequate preparation for developing teachers' social-emotional skills to create the antecedents necessary for a profound and transformative form of collective teacher efficacy (Loughland & Ryan, 2021, p. 9).

Guskey (2014) approached the planning of professional learning using backward design and stated, "The effectiveness of any professional learning activity, regardless of its content, structure, or format, depends mainly on how well it is planned" (p.10). By embedding backward design into planning, educational leaders can "begin with the end in mind" (Guskey, 2014, p12). Guskey (2014) provides the order of steps for professional learning planning as (1) student learning outcomes, (2) new practices implemented, (3) needed organizational support, (4) desired educator knowledge and skills, and (5) optimal professional learning activities. The backward planning case study provided a real-world exemplar of backward planning by using a systematic approach to professional learning to identify and implement a workable solution focused on student learning outcomes.

Tam (2015) correlates the shared beliefs of teachers before and after implementing an intentional, focused professional learning community (PLC). Robust learning environments create teacher change through collaborative learning activities of reflection, observation, action research, and dialog. Tam (2015) states, "Without addressing the underlying deficit beliefs that influence teachers' behavior, launching school-based curriculum does little towards changing practice once teachers return to classrooms and close their doors" (p. 37). Tam (2015) further

aligns with Loughland and Ryan's (2021) emphasis on meeting the social-emotional needs of teachers to develop a solidified form of collective teachers' efficacy. Additionally, it reinforces Guskey's (2014) backward design approach to planning professional learning for teachers.

### *Develop, Align, and Implement*

Zepeda (2019) provided some practical steps to support school leaders and teachers in applying and growing professional learning activities.

1. Allow time to practice with feedback and coaching.
2. Model new skills.
3. Provide authentic encouragement.
4. Create a safe space to brainstorm and learn.
5. Designate time for collaboration that focuses on student learning.
6. Give teachers a voice and choice (pp. 73-86).

Just as teachers strive to create a classroom environment to encourage students to engage, learn, and grow, educational leaders must create district and school environments that encourage teachers to engage, learn, and grow. By monitoring through formal and informal observations, conversations, and evaluations, educational leaders have a better pulse of teachers' needs and the effectiveness of professional learning activities.

### *Identify Barriers*

While recognizing the benefits of coaching are exponential, often, there are financial limitations to additional personnel and on-site instructional coaches. Zepeda (2019) suggests an excellent alternative through peer coaching. Establishing relationships within the organization is not challenging; however, establishing critical friends or friend groups is more complicated. The challenge is developing a group that has established a focus that improves and challenges the

group members. Peer groups can quickly lose focus and regress to a session of complaints or negativity. The critical friends protocols and leadership implications remind an educational leader of the responsibility to support others, break down barriers, establish a level of transparency needed in peer observation, and reflect on the feedback of others to make instructional and curriculum adjustments. It was, furthermore, combatting the challenge of teacher isolation in a small system and creating collaborative planning that encouraged horizontal and vertical conversations.

### *Sustain Continuous Improvement*

Jones and Thessin (2017) reference the overarching question that educators continually reconsider, "How do districts sustain continuous improvement of professional learning that has developed and implemented PLCs successfully?"(p.237). They define sustaining continuous improvement by using PLCs to operate a learning organization that focuses continuous efforts on professional learning to facilitate teacher growth towards creating and improving student assessments and analyzing data to focus on student learning. The article suggests sustainability via a culture shift that exhibits a visible change in the attitudes of administrators that models an organization of learning embedded in trust and continuous improvement. In conclusion, the study by Jones and Thessin (2017) found that "leaders must recognize the importance of PLCs to focus on promoting student learning through a shared vision, safe culture with quality instruction and continuous improvement, necessary and appropriate resources, and behavior that highlights integrity and ethics to establish trust and a safe environment" (p. 237).

### **Chapter Summary**

The research on common formative assessments varies based on historical trends, contextual factors, implementation variations, and professional learning opportunities. The

importance of common formative assessments to inform teachers' instructional practices cannot be understated (Real-Fernández et al., 2019). Instead of concentrating on the quantity of knowledge imparted, Arnove (2020) emphasized focus on what is learned and how it is learned. Much like a professional athlete prepares by reviewing statistics and watching the film to prepare to make a play in the heat of competition, there is a need for teachers to review formative student data and to reflect upon instructional practices to be better equipped to meet the needs of students. The action research study methodology focused on developing and implementing common formative assessments to inform teachers' instructional practices through literature.

Chapter 3 describes an action research methodology and reflects upon the need for future research development, data collection methods, and data analysis techniques. The next chapter provides a detailed description of the interventions of this action research study.

## **Chapter 3**

### **ACTION RESEARCH METHODOLOGY**

The purpose of this action research study was to develop and implement common formative assessments for mathematics teachers to inform instructional practices. To provide identified K-12 mathematics teachers with a tool for measuring student growth during the learning process, the Grantham School District recognized the need to develop, align, and implement common formative assessments in every classroom. This study sought feedback from two teams identified at the district and school levels. The district-level instructional leadership team provided feedback regarding the district's common formative assessment tool's development, alignment, and implementation. Additionally, the school-level teams provided feedback regarding implementing the common formative assessment tool and the impact on the horizontal and vertical alignment of mathematics instruction between grade levels in the school.

The researcher approached the study with some overall questions: Can an online formative assessment tool provide teachers with the capacity to inform instructional practices while simultaneously facilitating horizontal and vertical alignment in mathematics classrooms throughout the district? How will the district instructional leadership team learn to impact the capacity to develop, align, and implement the use of a common formative assessment tool to inform instructional practices in all classrooms district-wide?

The following research questions guided this analysis to address the purpose of this action research study:

1. How can the district instructional leadership team support professional learning for math teachers to develop and implement common formative assessments to inform instructional practices?
2. How do mathematics teachers describe the impact of professional learning on their capacity to utilize common formative assessments as a tool to inform instructional practices?
3. What do Action Research Design Team (ARDT) members learn in the process of leading the design and implementation of common formative assessments in mathematics?

The researcher collaborated with an ARIT to examine the research questions. The team further analyzed a framework for designing and implementing a common formative assessment tool to inform teachers' instructional practices and impact student learning in the mathematics classroom. Data collection incorporated numerous qualitative methods, including surveys, interviews, focus groups, the researcher's journal, and artifacts, further detailed in this chapter.

Chapter 3 outlined the theoretical and conceptual frameworks that guided the study and explained the research design, data collection methods, and data analysis used in this action research study.

### **Rationale For Qualitative Research**

Qualitative research is theoretically significant research that builds on theory or extends current theoretical assumptions (Tracy, 2010). Identifying a "worthy qualitative topic often emerges from disciplinary experiences that are theoretically and conceptually compelling" (Tracy, 2010, p. 840). Tracy (2010) describes comprehensive qualitative research as relevant, timely, significant, interesting, or evocative (p. 840). When considering the significance of a qualitative research study, the researcher will evaluate the study's knowledge, practice, and

politics while considering the impact of the research to expand knowledge and insight, deepen understanding, improve practice, generate further research, and empower critical thinking.

Over time, qualitative research has passed through several historical phases yet maintained key defining characteristics that applied to the field. "Qualitative research is a field of inquiry that crosscuts disciplines and subject matters" (Denzin & Lincoln, 2013, p.5). Through the study of people in their natural settings and immersion into social situations, qualitative research attempts to interpret and achieve a holistic understanding of meaningful experiences. The researcher acts as the primary tool for collecting and analyzing data to interpret findings from the perspective of the research participants.

Qualitative research provides a descriptive explanation of the study's setting, research participants, and related experience to produce findings based on contextualized meaning. Bringing together the subjective lens of the researcher and the research participants forms the context of the findings. Embedded use of member checks and peer review addresses the triangulation issues of the trustworthiness of the methodology that results in a research design that is flexible, iterative, and modifiable when necessary (Bloomberg & Volpe, 2018, pp. 42-43). Qualitative research does not prefer a single methodological practice but rather a set of interpretive actions. The challenge of the researcher's approach is to align the research problem, purpose, and questions.

### **Overview of the Action Research Methods**

The action research process is a systematic, collaborative, and democratic process oriented toward inquiry that seeks practical solutions to people's complex problems in their communities and organizations (McNiff, 2018; Mertler, 2017; Stringer, 2014). Action research directs outcomes to advocate change and improve practice. This type of research is beneficial in

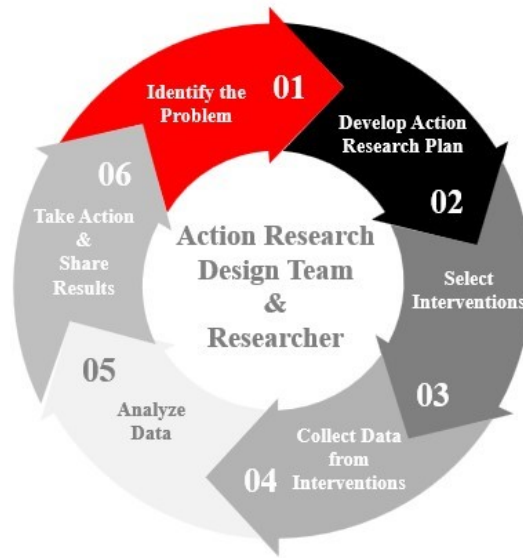
the educational setting that values collaborative and engaging stakeholder involvement in developing solutions to identified issues.

The founder of action research, Kurt Lewin (1890-1947), emphasized that the theory of change employs three phases: unfreezing, changing, and refreezing (Bloomberg & Volpe, 2018). The philosophy of John Dewey (1859-1952) further expanded upon Lewin's theory of change with a focus on the philosophy of experience to improve education in society. McNiff (2018) and Mertler (2017) suggest an ideal mechanism for social justice advocacy in the educational system, and the action research approach can solve initial problems while facilitating long-term sustainability capacity in identifying and addressing new problems.

The action research process employs a cyclical framework that enables the researcher and research participants to collaborate in a shared process that provides definitive procedures for complex issues. The process includes a dynamic and powerful cycle of planning, acting, developing, and reflecting (Mertler, 2017). The framework's cyclical rather than linear nature allows the research to be started at any phase and cycle through the process multiple times (Bloomberg & Volpe, 2018). Figure 3.1 reflects the cyclical nature of the action research process using the following six defined steps:

1. Identify the problem.
2. Develop an action research plan.
3. Select interventions.
4. Collect Data from interventions.
5. Analyze data.
6. Take action and share results.

**Figure 3.1**



*Action Research Process*

*Note.* Adapted from the works of Glanz (2014); Zepeda (2019).

The action research used in this study supported the goals of the Grantham School District to inform instructional practices in mathematics classrooms through the effective use of common formative assessments. District leaders emphasized the importance of embedded professional learning designed to help teachers better understand the intentional design of common formative assessments, the interpretation of student data, and the implementation of effective instructional strategies to improve student learning. In a small district, district leaders must be instructional leaders versed in student data, common formative assessments, and effective instructional strategies to facilitate teachers' implementation of this process. Therefore, action research provides a framework cycle that is systematic, collaborative, and democratic to align the research problem, purpose, and questions (Bloomberg & Volpe, 2018, p. 59).

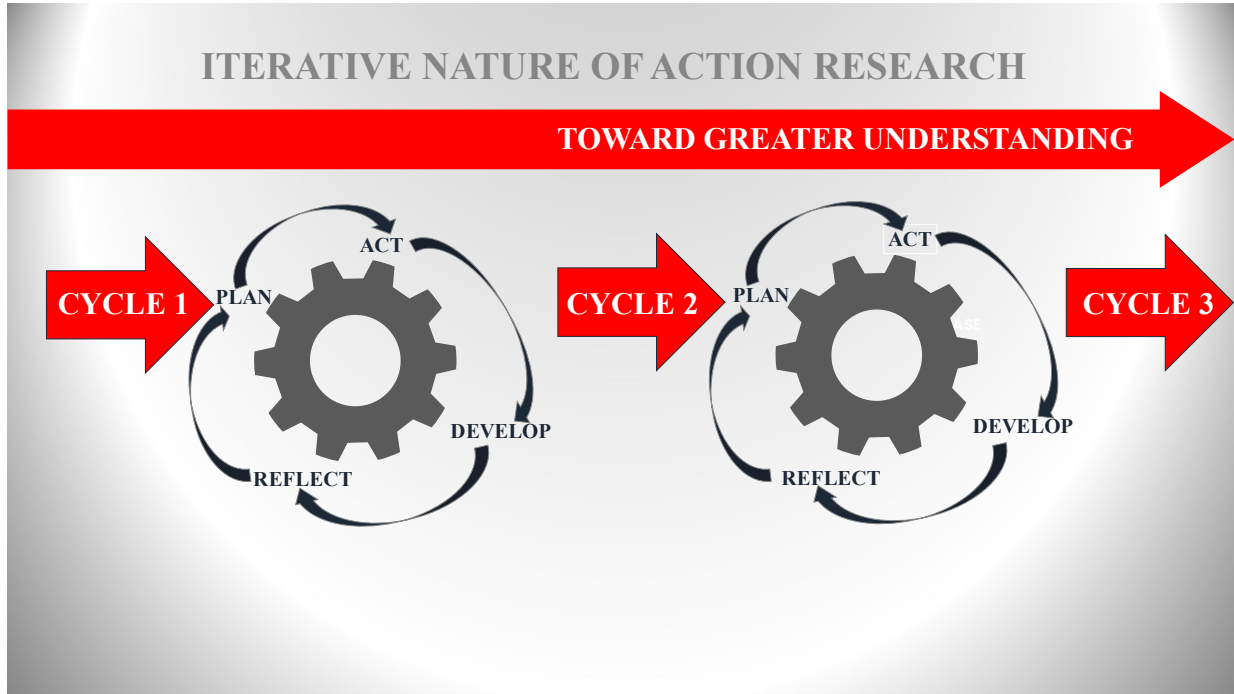
## **Action Research Design**

Originally developed primarily for the professional development of teachers, action research reemerged as a popular way of involving practitioners in improving schools (Glanz, 2014, p.16). As the first educator to include supervisors in action research, Corey explained that they "attempted to solve their practical problems by using the methods of science" (Glanz, 2014, p.16). Action research utilizes an array of methodologies and approaches to examine educational problems in school settings through the implementation of systematic problem-solving and action research designed to empower educators to participate in the process that directly impacts practice (Glanz, 2014, p. 20).

### *The Spiraling and Iterative Nature of Action Research*

Typically, action research is a collaborative and participatory process employing the researcher as a "facilitator who questions, problem-poses, and consults" (Bloomberg & Volpe, 2018, p. 61). McNiff (2018) describes it as "research in action on action for action" (p.14). Figure 3.2 illustrates that this cycle is not linear but rather iterative and spiraling in nature through a process that elicits a cycle of planning, acting, developing, and reflecting—allowing the researcher to start at any phase and cycle through the process multiple times (Bloomberg & Volpe, 2018). Using the logic model, the researcher and participants followed a framework that defined the cycles of this study.

**Figure 3.2**



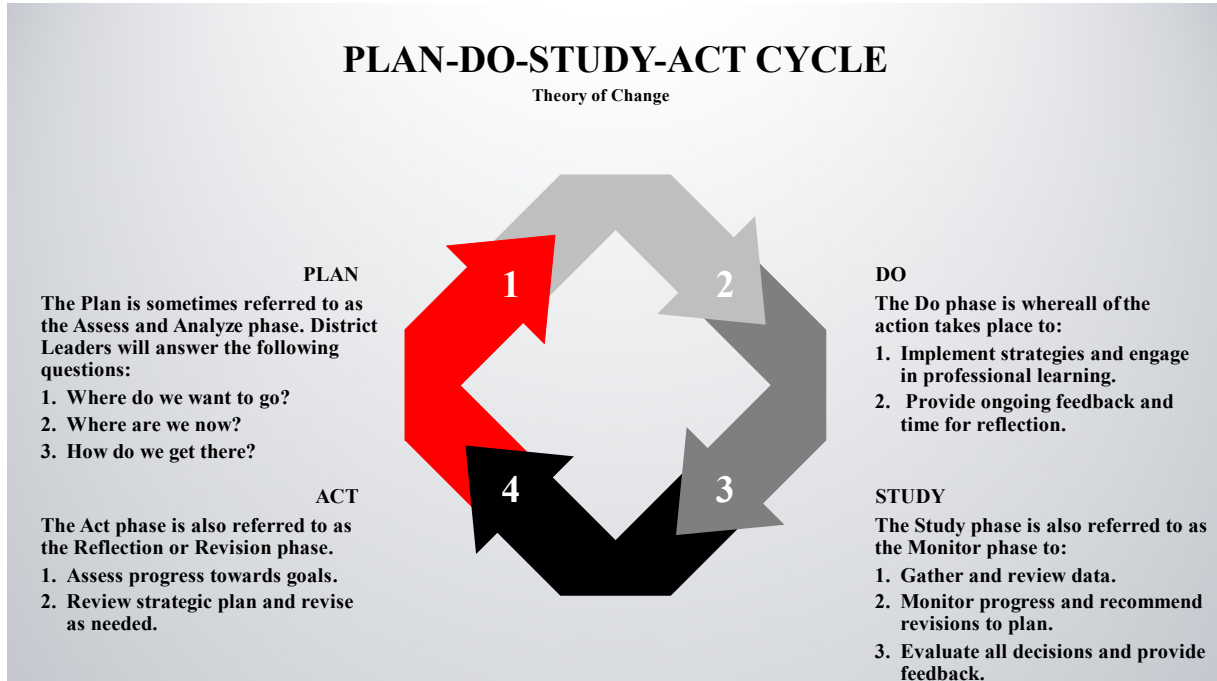
*The Spiraling and Iterative Nature of Action Research*

*Note.* Adapted from the work of Mertler (2017).

*Logic Model*

The logic model for this study utilized a theory of change to articulate a goal for change, and as a result, we planned to invest time and resources to contribute to that change. Figure 3.3 illustrates the model used for the study. The logic model allowed school leaders to learn best practices in supporting data-driven instruction. The researcher examined school leaders' perspectives as they fostered a sense of ownership to impact student learning in the mathematics classroom. Furthermore, teachers learned how to develop and implement common formative assessments to inform instructional practices. Furthermore, aligning the purpose of the study and the overarching research questions built the capacity to meet the personalized needs of students in the mathematics classroom.

**Figure 3.3**



*Logic Model for the Study*

*Note.* Adapted from the works of Fullan (2007); McLaughlin & Mitra (2001).

*Theory of Change*

The theory of change process can be a powerful tool for promoting collaboration and engagement at the community level focused on products and outcomes (Connell & Kubisch, 1998). The study fostered collaboration and developed community capacity within the K-12 mathematics teachers as instructional leaders in the classroom. As Elmore (2004) advised, "Improvement is more a function of learning to do the right things in the settings where you work" p. 73). This study capitalized on the concept that teachers implement lasting change in instructional practice through the knowledge gained from job-embedded professional learning. The theory of change provided a cyclical framework of Plan-Do-Study-Act, creating a favorable environment for teachers to transfer new knowledge into daily practice.

### *The Case*

A case study provides an in-depth investigation of a specific phenomenon that is often bound by context (Merriam, 2009). Frequently, case studies are guided by a series of questions a researcher tries to answer to provide an in-depth, descriptive account (Glanz, 2014). A case study can be used as an exploratory form of inquiry that highlights interaction with research participants and provides a comprehensive illustration of the study (Bloomberg & Volpe, 2018).

The context of the study is a single district comprised of four schools. The case for this study was intentionally focused on job-embedded professional learning for K-12 mathematics teachers at Grantham School District. The study aimed to see how school leaders who use intentionally focused job-embedded professional learning impact the use of common formative assessments in the classroom. Surveys, interviews, focus groups, the researcher's journal, and artifacts provided an in-depth view of how the framework and processes facilitated leaders' support and teachers' perceptions.

### *The Action Research Design Team*

The Action Research Design Team (ARDT) was comprised of Grantham School District (GSD) personnel, including the researcher, the district instructional leadership team, and four assistant principals. Table 3.1 lists the team members, describes their roles in GSD, and provides their years of classroom and administrative experience that helped to define their roles in the research.

**Table 3.1***Action Research Design Team*

<b>Team Member</b>	<b>Primary Role at Grantham School District</b>	<b>Action Research Role</b>
Primary Researcher	Executive Director of Curriculum and Instruction	10 years of classroom experience; 12 years of administrative experience.
ARDT Member 1	Instructional Technology Director	9 years of classroom experience; 3 years of administrative experience.
ARDT Member 2	Assessment/CTAE Director	16 years of classroom experience; 7 years of administrative experience
ARDT Member 3	K-12 Mathematics Lead	26 years of classroom experience teaching
ARDT Member 4	Assistant Principal, Primary	26 years of classroom experience; 2 years of administrative experience.
ARDT Member 5	Assistant Principal, Elementary	9 years of classroom experience; 2 years of administrative experience.
ARDT Member 6	Assistant Principal, Middle	19 years of classroom experience; 5 years of administrative experience.
ARDT Member 7	Assistant Principal, High	20 years of classroom experience; 4 years of administrative experience.

The primary researcher served as the Executive Director of Curriculum and Instruction for the Grantham School District and had a vested interest in examining how to impact student learning using common formative assessments to inform teachers' instructional practices. The

Instructional Technology Director and Assessment/CTAE Director served on the ARDT to provide a whole-district perspective. The K-12 Mathematics Lead provided a wealth of knowledge regarding practical methods of using common formative assessments and sound instructional practices in developing the interventions. The assistant principals represented the perspectives of teachers and students at each school level within the district.

The ARDT members were selected for their leadership and instructional experience. The ARDT worked to create and implement interventions designed to address the identified challenges in the problem of practice. The researcher worked collaboratively with the ARDT to develop interventions aimed at finding solutions for the action research participants.

#### *The Action Research Implementation Team*

The ARIT members were comprised of the researcher, three instructional coaches, and K-12 mathematics teachers. The researcher asked the K-12 mathematics teachers and instructional coaches to participate in the study at the beginning of the 2022-2023 school year. The consent form outlined the research aims and potential benefits to teachers and instructional coaches. The K-12 mathematics teachers brought a wide range of classroom experience teaching mathematics to the study. Additionally, the instructional coaches were selected to study the nature of their roles within each school that required them to observe and give feedback to mathematics teachers regarding their instructional practices.

#### *Research Plan and Timeline*

A reflective process is a powerful approach to professional development (Osterman & Kottkamp, 2001; Glanz, 2014). Glanz (2014) asserted, "[r]eflective practice is a process by which educational leaders take the time to contemplate and assess the efficacy of programs, products, and personnel in order to make judgments...so that improvements or refinements

might be achieved" (p. 24). He further suggested that continuous reflection and action are imperative to sustained improvement. The action research timeline in Table 3.3 outlines the cycles of reflection and action used in the study. The entire timeline took place in the 2022-2023 school year.

**Table 3.2**

*Action Research Timeline*

<b>Date</b>	<b>Action Research Activity</b>
July 2022	<ul style="list-style-type: none"> <li>• Secured consent to participate in the study</li> </ul>
August 2022	<ul style="list-style-type: none"> <li>• ARIT plans professional learning</li> <li>• ARDT Weekly Meetings</li> <li>• Initial Meeting of ARIT</li> <li>• Action Research Cycle 1 and Intervention Implemented</li> <li>• Collected Artifacts</li> <li>• Researcher's Journal- record data/reflections</li> </ul>
September 2022	<ul style="list-style-type: none"> <li>• ARDT Weekly Meeting</li> <li>• Action Research Cycle 1 and Intervention Completed</li> <li>• Action Research Cycle 2 and Intervention Implemented</li> <li>• Administer Assessment Literacy Inventory survey to ARIT</li> <li>• One-on-One Interviews</li> <li>• Collected Artifacts</li> <li>• Researcher's Journal- record data/reflections</li> </ul>
October 2022	<ul style="list-style-type: none"> <li>• ARDT Weekly Meeting</li> <li>• Action Research Cycle 2 and Intervention Completed</li> <li>• Collected Artifacts</li> <li>• Researcher's Journal- record data/reflections</li> </ul>
November 2022	<ul style="list-style-type: none"> <li>• ARDT Weekly Meeting</li> <li>• Action Research Cycle 3 and Intervention Implemented</li> <li>• Focus Group</li> <li>• Collected Artifacts</li> <li>• Researcher's Journal- record data/reflections</li> </ul>
December 2022	<ul style="list-style-type: none"> <li>• ARDT Weekly Meeting</li> <li>• Action Research Cycle 3 and Intervention Completed</li> <li>• Collected Artifacts</li> <li>• Researcher's Journal- record data/reflections</li> </ul>
January 2023	<ul style="list-style-type: none"> <li>• Appropriate Follow-up activities</li> </ul>

## **Context of the Study**

This action research study took place in Grantham School District (GSD), one of 21 public city school systems in the southeastern region of the United States. The unique nature of the school district, a small city within a large county, includes some students who live within the city while others live outside the city in a more rural setting. The district's four school zones included boundaries within the city limits and an area outside the city limits in an adjoining county. Additionally, a reciprocal enrollment agreement existed with the neighboring school system.

At the time of the study, enrollment was approximately 2,000 students enrolled from prekindergarten to 12th grade. Grantham School District employed slightly over 250 staff members who served the students in four schools on three campuses. The middle and high schools were housed on the same campus and shared certified staff who taught elective courses such as band, foreign language, and Junior Reserve Officer Training Corps (JROTC). The student body demographic makeup was 1% Asian, 3% multi-racial, 5% Hispanic, 20% black, and 70% white. The Free and Reduced Lunch Rate was 48%, and approximately 60% of the homes in the system were rentals. 17.7% of the students received gifted services, and 10.7% received special education services.

## **Data Sources**

The Grantham School District recognized the need to develop, align, and implement common formative assessments in every classroom to provide teachers with a tool for measuring student growth during the learning process. This action research study aimed to develop and implement common formative assessments to inform instructional practices for mathematics teachers. This study sought feedback from two teams identified at the district and school levels.

The district-level instructional leadership team provided feedback regarding the district's common formative assessment tool's development, alignment, and implementation. Additionally, the school-level teams provided feedback regarding implementing the common formative assessment tool and the impact on the horizontal and vertical alignment of mathematics instruction between grade levels in the school.

### *Participants*

At the time of the study, Grantham School District emphasized using Edulastic as the tool for common formative assessments for teachers to inform instructional practices and improve student achievement. Participants represented a broad range of professional experiences and educational backgrounds. The ARDT included the Executive Director of Curriculum and Instruction, the Instructional Technology Director, the Assessment/CTAE Director, the K-12 Mathematics Lead, and four assistant principals. Subsequently, the ARIT consisted of K-12 mathematics teachers and instructional coaches.

### *Selection Criteria*

The selection of participants for this action research study was purposeful and incorporated participants whose current roles were the goals of the study (Stringer, 2014). The ARDT incorporated a group of district-level administrators with experience in designing, implementing, and monitoring professional learning that built the capacity of school leaders and teachers to use common formative assessments to inform instructional practices. The selection criteria were determined to enhance the researcher's insight into the perceptions and experiences of the participants in the context of the research questions. Consequently, K-12 mathematics teachers were members of the ARDT.

While both groups participated voluntarily, there were no requirements regarding years of experience as an administrator or a mathematics teacher. The ARDT participated in interviews and bi-weekly meetings to provide feedback regarding the design, implementation, and monitoring of professional learning to build the capacity of school-level leaders and mathematics teachers. The identified mathematics teachers agreed to use a predetermined common formative assessment tool on a specified schedule. Additionally, the ARIT members engaged in asynchronous surveys and synchronous focus groups to provide feedback on implementing common formative assessments to inform instructional practices. The sample size of both groups was determined by the selection criteria and willingness to participate.

### **Data Collection Methods**

Qualitative measures informed this action research. Merriam (2009) defines qualitative measures as data gathered from what people say and observe. Under the guidance of a foundational theoretical framework for the action research study, the qualitative data reflected the insights, reasoning, and motivation of the research participants collected through various qualitative methods. For this case study, the data collection incorporated numerous qualitative methods: surveys, interviews, focus groups, the researcher's journal, and artifacts (Mertler, 2017). The qualitative cycles developed by the ARDT guided the collaborative work of the ARIT, resulting in findings.

#### *Surveys*

Glanz (2014) suggests that qualitative surveys use open-ended questions to produce written or typed answers. The questions solicited the participants' opinions, experiences, narratives, or accounts of the action research study (Glanz, 2014). Survey research aims to "generalize from a sample to a population so that inferences can be made about this population's

characteristics, attitude, or behavior" (Creswell, 2014, p. 157). Online surveys were a precursor to the interviews and a focus group to identify initial themes, biases, and issues.

The researcher employed the survey from Mertler and Campbell (2005), the Assessment Literacy Inventory (ALI), and encompassed the seven comprehensive standards of classroom assessment knowledge, skills, and competence required of teachers (Stiggins, 1999). The ALI incorporated questions that connected assessment to a clear purpose and clarified achievement expectations. By applying proper assessment techniques and using developed quality assessments and rubrics, teachers avoided assessment bias while soliciting effective student feedback and using the assessment to inform instruction (Stiggins, 1999).

An ALI survey was used at the beginning of the second action research cycle to identify prior knowledge of assessments of mathematics teachers. The ARIT analyzed the results of the surveys to determine the design of professional learning on the capacity of teachers to use common formative assessments to inform instructional practices. The survey results were used to make the necessary adjustments to the action plan throughout the process.

### *Interviews*

Individual interviews with the assistant principals occurred at the beginning of the action research process. Interviews incorporated a conversational dialogue with each assistant principal to determine how they described the impact of professional learning on their capacity to support the use of a common formative assessment tool to inform instructional practices in mathematics classrooms (Glanz, 2014). The interview questions were crafted to allow the researcher to get the participants' perspectives directly and dig deeper than what could be observed (Kemmis et al., 2014; Merriam, 2009).

The researcher used critical incident interview questions to allow the assistant principals to describe when the process worked and did not. The critical incident technique was an exploratory qualitative method of research that was reliable and provided a comprehensive depiction of the study (Woolsey, 2011). Flanagan (1954) summarized that using the critical incident interview technique allows the researcher to follow a framework that facilitates direct observation of human behavior in solving relevant problems. The critical incident technique allowed for a straightforward qualitative approach, clearly defined data collection and analysis guidelines, focused on real-life human experiences, enabled the development of practical outcomes, and allowed for flexibility (Hughes, 2006).

Participants, including assistant principals, instructional coaches, and principals, were interviewed individually, allowing them to speak freely and remain uninfluenced by the responses of the others. The researcher used critical incident questions connected to all three research questions. Interviews were recorded via a voice recording device for the purpose of transcription and analysis.

### *Focus Group*

The researcher conducted a focus group session with the research implementation team to gain the thoughts and opinions of the participants of the study using guidelines provided by Eliot and Associates (2005). The focus group was initiated at the mid-point of the action research study to gain the mathematics teachers' perspectives and adjust the action research cycle. As in the interviews, the focus group intended to draw out and examine personal experiences, perceptions, and values without focusing on one-on-one interactions (Hall, 2020).

The focus group included mathematics teachers and instructional coaches with existing relationships that encouraged honest, collaborative dialogue (Roulston, 2010). The focus group

was structured so that the researcher was the facilitator in managing the conversation while extracting data. The researcher began each session with a ranking exercise through a semi-structured format that “allowed participants to rank instructional strategies and assessment protocol in order of importance” (Hall, 2020, p. 48). Open-ended questions designed to facilitate dialogue and prompt further clarification from the researcher followed the ranking activity. The focus group structure also allowed the members of the action research team to express a range of feelings, opinions, and ideas; understand differences in perspectives; uncover and provide insight into factors that influence opinions; and seek ideas that emerge from the group (Kreuger, 2002). The focus group interviews were recorded using a voice recorder for transcription and analysis.

#### *Researcher’s Journal*

The researcher used multiple data sources to collect data, address each research question, and provide reliable results. Using a reflexive journal provided a tracking system of thoughts and discoveries throughout the action research process. These reflections served to help the researcher identify themes, biases, and issues that occurred in surveys, interviews, and focus groups. Reflexive journaling allowed the researcher to assess and reflect on the actions, thoughts, and emotions experienced while analyzing the data (Coughlan & Brannick, 2014). The researcher used the journal to capture weekly thoughts on the action research process and reflect upon personal beliefs and biases that may predispose to reason for data that points to a particular conclusion.

#### *Artifacts*

Documents were collected to provide additional context to the purpose of the study and support the action research process (Merriam, 2009). Documents, including teaching artifacts, provided additional context about the focus of the study, and these documents were used to

corroborate observations and other data. The ARIT created documents during the planning phase, while others were designed during the action research process. The researcher used a color-coding digital tracking system in Google Sheets to label participants' responses by topic and preserved anonymity when reading the transcription. The colors represented emerging themes and allowed the researcher to visualize the critical themes of the surveys, interviews, and focus.

Bloomberg and Volpe (2018) state, "while the analysis of documents is potentially rich in portraying participants' values and beliefs in a particular setting, documents are neutral, transparent reflections" (p. 196). The researcher compared all documentation using the tracking system and created categories based on shared characteristics or features of the data. As an integral part of the conclusive findings of the study, the researcher noted how the categories "transcended the reality of data and progressed toward the thematic, conceptual, and theoretical levels" (Bloomberg & Volpe, 2018, p. 214).

### **Interventions**

The purpose of this study was to determine the impact of professional learning on the capacity of mathematics teachers to develop and utilize common formative assessments as a tool to inform instructional practices, precisely their capacity to replicate and sustain this process to impact student learning longitudinally. As the Executive Director of Curriculum and Instruction, the researcher facilitated professional learning for administrators and teachers using a common formative assessment tool, Edulastic, to inform instructional practices.

Edulastic was an online digital tool selected by teachers through a district-wide process that identified a platform for common formative assessments. This online platform provided a database of vetted questions and the option to create an assessment. The district implemented a

soft rollout targeting specific grade levels in the 2022 school year. In the 2023 school year, every grade level was targeted to use Edulastic as a formative tool once a month. An Edulastic professional learning module was initiated during the first month of school for all new and returning staff to jump-start the school year. This module included the definition and purpose of common formative assessments and how to develop a formative assessment using Edulastic. Additionally, the module provided interactive features for accessing and interpreting formative results using the reporting features of Edulastic. Participants used these formative results to adjust instructional practices to maximize student learning.

This professional learning module provided both synchronous and asynchronous learning experiences. All teachers and administrators participated in synchronous training facilitated by the researcher and the ARDT members. This team posted the sessions on each subcategory of the module for the staff to access asynchronously via the district's intranet. Both synchronous and asynchronous sessions allowed the opportunity for staff to ask questions or provide feedback via a Google Form.

During the synchronous sessions, staff engaged in practical, real-time activities using Edulastic to improve their knowledge and skills in assessment development, data analysis, and instructional alignment. Instruction and practice focused on best practices for common formative assessment design, including alignment to the standards and selection of questions representative of Norman Webb's Depth-of-Knowledge (DOK) schema during these modules. The overall goal was to provide teachers and administrators with the knowledge, skills, and tools to increase their capacity to develop, implement, and analyze common formative assessments directly related to instructional practices with greater fidelity.

The researcher's and ARDT members' primary roles were to design and facilitate the Edulastic professional learning modules. Weekly meetings allowed this team to discuss and evaluate the effectiveness of the professional learning modules, synchronous and asynchronous. The ARDT employed a tracking system to identify all professional learning modules, staff feedback, the Edulastic tool usage, and student achievement data.

This action research study consisted of three cycles based on the Plan-Do-Study-Act framework. The action research cycles began in August 2022 and ended in January 2023. The ARDT planned, executed, and evaluated the use of Edulastic to administer common formative assessments to inform instructional practices to improve student learning in mathematics classrooms.

### **Data Analysis Methods**

Data analysis consists of organizing the data collected to find meaningful patterns, themes, or relationships for interpretation (Glanz, 2014). Bloomberg and Volpe (2018) note that data analysis looks across the data set and applies multiple coding processes that combine to create categories that reflect essential concepts of the data. This study followed Glanz's (2014) framework for data analysis of organizing and coding data to generate themes for analysis and interpretation.

#### *Coding*

In qualitative research, coding is a strategy for managing large volumes of data and reducing it meaningfully (Bloomberg & Volpe, 2018). This iterative process allows the researcher to categorize themes within the study's theoretical framework and assign codes relevant to the theme. While initial coding categories are deductively obtained from the literature, additional coding will emerge inductively for the researcher from experience and data

because of the intervention cycles of the research. Both deductive and inductive methods are needed for the researcher to gain accurate and meaningful insight into the data. The data gathered in this study were analyzed using data analysis methods suitable for a qualitative study, and the research questions guided the inductive coding process. During and after data collection, the coding schema was interpreted and analyzed by the ARIT for any discrepancies. Table 3.3 offers a sampling of codes, their meaning, and data examples.

**Table 3.3**

*Code Sampling for Data*

<b>Code</b>	<b>Meaning</b>	<b>Data Examples</b>
T	Time	“I really feel like if you ask be what the biggest barrier would be, it’s that on uninterrupted time, to be able to develop and implement these types of assessments,” stated an elementary teacher.
CFA	Common Formative Assessment	“A new Edulastic common formative assessment is created and implemented based on the standards being taught, and the data collected from these assessments is usually used in a data talk,” responded an elementary teacher.
IP	Instructional Practices	“Because I think it all starts with quality instruction,” stated a middle school instructional coach.

*Thematic Analysis*

During and after data collection, the coding schema was interpreted and analyzed through a process known as thematic analysis. The thematic analysis focuses on the identification and interpretation of data. This framework allows the researcher a structure that reflects the high standards of ethical practice for reporting research findings and interpretations (Peel, 2020). The phases of thematic analysis and procedures for establishing the trustworthiness of the data are provided in Table 3.4.

**Table 3.4***Phases of Thematic Analysis and Establishing Trustworthiness*

<b>Phases of Thematic Analysis</b>	<b>Means of Establishing Trustworthiness</b>
Phase 1: Familiarizing with the Data	<ul style="list-style-type: none"> <li>• Prolong engagement with data</li> <li>• Triangulate different data and collection modes</li> <li>• Document theoretical and reflective thoughts</li> <li>• Document thoughts about potential codes/themes</li> <li>• Store raw data in well-organized archives</li> <li>• Keep records of all data field notes, transcripts, and reflective journals</li> </ul>
Phase 2: Generating Initial Codes	<ul style="list-style-type: none"> <li>• Peer debriefing</li> <li>• Researcher triangulation</li> <li>• Reflective journaling</li> <li>• Use of a coding framework</li> <li>• Audit trail of code generation</li> <li>• Documentation of all team meetings and peer debriefings</li> </ul>
Phase 3: Searching for Themes	<ul style="list-style-type: none"> <li>• Researcher triangulation</li> <li>• Diagramming to make sense of theme connections</li> <li>• Keep detailed notes about the development and hierarchies of concepts and themes</li> </ul>
Phase 4: Reviewing Themes	<ul style="list-style-type: none"> <li>• Researcher triangulation</li> <li>• Themes and subthemes vetted by team members</li> <li>• Test for referential adequacy by returning to raw data</li> </ul>
Phase 5: Defining and Naming Themes	<ul style="list-style-type: none"> <li>• Researcher triangulation</li> <li>• Peer debriefing</li> <li>• Team consensus on themes</li> <li>• Documentation of team meetings regarding themes</li> <li>• Documentation of theme naming</li> <li>• Member Checking</li> </ul>
Phase 6: Producing the Report	<ul style="list-style-type: none"> <li>• Peer debriefing</li> <li>• Describing the process of coding and analysis</li> <li>• Thick descriptions of context</li> <li>• Description of the audit trail</li> <li>• Report on reasons for theoretical, methodological, and analytical choices throughout the entire study.</li> </ul>

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*Notes.* Adapted from the works of Nowell et al. (2017).

Qualitative research methods require the researcher to act as the instrument of analysis. It is essential to employ a coding system and find themes to reduce the researcher's bias influence and improve the study's trustworthiness. By adhering to the coding system and identifying themes reflected in Table 3.3, the researcher reduces bias, improves trustworthiness, and strengthens the reliability and validity of the study (Bloomberg & Volpe, 2018; Nowell et al., 2017).

### **Reliability, Validity, and Generalizability**

This research study aimed to address a situationally specific problem in a defined context and setting, thus impeding its broad impact. As Coghlan and Brannick (2014) report, "action research projects are situation-specific and do not aim to create universal knowledge" (p. 172). The researcher worked to establish the validity and reliability of the action research study's data using four validation strategies: credibility, transferability, confirmability, and dependability (Bloomberg & Volpe, 2018).

Due to the limited nature of this action research study, elements of the study may be generalized or replicated in other studies to depict dependability. The researcher and the ARDT employed various sources and methods to provide an in-depth understanding and authentic representation of the findings to triangulate the data. The various sources and methods included the incorporation of reflexive journaling, the engagement of field engagement, the presentation of thick description, the search for discrepant findings, the incorporation of member checks of interview transcripts, and the enhancement of peer debriefing to ensure accuracy (Bloomberg & Volpe, 2018).

Bloomberg and Volpe (2018) emphasized, "qualitative research aims not to produce truths generalized to other people or settings but rather to develop descriptive findings applied in

other contexts” (p. 205). While qualitative researchers do not pretend to achieve objectivity, it is critical to “illustrate how the data can be traced back to its origins” (Bloomberg & Volpe, 2018, p. 205). The researcher used member checking to measure confirmability that bias did not skew the interpretation of the data to fit a predetermined outcome. By regularly using a reflexive journal and soliciting input and feedback from the ARIT, the researcher established a step-by-step analysis of the data to support that the study’s findings accurately portrayed the participants’ responses.

Finally, the researcher reviewed the action research process, and the data analysis aligned with the research questions. The researcher used carefully selected survey and interview questions, intentionally designed observation rubrics, and strategically facilitated focus groups to provide credibility to the study. Discrepancies were noted in the findings when data indicated an outlier and did not generate a code. This data collection provided an audit trail to inform the reader and confirm an appropriate and viable research design (Bloomberg & Volpe, 2018).

Acknowledging the restrictions of an action research study that used qualitative methods, the researcher addressed the study’s trustworthiness by systematically cross-checking the data and findings using procedures and processes designed to interpret and explain through a triangulation of methods and sources (Bloomberg & Volpe, 2018). The researcher employed member checking with the action research design and implementation teams to review the data collected, data analysis, and data reports to ensure the accuracy of perspectives and experiences (Stringer, 2014).

### **Subjectivity Statement**

Action research is an ongoing process used by practitioners to improve schools. The action research cycle consists of five components: reflect, select a focus, collect data, analyze

and interpret data, and take action (Glanz, 2014). Reflective practice is a fundamental process for educational leaders to guide during action research to improve schools. Bourke (2014) asserts that these reflections often illustrate the practitioner's positionality and the potential effects on the research, participants, and researcher. While researchers strive to remain objective, they must remain cognizant that eliminating subjectivity is not feasible. Professional and personal biases and experiences will shape the lens of the action research process. Therefore, it is imperative as researchers to recognize our own biases, acknowledge the impact that they may have on the action research process, and identify how to incorporate them into the process.

As the Executive Director of Curriculum and Instruction for the district, the researcher supported teachers and administrative teams of all schools in the district through the development, implementation, and monitoring of embedded professional learning specifically designed to support the district's mission and vision of student achievement, readiness, and engagement highlighted in the five-year strategic plan. By previously acting as a mathematics instructional coach in the middle and high schools and as the Assessment and Accountability Director for the district, the researcher developed positive relationships and established a level of transparency and trust with teachers and administrators at all schools. As the landscape of education drastically changed due to the COVID-19 pandemic, the researcher was instrumental in developing and communicating a return-to-school roadmap designed to meet the needs of all students and staff in a volatile and fluid environment. Throughout the study, the researcher acknowledged the insider and outsider roles' impact on positionality.

With an undergraduate degree in psychology and a master's degree in special education, the researcher had an acute awareness of both the skill set and biases that could potentially impact the reflective process of this action research process. Additionally, the researcher had

lived and worked in a suburban private school and a large public metropolitan school system. To neutralize any negative impact of preconceived ideas or biases due to personal or professional experiences, the researcher described, interpreted, and analyzed data through a critical lens with input from the ARDT and the ARIT.

Participation in the action research process was strictly voluntary, and the researcher maintained transparency of actions and confidentiality of all qualitative data collected from the participants. The researcher assured participants, verbally and in writing, that their withdrawal from the action research study would not impact their employment.

### **Limitations**

Limitations of a study are indicated by Bloomberg and Volpe (2018) as “those characteristics of design or methodology that impacted or influenced the interpretation of the findings from your research” (p. 207). The limitations of this study arose from the nature of qualitative research. The researcher served as a participant and observer in the study, which influenced the amount of researcher bias. Merriam (2009) asserts that the participant-observer role will impact the study by providing guidance and facilitating collective sense-making of the data. Additionally, the researcher held a position of power within the district, limiting the findings. Participation in the research was voluntary and would not impact any participant’s current role or position within the district. Additionally, the researcher strove to establish an environment free of evaluation to encourage participants to exchange dialogue and perspectives openly.

Other limitations were due to the specific context of the study. The small size of the school district impacted the number of participants. Another limitation was the timing and length

of the study. The study was conducted from August 2022 to January 2023, which prescribed the number of intervention cycles, limiting the diversity of experiences throughout the study.

Inherently, case studies have limitations but are suitable for research in complex social units (Merriam, 2009). The real-life application of mathematics using common formative assessments to inform instructional practices was well-suited for an action research case study despite the limitations because the findings offer insight into possible avenues of sustainable development.

### **Chapter Summary**

This chapter describes the data collection and analysis methods used in this action research study. Action research was preferred because of the iterative focus on action and reflection. The research focused on the development and implementation of job-embedded professional learning by the ARDT to impact the use of common formative assessments to inform instructional practices of K-12 mathematics teachers. Surveys, interviews, focus groups, the researcher's journal, and artifacts were used as data sources. All data collected were coded and analyzed for the themes, patterns, and relationships as they related to the research questions.

The next chapter presents the findings of the study in the Grantham School District (GSD). The case study within the context of job-embedded professional learning supporting K-12 mathematics teachers in using common formative assessments to inform instructional practices to impact student learning is described in detail. The interventions and cycles of action are also detailed in Chapter 4.

## CHAPTER 4

### FINDINGS FROM THE ACTION RESEARCH CASE

In K-12 education, there continues to be a disparity in the development and implementation of common formative assessments to inform the instructional practices of mathematics teachers (Schoenfield, 2015). As educators seek to refine the process of designing and implementing common formative assessment practices in digital and face-to-face classroom environments, research highlights the use of an online formative assessment tool that affects the teaching and learning processes (González-Gómez et al., 2020). The purpose of this action research study was to develop and implement common formative assessments for mathematics teachers to inform instructional practices. The following research questions guided this action research study:

1. How can the district instructional leadership team support professional learning for math teachers to develop and implement common formative assessments to inform instructional practices?
2. How do mathematics teachers describe the impact of professional learning on their capacity to utilize common formative assessments as a tool to inform instructional practices?
3. What do Action Research Design Team (ARDT) members learn in the process of leading the design and implementation of common formative assessments in mathematics?

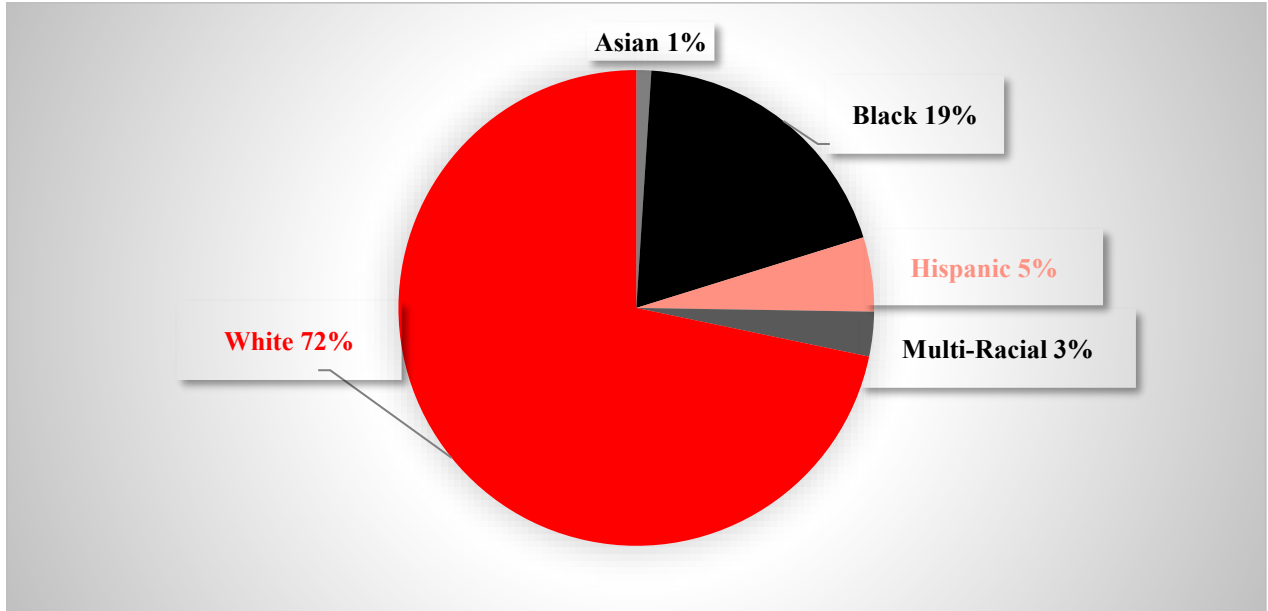
Chapter 4 explores the context of the case study, a description of problem-framing, and the story of the research conducted by the ARDT and the Action Research Implementation Team

(ARIT). The context includes a description of the district and the problem-framing in the context of Grantham School District (GSD). This chapter presents the findings from the case study in correspondence to the action research cycles, the perspectives of the ARDT, and the direct input of the ARIT to paint a comprehensive picture of the case study.

### **Context of the Study**

Grantham School District (GSD) is a small, semi-rural public city school district. Since 2016, GSD has operated under the terms of a Strategic Waiver School System (SWSS) partnership contract with the State Board of Education. The SWSS agreement allowed the district to exercise flexibility to increase student achievement. The district used the SWSS waivers in academic programs, human resources, and finance. GSD exercised flexibility in class size, graduation requirements, educational programs, and professional learning and made decisions in an effort to meet the student population's needs. The student body demographic makeup at the time of the study was 1% Asian, 3% multi-racial, 5% Hispanic, 19% black, and 72% white. The Free and Reduced Lunch Rate was 48%, and approximately 60% of the homes in the system were rentals. 17.7% of the students received gifted services, and 10.7% received special education services. Indicated in Figure 4.1 are the GSD student-reported demographics.

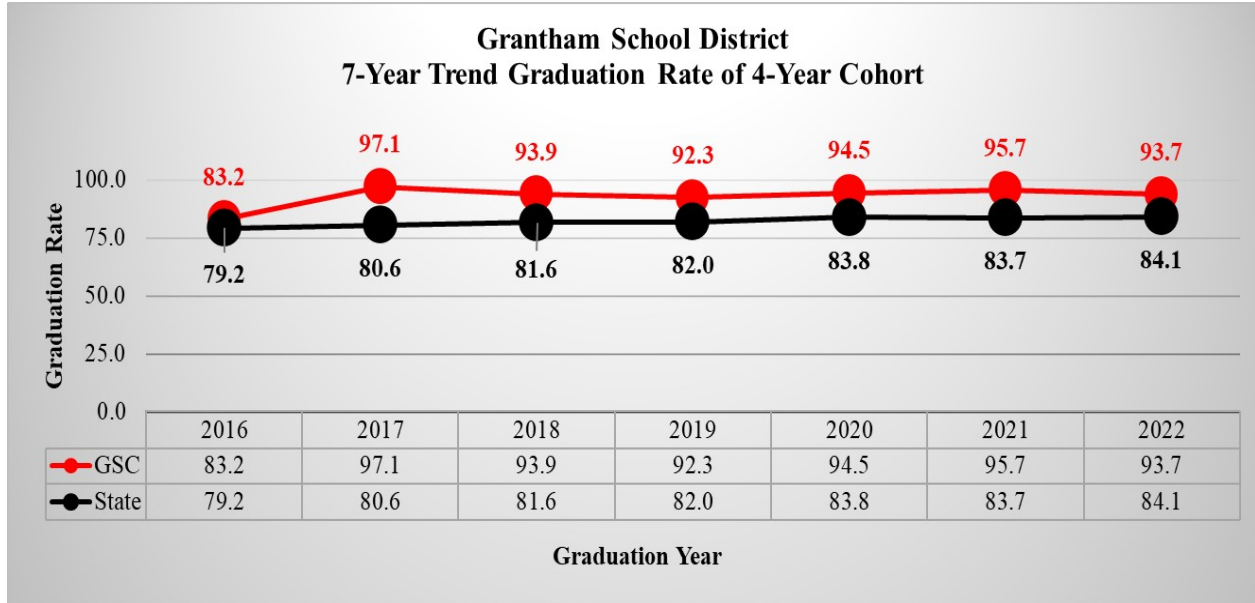
**Figure 4.1**



*2022 Student Demographics in Grantham School District*

GSD continued a trajectory of performing consistently above a 90% graduation rate and well above the state rate with an intentional focus on increased academic expectations. Figure 4.2 references a 7-year graduation rate trend for GSD and the state. The adjusted cohort graduation rate defines the cohort based on when a student first becomes a freshman. The data calculated uses the number of students who graduate within four years. The gains made by GSD reflect the hard work and dedication of the system as a whole and the community at large to prioritize students' success.

**Figure 4.2**



*7-Year Trend Graduation Rate of GSD and State*

Despite the district’s emphasis on increased academic expectations and the consistent trajectory of the 4-year cohort graduation rates, GSD students continued to underperform in mathematics achievement, reflected in milestone assessment results. In the spring of 2022, the percentage of students who scored proficient and distinguished increased only in third, fifth, and eighth grades and Algebra 1. However, the percentage of students who scored proficient and distinguished in mathematics did not exceed the 50<sup>th</sup> percentile in any grade level or course, as depicted in Figure 4.3.

**Figure 4.3**

<b>GSD EOG Multi-Year Trend (% Proficient &amp; Distinguished)</b>					
	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2021</b>	<b>2022</b>
<b>3rd Grade Math</b>	55%	47%	51%	41%	<b>49%</b>
<b>4th Grade Math</b>	50%	57%	45%	46%	43%
<b>5th Grade Math</b>	31%	39%	42%	46%	<b>50%</b>
<b>GSD EOG &amp; EOC Multi-Year Trend (% Proficient &amp; Distinguished)</b>					
	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2021</b>	<b>2022</b>
<b>6th Grade Math</b>	39%	33%	39%	32%	29%
<b>7th Grade Math</b>	49%	37%	39%	34%	34%
<b>8th Grade Math</b>	52%	45%	33%	24%	<b>27%</b>
<b>Algebra 1</b>				70%	30%
<b>GSD EOC Multi-Year Trend (% Proficient &amp; Distinguished)</b>					
	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2021</b>	<b>2022</b>
<b>Coordinate Algebra</b>	20%				
<b>Algebra 1</b>		50%	22%	18%	<b>20%</b>
<b>Analytic Geometry</b>	34%				
<b>Geometry</b>		26%	61%		

*Multi-Year Trend of the Percentage of Proficient and Distinguished Scores in Mathematics*

Drilling further into the study context, GSD administered the Measures of Academic Progress (MAP) to all kindergarten through eighth-grade students. The MAP is an adaptive assessment that measures student growth in reading, math, and language skills and is administered three times a year in the fall, winter, and spring. Much like the results indicated by the milestones trend data, the MAP trend data reflected students performing below the mean norm in mathematics, specifically in third through eighth grades. Figure 4.4 provides a 3-year trend of kindergarten through 2<sup>nd</sup> grade. Figure 4.5 reflects the 3<sup>rd</sup> through 5<sup>th</sup>-grade 3-year trend,

and Figure 4.6 represents the 6<sup>th</sup> through 8<sup>th</sup>-grade 3-year trend of students' MAP scores in mathematics.

**Figure 4.4**

<b>GSD K-2nd Grades 3-Year Trend of MAP Scores</b>							
<b>2020 Growth Norms used in this comparative data</b>							
<b>FALL</b>	<b>Norm</b>	<b>Current 2nd</b>		<b>Current 1st</b>		<b>Current K</b>	
Math - 2	175.04	2022-2023	194.1				
Math - 1	160.05	2021-2022	158.6	2022-2023	161.9		
Math - K	139.56	2020-2021	151.3	2021-2022	141.9	2022-2023	141.4
<b>WINTER</b>	<b>Norm</b>	<b>Current 2nd</b>		<b>Current 1st</b>		<b>Current K</b>	
Math - 2	184.07	2022-2023					
Math - 1	170.18	2021-2022	166.2	2022-2023			
Math - K	150.13	2020-2021	150.6	2021-2022	151.6	2022-2023	
<b>SPRING</b>	<b>Norm</b>	<b>Current 2nd</b>		<b>Current 1st</b>		<b>Current K</b>	
Math - 2	189.42	2022-2023					
Math - 1	176.4	2021-2022	172	2022-2023			
Math - K	157.11	2020-2021	157.4	2021-2022	159.6	2022-2023	
<b>Mean Above Norm</b>							
<b>Mean Below Norm</b>							
<b>Mean More Than 5 Below Norm</b>							

*GSD K-2<sup>nd</sup> Grades 3-Year Trend of MAP Scores*

Figure 4.5

GSD 3rd-5th Grades 3-Year Trend of MAP Scores							
2020 Growth Norms used in this comparative data							
FALL	Norm	Current 5th		Current 4th		Current 3rd	
Math - 5th	209.13	2022-2023	208.3				
Math - 4th	199.55	2021-2022	198.9	2022-2023	197.5		
Math - 3rd	188.48	2020-2021	187.2	2021-2022	186	2022-2023	186.4
Math - 2nd	175.04	2019-2020	181.4	2020-2021	173.4	2021-2022	170.4
Math - 1st	160.05	2018-2019	164	2019-2020	163.2	2020-2021	161.8
Math - K	139.56					2019-2020	137
WINTER	Norm	Current 5th		Current 4th		Current 3rd	
Math - 5th	214.7	2022-2023					
Math - 4th	206.05	2021-2022	204.3	2022-2023			
Math - 3rd	196.23	2020-2021	194	2021-2022	195	2022-2023	
Math - 2nd	184.07	2019-2020	194.1	2020-2021	180.2	2021-2022	180.6
Math - 1st	170.18	2018-2019	169.5	2019-2020	175.2	2020-2021	166.2
Math - K	150.13			2018-2019	147.5	2019-2020	149.6
SPRING	Norm	Current 5th		Current 4th		Current 3rd	
Math - 5th	218.75						
Math - 4th	210.51	2021-2022	208.9	2022-2023			
Math - 3rd	201.08	2020-2021	200.6	2021-2022	197.4	2022-2023	
Math - 2nd	189.42	2019-2020	N/A			2021-2022	185.7
Math - 1st	176.4	2018-2019	N/A			2020-2021	173.8
Math - K	157.11					2019-2020	N/A
<b>Mean Above Norm</b>							
<b>Mean Below Norm</b>							
<b>Mean More Than 5 Below Norm</b>							

GSD 3<sup>rd</sup>-5<sup>th</sup> Grades 3-Year Trend of MAP Scores

Figure 4.6

GSD 6th-8th Grades 3-Year Trend of MAP Scores							
2020 Growth Norms used in this comparative data							
FALL	Norm	Current 8th		Current 7th		Current 6th	
Math 6+ (8th)	224.92	2022-2023	223.7				
Math 6+ (7th)	220.21	2021-2022	212.5	2022-2023	216.8		
Math 6+ (6th)	214.75	2020-2021	213.4	2021-2022	212.5	2022-2023	214.5
Math - 5th	209.13	2019-2020	209.5	2020-2021	205.8	2021-2022	206.2
Math - 4th	199.55	2018-2019	199.8	2019-2020	198.9	2020-2021	195.5
Math - 3rd	188.48			2018-2019	189.6	2019-2020	185.7
Math - 2nd	175.04					2018-2019	181.5
WINTER	Norm	Current 8th		Current 7th		Current 6th	
Math 6+ (8th)	228.12	2022-2023					
Math 6+ (7th)	224.04	2021-2022	221.7	2022-2023			
Math 6+ (6th)	219.56	2020-2021	216.9	2021-2022	215.8	2022-2023	
Math - 5th	214.7	2019-2020	214.7	2020-2021	212	2021-2022	212.5
Math- 4th	206.05	2018-2019	205.2	2019-2020	203.8	2020-2021	201.1
Math- 3rd	196.23			2018-2019	195.1	2019-2020	194.5
Math - 2nd	184.07					2018-2019	187.1
SPRING	Norm	Current 8th		Current 7th		Current 6th	
Math 6+ (8th)	230.30	2022-2023					
Math 6+ (7th)	226.73	2021-2022	223.5	2022-2023			
Math 6+ (6th)	222.88	2020-2021	218.8	2021-2022	217.6	2022-2023	
Math - 5th	218.75	2019-2020	N/A	2020-2021	218.2	2021-2022	218.4
Math - 4th	210.51					2020-2021	205.6
<b>Mean Above Norm</b>							
<b>Mean Below Norm</b>							
<b>Mean More Than 5 Below Norm</b>							

GSD 6<sup>th</sup>-8<sup>th</sup> Grades 3-Year Trend of MAP Scores

In response to the continual low performance of students in mathematics, GSD recognized a need for a plan to change the trajectory of students' academic performance in mathematics. In 2019, before the COVID-19 pandemic, GSD developed a five-year strategic plan that identified five pillars that exemplified the district's mission, vision, and values. Student achievement, readiness, and engagement were among the five pillars that focused on providing access to appropriately personalized and challenging learning opportunities, facilitating and valuing student voice and choice, and utilizing useful and engaging instructional and assessment strategies. The objective to utilize valuable and engaging instructional and assessment strategies prompted the district-level instructional team to develop an action step to create and implement common formative assessments in grade-level and department teams over a five-year phase-in period.

Using a purchased, open, all-access online program, Edulastic, as the common formative assessment tool, the overarching goal was to provide a format that facilitated the conditions for collaborative conversations to occur horizontally within grade levels and vertically across grade bands for all district mathematics teachers. The collaborative action research methodology provided the framework for designing and implementing common formative assessments in all grade-level and department teams throughout the district.

The goal of this study was to examine how school leaders, who intentionally used and focused on job-embedded professional learning, impacted the use of common formative assessments by teachers to inform their instructional practices in the mathematics classroom. GSD recognized the need to develop, align, and implement common formative assessments in every K-12 mathematics classroom using Edulastic to measure student growth during the learning process. Participation in the case study was voluntary. The researcher first administered

the Assessment Literacy Inventory (ALI) survey (Appendix C). Individual interviews and a virtual focus group session followed the survey. The action research study consisted of three cycles based on the Plan-Do-Study-Act framework. The action research cycles began in August 2022 and ended in January 2023. The design of the interventions resulted from challenges from the participants' feedback on using Edulastic as a common formative tool to inform instructional practices in the mathematics classroom.

#### *The Action Research Design Team*

The Action Research Design Team (ARDT) incorporated a group of district-level administrators with experience in designing, implementing, and monitoring professional learning to build the capacity of school leaders and teachers how to use common formative assessments to inform instructional practices. The ARDT met with the participants monthly during their collaborative planning and just as an ARDT to discuss the data collected from the surveys, interviews, focus groups, and interventions. Outlined in Table 4.1 is the composition of the team. The primary researcher, ARDT Member 1 and ARDT Member 2, served as the core of the ARDT. These team members met weekly to reflect on the data and considered the challenges presented by the participants during the research cycles. The core team shared the data with the other ARDT members and developed interventions using the Plan-Do-Study-Act framework.

**Table 4.1***Action Research Design Team*

<b>Team Member</b>	<b>Primary Role at Grantham School District</b>	<b>Action Research Role</b>
Primary Researcher	Executive Director of Curriculum and Instruction	10 years of classroom experience; 12 years of administrative experience.
ARDT Member 1	Instructional Technology Director	9 years of classroom experience; 3 years of administrative experience.
ARDT Member 2	Assessment/CTAE Director	16 years of classroom experience; 7 years of administrative experience
ARDT Member 3	K-12 Mathematics Lead	26 years of classroom experience.
ARDT Member 4	Assistant Principal, Primary	26 years of classroom experience; 2 years of administrative experience.
ARDT Member 5	Assistant Principal, Elementary	9 years of classroom experience; 2 years of administrative experience.
ARDT Member 6	Assistant Principal, Middle	19 years of classroom experience; 5 years of administrative experience.
ARDT Member 7	Assistant Principal, High	20 years of classroom experience; 4 years of administrative experience.

*The Action Research Implementation Team*

The study participants represented a broad range of professional experiences and educational backgrounds. The researcher, three instructional coaches, and K-12 mathematics teachers comprised the Action Research Implementation Team (ARIT). Following the

aforementioned timeline, the study occurred over six months, from August 2022 through January 2023. Participation was voluntary, and there were no requirements regarding years of experience as an instructional coach or a mathematics teacher. The identified mathematics teachers agreed to use a predetermined common formative assessment tool at least once a month. The mathematics teachers and instructional coaches engaged in asynchronous surveys, a virtual focus group session, and individual interviews and provided feedback on implementing common formative assessments to inform instructional practices. The selection criteria and participant willingness determined the sample size.

### **Findings from the Case**

The design of the action research case study examined how school leaders used intentionally focused job-embedded professional learning on impacting the use of common formative assessments to inform the instructional practices of mathematics teachers. The study occurred from August 2022 through January 2023. Grantham School District (GSD) offered its approval of the study on August 1, 2022. The researcher received an institutional review board notice of exemption and approval on August 16, 2022. This chapter provides a detailed account of the action research process.

The researcher began the study in mid-August after consulting with the core ARDT members. The K-12 mathematics teachers and instructional coaches opted into the study and participated in the pre-survey. As challenges arose, critical members of the ARDT met weekly to design and implement interventions. The ARDT continued to debrief and reflect after each implementation cycle to determine the following action. Midway through the study, the researcher conducted a single round of interviews with members of the ARDT and ARIT. Finally, the ARDT participated in a virtual focus group to wrap up the study.

The data collected narrates the story of the K-12 mathematics teachers navigating the process of designing and implementing common formative assessments to inform their instructional practices. While education had begun to return to pre-COVID normalcy, teacher burnout emerged in the 2020 Teacher Burnout in Georgia, Voices from the Classroom report commissioned by the Georgia Department of Education. The landscape of education, including the administrators, teachers, and students, bore scars from the COVID-19 experience that could not be overlooked. The impact of the pandemic prompted a need to provide clarity, define expectations, and design cyclical relevant training through intentionally embedded professional learning. The study revealed several key findings. The following sections detail the findings of each action research cycle and expand upon these findings.

### **Action Research Cycle 1**

Action Research Cycle 1 started a few weeks into the school year in mid-August of 2022. Cycle 1 lasted for approximately four weeks and concluded by mid-September. Before developing interventions, the core ARDT team reviewed data, survey feedback, and reflections from the previous school year regarding using Edulastic to implement common formative assessments to inform teachers' instructional practices. The research team met on July 29, 2022, to discuss each member's role in planning the interventions and potential outcomes. The core ARDT designed a structured monthly framework to train, encourage, assist, and mentor teachers known as TEAM Time. The team determined the data indicators of meeting minutes, surveys, interviews, focus groups, and reflections.

The initial interactions between ARDT members and participants occurred in mid-August at the start of the cycle during the participants' collaborative planning time. The August TEAM Time session launched with a brief introduction of all team members, including a photo, profile,

educational background, experience, and district roles. Following the introduction, the team transitioned to an Edulastic refresher training that highlighted new and revised features of the Edulastic tool and provided helpful links and articles for assessment and reports.

The team segued to an overview of the process used to identify Edulastic as a common formative assessment tool and the definition, purpose, and district expectations of common formative assessment. A white paper written by the researcher of this case study described the impact of common formative assessments on student learning and best practices for using Edulastic for common formative assessments to inform instructional practices. Rich discussion surrounding the purpose of common formative assessments and the use of Edulastic led to a just-in-time problem for the ARDT's consideration.

Participants completed a feedback survey indicating the successes and challenges of using Edulastic to administer common formative assessments and how the research team could better address the challenges in the September TEAM Time. Participants indicated the usage of Edulastic to administer common formative assessments monthly at the elementary, middle, and high school levels for various purposes - ranging from warm-ups to exit tickets. The results indicated that 61% used Edulastic for unit assessments. A specific highlight indicated, *"I like the live Class Board where I can see student mastery. I also like the ease of data reporting. Lastly, I like the ability to redirect questions or assessments to students to give them a chance to correct their work."*

Similarly, other responses stated, *"I love the way Edulastic is teacher-friendly, getting instant student feedback...I could go on."* Conversely, participants provided a list of challenges for the research team to consider. These challenges encompassed the lack of question selection in some content areas, the need for time to create assessments in the platform, and the inability to

control student access to preserve assessment security. The team addressed these challenges in the upcoming September TEAM Time training session.

The core ARDT met on August 22, 2022, to debrief about the August TEAM Time session and the feedback from the Edulastic feedback survey. The overall feedback was positive. The team reflected on and discussed the survey results that indicated most teachers were using Edulastic for unit assessments and student feedback at least monthly. Additional reflection surfaced that there was little evidence that teachers were using the data from Edulastic to reflect on their instructional practices. The researcher noted that the administration of the Assessment Literacy Inventory (ALI) survey would provide additional data regarding the participants' knowledge and understanding of assessments.

Throughout Cycle 1, the core ARDT continued conversations with mathematics teachers regarding using Edulastic to design and implement a common formative assessment to inform their instructional practices. Field notes indicated that while teachers made a conscious effort to use Edulastic to administer classroom assessments, there was no evidence of a unified understanding of the definition and purpose of common formative assessments. The team met weekly to reflect on these conversations and brainstorm on the action items of each team member in the adjustment in the second action research cycle.

### **Action Research Cycle 2**

The second action research cycle occurred from mid-September through late October. The ARDT focused on addressing the common issues in using Edulastic in the September TEAM Time based on feedback and reflections from the first action research cycle. The researcher sought feedback from the principals regarding the first action research cycle and intervention during a monthly principals' meeting on August 29, 2022. Principals received a

copy of the survey results and the agenda minutes from the August TEAM time. Some of the principals attended the August collaborative planning meetings with their staff and had firsthand knowledge of the use of Edulastic as a common formative tool by their staff. The principals provided additional insights into the successes and challenges of using Edulastic as a common formative assessment tool. They echoed the teachers' sentiments regarding the limitations of questions in certain subjects, the ease of reports, the inability to securely monitor assessments, and the need for time to develop, implement, and reflect on the assessments in Edulastic. Additionally, the ARDT used the field notes, weekly reflections, and TEAM Time survey data to design professional learning to address the identified challenges.

### *Survey*

The researcher invited the members of the ARIT via email to participate in the ALI survey on September 11, 2022. The participants had a five-week window to complete the ALI survey as an online Google form accessible by participants from September 11<sup>th</sup> through October 17<sup>th</sup>, 2022. The ALI consisted of five scenarios, each followed by seven questions related to the seven standards adapted from the 1990 Standards for Teacher Competence in Educational Assessment of Students (AFT, NCME, & NEA, 1990). Some items measured general concepts related to testing and assessment, including the use of assessment activities for assigning student grades and communicating the results of assessments to students and parents, other items related to knowledge of standardized testing, and the remaining items related to classroom assessment. A total of 13 mathematics teachers, representing kindergarten through twelfth grade, participated in the ALI survey. Results from the survey informed the design of subsequent research cycles.

The researcher calculated the mean scores for each question in a spreadsheet. Further calculations of the scores identified the number of questions answered correctly with greater than 50% accuracy for each of the seven standards, as shown in Table 4.2.

**Table 4.2**

*ALI Survey Analysis by Standard*

<b>Standard</b>	<b>Questions Answered Correctly with &gt;50% Accuracy</b>
1. Teachers should be skilled in choosing assessment methods appropriate for instructional decisions.	3 out of 5
2. Teachers should be skilled in developing assessment methods appropriate for instructional decisions.	3 out of 5
3. The teacher should be skilled in administering, scoring, and interpreting the results of both externally produced and teacher-produced assessment methods.	5 out of 5
4. Teachers should be skilled in using assessment results when making decisions about individual students, planning to teach, developing curriculum, and school improvement.	3 out of 5
5. Teachers should be skilled in developing valid pupil grading procedures which use pupil assessments.	3 out of 5
6. Teachers should be skilled in communicating assessment results to students, parents, lay audiences, and educators.	2 out of 5
7. Teachers should be skilled in recognizing unethical, illegal, and otherwise inappropriate assessment methods and uses of assessment information.	5 out of 5

The ARDT examined the ALI survey results and other data in a meeting held on October 24, 2022. The analysis of the ALI survey revealed that mathematics teachers in GSD had a solid understanding of the administration, scoring, and interpreting of the results of both externally produced and teacher-produced assessment methods. Additionally, teachers were skilled in

recognizing unethical, illegal, and otherwise inappropriate assessment methods and uses of assessment information. This analysis aligned with observations and reflections of the ARDT from the August TEAM Time.

The survey analysis continued to reveal areas of growth for teachers regarding assessments. The results reflected the need for teachers to develop an understanding of how to choose and develop assessments for instructional decisions. Additionally, the survey results uncovered the need for teachers to develop the skills to appropriately use assessment data in making instructional decisions, such as grading student work, planning lessons, and selecting curriculum. Finally, the most significant area of growth indicated that teachers improved their skills in communicating assessment results with parents, students, and other staff members. The ARDT considered these findings in planning the September TEAM Time session.

On September 20, 2022, core members of the ARDT delivered the September TEAM Time to participants in collaborative planning sessions. The ARDT addressed the specific challenges identified using Edulastic as a tool to design and implement common formative assessments. Participants could access a list of common issues, an explanation of why they happen, and a list of steps to fix the issue. The ARDT team members modeled the steps first, and then participants had the opportunity to apply the steps in real-time in the Edulastic platform.

The ARDT facilitated additional discussion regarding the purpose of common formative assessments and how teachers use them to inform their instructional practices. Teachers appreciated the time to brainstorm, unpack, exchange, and reflect on using common formative assessments to inform instructional practices. The ARDT team took note of the similarities and differences of each session discussion at the various grade levels. Participants completed a feedback survey at the end of the first action research cycle.

Mathematics teachers from elementary, middle, and high school responded to the September TEAM Time survey. The high school mathematics team responded that the session facilitated ownership of using Edulastic as a common formative assessment tool. Elementary school teachers agreed with high school teachers and added that the training session provided a safe environment to take risks, encouraged active involvement and engagement, modeled skills, and provided feedback and coaching. Middle school teachers echoed all previous responses to the survey and that the training provided time to brainstorm, unpack, exchange, and reflect on ideas.

As the core ARDT debriefed on the feedback and observation notes from the September TEAM Time training session, they recognized the most impactful components of the training session and discussed ways to replicate them in future training sessions intentionally. The team determined to facilitate a safe environment, active involvement that included an opportunity to exchange and reflect ideas, modeling, and a coaching and feedback cycle as non-negotiables when planning and developing future professional learning opportunities.

### *Interviews*

Throughout Cycle 2, the researcher interviewed assistant principals, instructional coaches, and principals. The interviews began on September 27, 2022, and ended on October 18, 2022. Using the critical incident interview protocol (Appendix D), the researcher provided three critical incidents aligned with the case study's action research questions. The one-on-one interview also provided a reflective space for each interviewee's personal experience using common formative assessments in the mathematics classroom to inform instructional practices. The questioning also prompted each participant to share their experience as a school leader and

how they supported the development and implementation of common formative assessments to inform the instructional practices in the mathematics classroom.

The interviews occurred face-to-face and via ZOOM using the critical incident protocol and script. The researcher recorded each interview using a software application that transcribed each conversation into a WORD document identifying the speakers and providing a summary of keywords. A total of seven interviews occurred. The only requirement of the interviewees was that they currently served in a school leadership role that worked in some capacity directly with mathematics teachers. Although each critical incident question was different, each followed the same follow-up questions: what happened; who was involved (no names); how did it turn out; what was it about this incident that made it seem significant; what conclusions did you draw from this incident; and can you describe the impact it had on instructional practices and student learning.

In an interview with an elementary instructional coach, the researcher learned how a previous experience as a fifth-grade teacher using common formative assessments to inform instructional practices shaped her perspective as an instructional coach:

*I think having those conversations was really beneficial because we could talk about the different teaching strategies that we were using...that we're not just talking about the data and the numbers, but truly, what are our instructional practices and how can we make them better to improve student learning?*

This member also reflected on the importance of a common vocabulary emphasizing that in her current role as an instructional coach, she focused on “*making sure that everyone in our buildings truly knows what a common formative assessment is, versus summative, again, communicating the purpose and the impact.*”

In another interview, the high school principal described the changes that he had made to his hiring practices, precisely the interview questions, to determine if staff had a foundational knowledge of the purpose of implementing common formative assessments:

*What kind of formatives are you going to do along the way? What is your checkpoint going to be? Even just sitting down with teachers and that geometry class, you're in unit one, right? What is your formative going to be along the way? What's the summative it's going to be the end of it, and then helping them kind of do backward design. Right? So this is the end test, and let's work backward. What are your quizzes or whatever checkpoints gonna look like? Okay, now let's map out what the unit looks like.*

This leader emphasized the importance of common practices and procedures among school leaders and was a worthwhile collaborative effort to ensure that teachers were using common formative assessments to inform instructional practices.

Teachers' reflective practices were also a common thread highlighted throughout the interviews. In an interview with an elementary assistant principal, he pondered if teachers embrace a growth mindset when looking at data to ask, “*What did you do differently?*” He further reflected on his past experiences using peer and video observations to provide constructive feedback focused on the teacher’s instructional practices rather than students in the classroom. He also provided context to the debate for using paper-pencil versus the online tool for common formative assessments in the mathematics classroom. The debate led to further discussion regarding the effect size of timely student feedback and a teacher's ability to assess data and pivot instruction quickly.

The challenges of time and teacher knowledge of common formative assessments continued to emerge in the last interview with a primary-level assistant principal. She was

transparent regarding the knowledge and implementation of common formative assessments and stated, “*But we're not doing them [common formative assessments] on the level where they really should be in could be...*” She went on to acknowledge that, “*You have to talk about instructional practices and strategies. They don't have time. They don't make time to do that. Maybe because they don't see the value of it.*”

After all interviews, the researcher used transcription software to discover keywords and themes for coding. The researcher uploaded all transcripts into a Google folder for access by the ARDT members to read for clarity and understanding. The keywords were added to a Google sheet to begin the coding process. Table 4.1 provides the keywords as they frequently occurred in the interviews. Table 4.3 includes the keywords that occurred in over 50% of the interviews. Results were shared with members of the ARDT to unpack and determine the adjustments for the final cycle.

**Table 4.3**

*Key Words Identified in Interviews*

<b>Key Words</b>	<b>Frequency of Occurrence in Interviews</b>
Teachers; Classroom	7 out of 7
Students; Instructional Practices; Common Formative Assessments	6 out of 7
Common; Taught; Teaching	4 out of 7
Assessments; Piece	3 out of 7
Instruction; Test	2 out of 7
Writing; Worked; Protocol; Inform	1 out of 7

Eight ARDT members, including the researcher, met on October 24, 2022, to examine artifacts and data gathered from the first two action research cycles. The artifacts included the ALI survey responses and calculations, the interview transcripts and keywords, the TEAM Time survey results, and Edulastic usage reports. The team had a protocol to lead them through unpacking the information using specified steps. The researcher provided an agenda that included observations, inferences, sense-making and checking bias, and recommendations. Each category provides questions or tasks designed to prompt reflective discussion and identify emerging themes as they align with the purpose of the action research study and action research questions.

The ARDT made observations of the data using three key questions to guide their thinking. What did you notice? What were the similarities? What were the differences? After notating the observations, the team discussed the inferences or conclusions they drew based on the data. The responses included that there seemed to be a lack of consistency in understanding specific assessment vocabulary and assessment concepts; however, there was a clearer understanding of looking at the patterns for more “teacher-practical” items. Additionally, the team inferred from the observations that teachers had varying knowledge and expertise in creating, administering, and interpreting various assessments. There was a need for the district to establish a common vocabulary, training, and expectations on the development and implementation of common formative assessments.

The ARDT members focused on their reflections on their previous experiences using, developing, and implementing common formative assessments in the mathematics classroom influenced their conclusions from the data. The members acknowledged that their roles and relationships with district staff might lead to the extrapolation of an intended response rather than

the data at face value. The team agreed that their background experiences and previous experiences with common formative assessments informed their views. When challenged to consider the influence of past professional learning experiences regarding the development and implementation of common formative assessments, the ARDT described these experiences as teacher-driven, organic, not systematic, classroom experience only, and endorsement coursework.

The last reflection asked the ARDT members to convey what resonated with their role as a leader in the development and implementation of common formative assessments. The team unanimously agreed that it was necessary to determine teachers' prior knowledge, provide relevant and robust training, create a common vocabulary, and communicate clear expectations. The ARDT team provided three recommendations to consider in the third action research cycle: clarity, framework, and training.

### **Action Research Cycle 3**

Action Research Cycle 3 occurred from November 2022 through the end of the semester on January 11, 2023. There was an intentional effort to design and implement common formative assessments to inform instructional practices in preparation for mid-term and Winter MAP assessments. The ARDT met weekly and discussed the need to provide a common vocabulary and a framework for collaborative planning focused on common formative assessment design and time for teachers to reflect on instructional practices.

As a result of the ARDT meeting on October 24, core team members of the ARDT created a collaborative planning time survey administered to all teachers. The Google form emailed to all staff requested input and feedback regarding how to best use collaborative planning time from both a district and school-level perspective. The results from this survey

provided input from 48 staff members from all four campuses rating the effectiveness of the current collaborative planning time, indicated the essential priorities of collaborative planning time, identified the elements and barriers of effective collaborative planning time, determined the necessary elements of an agenda, and provided solutions for improvement. The results from the anonymous survey indicated that 42% of the staff rated the current collaborative planning time ineffective.

The core ARDT members began to develop collaborative planning and data review guidelines in the form of a digital handbook. The initial draft provided background and purpose, non-negotiables/negotiables, norms, agenda templates, and resources aligned with research for designing and implementing effective instructional practices. The draft was shared with principals and instructional coaches during monthly meetings to solicit feedback and gain a school leader perspective, contrasting with the survey feedback and other artifacts gathered in the cycle.

### *Focus Group*

At the beginning of the third cycle, the ARIT participants were invited via email on October 28, 2022, to participate in a virtual focus group. The researcher included a copy of the focus group protocol and questions in the email. Finding a convenient time for participants to meet during this time of year proved challenging. Based on the responses to the email invitation, the researcher scheduled a Zoom focus group for after school on November 10, 2022. Using the focus group questioning protocol (Appendix E), the researcher provided three categories of questions that aligned with the case study's action research questions. The focus group provided an interactive forum for participants to discuss personal experiences using common formative assessments in the mathematics classroom to inform instructional practices. The questioning

also prompted each participant to share their experiences of receiving support to develop and implement common formative assessments to inform the instructional practices in the mathematics classroom.

The researcher recorded the focus group using a software application that transcribed the conversation into a WORD document identifying the speakers and providing a summary of keywords. Five participants, including the researcher, attended the focus group meeting and represented all school levels. The only requirement of the participants was that they were current mathematics teachers. The researcher uploaded the focus group transcript into the Google folder for the ARDT to read for overall meaning and identify codable themes using the keywords. The keywords were recorded in a Google sheet and sorted by frequency with the interview keywords. The keywords from the focus group that aligned with the interviews were instructional practices, common formative assessments, teachers, assessments, data, students, formative assessments, instruction, understanding, and standard. ARDT members shared the results.

Participants in the focus group provided insights that cross-walked with those gathered in the one-on-one interviews. The researcher served in a dual role as the facilitator of the questions and observer of the interactions and responses of the group. When asked how they developed and implemented common formative assessments in the mathematics classroom, an elementary teacher responded, *“A new Edulastic common formative assessment is created and implemented based on the standards being taught, and the data collected from these assessments is usually used in a data talk.”* Another teacher responded, *“I would say from the data talks, we're able to glean important information that directly impacts future instruction.”*

Time and teacher implementation were barriers identified to the development and implementation of common formative assessments to inform instructional practices. *“I really feel*

*like if you ask me what the biggest barrier would be, it's that on uninterrupted time, to be able to develop and implement these types of assessments,”* stated an elementary teacher. Followed by a high school level math teacher’s response, *“I think, for me, one of the biggest barriers to implementing them is I write a lesson plan for the week.”*

In contrast, the same high school teacher went on to share how he had received support from the district and school-level teams:

*Well, I would say my story is one of one of two situations. Last year definitely had a support structure in place with the common teammate of planning of what to do this year. But support-wise, training-wise, I know we've had meetings of how district wants this side of things set up, felt like we've got properly set up and trained for that so that I knew how to use the tools they wanted us to use, and be able to make decisions from those quickly... We're working on systems to make it work.*

Further elaboration from an elementary school indicated, *“Addressing that question, I think that the idea of data talks has forced us to promote a learning culture so that we are forced to always don't forget the connection to data, but and how it impacts instruction.”*

The group continued to debate the need for additional professional learning with a focus on common formative assessments or instructional practices. The middle school instructional coach adamantly stated, *“Because I think it all starts with quality instruction.”* Followed by statements that included, *“I wish the discussion could include, well, how do you plan to teach that?”* and, *“We get caught up with checking off the boxes of completion and don't have the instructional practice discussions we want to have.”* The discussion sparked the reflection of the ARDT members on how to streamline professional learning and support common formative assessments and instructional practices into a cohesive framework.

In just-in-time modeling of this framework, the ARDT designed and implemented a professional learning module for the fall semester district vertical team meetings. The vertical teams comprised K-12 teachers selected by the principal in each subject area: English Language Arts (ELA)/writing, mathematics, science, social studies, and fine arts. A district-level leader facilitated the teams. The purpose of vertical teams was to hold meaningful conversations about our instructional practices from a vertical perspective, gain insight into instructional patterns and themes at the school and district level, establish consistency in instructional practices, and build and develop relationships across campuses.

On November 16, 2022, the district vertical teams met after school to share an effective lesson and discuss patterns, inspirations, and how to replicate this with more lessons. Next, the group identified the single most pressing issue at their campus. After describing the struggle, members had to unpack how they identified it, provide the steps taken to address it, hypothesize the root cause, and propose a solution. Each team used a solution-focused protocol to impact the areas of struggle from a vertical perspective and identify instructional changes.

Sixty-three staff members participated in the vertical team meeting, and 43 provided feedback. Over 74% of the vertical team members found the activity highly relevant and useful to their role. Additionally, each vertical team recorded minutes from the meeting detailing the great lessons, struggling topics, and solution-oriented discussions. The mathematics vertical team data revealed the need for teachers to have time to reflect and discuss how they were using assessments to inform their instructional practices. The researcher examined the minutes and feedback survey for commonalities and areas of professional learning needed to inform the research cycles.

The core ARDT team was an integral part of this study. The team met weekly to debrief and discuss artifacts, data, and reflections. As challenges emerged, the ADRT team members sought professional learning solutions to aid in designing and implementing common formative assessments to inform instructional practices. The ADRT prepared interventions and participated in delivering those interventions in every cycle. The team ensured that the study continued throughout the semester with an emphasis on defining and refining a process that would meet the needs of teachers.

A vital component of the ADRT was the Instructional Technology Director. Her instructional experience in the classroom and expertise in the Edulastic platform was instrumental in every aspect of the action research study. Her relationships with staff at every school level enabled her to serve as a role model for her teammates and gave her insights into the challenges and needs of the teachers. She walked step-by-step with the researcher throughout each cycle and would immediately debrief with the researcher to develop a plan of action for the next cycle. She was instrumental in collecting and sifting through the artifacts and data. The researcher sought her perspective in making sense of the data, identifying the challenges, and designing the interventions.

The Assessment/CTAE Director's range of experience as a high school social studies teacher, middle school assistant principal and athletic director, and district assessment director gave him a broad lens when unpacking the data. He brought a critical lens to the action research study and asked direct questions forcing the researcher to seek a deeper understanding of the purpose and implications of the study. He participated in the design and implementation of professional learning activities. His field notes reflected the perspectives of others which he debriefed in detail with the researcher after each intervention.

Additional ADRT members participated in the one-on-interviews and the mid-point data dig. The K-12 Mathematics Lead was a key communicator with mathematics teachers in the action research cycle one and two. Her perspectives as a math teacher and coach were helpful in the development of professional learning interventions using common formative assessments to inform instructional practices that would resonate with mathematics teachers. In his first year, the elementary assistant principal was a new voice in the district. He provided a comparative lens in the interview and his data reflections drawing on his past experiences in other roles in other school districts.

Representing the middle school, the assistant principal participated as a member of the ADRT in the interviews and mid-point data analysis. With a background in special education in another district and experience as the 504 and MTSS school coordinator, she approached the interview questions with a focus on meeting the needs of students through instructional practices. Her feedback in the data analysis reflected a need for clear expectations and flexibility.

The principal and assistant principal from the high school also participated as members of the ADRT. The principal participated in the interviews and recounted his experiences as a building leader in the mathematics department. His ability to develop relationships with his staff instrumentally assisted the researcher as he probed for evidence that common formative assessments were being used with fidelity to inform instructional practices in mathematics classrooms. Similarly, the assistant principal provided candid feedback in the interview. Her previous experience as a high school social studies teacher enabled her to provide a detailed analysis of the data and artifacts.

The composition of the ADRT represented a vast level of educational and professional experience that provided the researcher with a broader understanding of the appropriate

interventions, areas of improvement, and adjustments needed. The researcher recorded notes from each meeting using agendas and individual conversations in the researcher's journal. The ADRT members provided the researcher with a process of checks and balances when using the data to inform the research cycles.

### **Chapter Summary**

This chapter examined the problem framing this action research study through a detailed account of the context and characteristics of the action research site. Three action research cycles described the narrative timeline depicting the action research teams' actions throughout the five-month research period. Data collection instruments, interventions, and processes for analysis were shared. The data from the surveys, interviews, a focus group, reflections, and meeting agendas contributed to the assessment of the intervention design. The next chapter includes an analysis of the findings revealed from the collected, analyzed, and coded data and the development of emerging themes related to the research questions.

## **CHAPTER 5**

### **ANALYSIS OF FINDINGS FROM THE ACTION RESEARCH CASE**

The purpose of this action research study was to develop and implement common formative assessments for mathematics teachers to inform instructional practices. To provide identified K-12 mathematics teachers with a tool for measuring student growth during the learning process, the Grantham School District recognized the need to develop, align, and implement common formative assessments in every classroom. This study sought feedback from two teams identified at the district and school levels. The district-level instructional leadership team provided feedback regarding the district's common formative assessment tool's development, alignment, and implementation. Additionally, the school-level teams provided feedback regarding implementing the common formative assessment tool and the impact on the horizontal and vertical alignment of mathematics instruction among grade levels in the school.

The researcher approached the study with some overall questions: Can an online formative assessment tool provide teachers with the capacity to inform instructional practices while simultaneously facilitating horizontal and vertical alignment in mathematics classrooms throughout the district? How will the district instructional leadership team learn to impact the capacity to develop, align, and implement the use of a common formative assessment tool to inform instructional practices in all classrooms district-wide?

The following research questions guided this analysis to address the purpose of this action research study:

1. How can the district instructional leadership team support professional learning for math teachers to develop and implement common formative assessments to inform instructional practices?
2. How do mathematics teachers describe the impact of professional learning on their capacity to utilize common formative assessments as a tool to inform instructional practices?
3. What do Action Research Design Team (ARDT) members learn in the process of leading the design and implementation of common formative assessments in mathematics?

This chapter presents the themes from data collection and subsequent findings throughout the action research cycles. The analysis and themes relate to the purpose of the study, the research questions, the theoretical framework, and the logic model.

Chapter 4 provided a detailed account of the interventions and data collection in the action research cycles. The data collection occurred during the fall semester of 2022-2023 at Gratham School District (GSD). The action research study involved district and school-level leaders who supported the development and implementation of common formative assessments in the mathematics classroom. The researcher completed three research cycles and gathered data through surveys, interviews, focus groups, artifacts, and the researcher's journal.

The study's theoretical framework used a set of guiding principles designed to facilitate problem-solving and change in the pedagogical process. Using Jawaroski's (2003) theoretical framework for this study enabled participants to simultaneously observe and contribute to the development and implementation of common formative assessments in the mathematics classroom. This theoretical framework led to the development of a logic model that guided the study. The core ARDT provided just-in-time support via professional learning for the

mathematics teachers paired with surveys, interviews, focus groups, and reflections. The Action Research Implementation (ARIT) members reflected and refined their practice of developing and implementing common formative assessments to inform instructional practices through interventions in each action research cycle.

Chapter 4 identified the findings for each action research cycle. Analysis derived the findings using data analysis methods suitable for a qualitative study, and the research questions guided the inductive coding process (Bloomberg & Volpe, 2018). This iterative process allowed the researcher to categorize themes within the study’s theoretical framework and assign codes relevant to the theme. The researcher recorded and analyzed the coding of each research question using a reflective, big-picture lens. During and after data collection, the coding schema was interpreted and analyzed by the ARIT for any discrepancies. Table 5.1 summarizes the emergent themes as they relate to each research question.

**Table 5.1**

*Summary of Themes Connected to Research Questions*

Research Questions	Themes
RQ1: How can the district instructional leadership team support professional learning for math teachers to develop and implement common formative assessments to inform instructional practices?	Theme 1: Cyclical and Relevant Professional Learning Models Desired Instructional Practice
RQ2: How do mathematics teachers describe the impact of professional learning on their capacity to utilize common formative assessments as a tool to inform instructional practices?	Theme 2: Time, Relevance, and Reflection Are Key
RQ 3: What do Action Research Design Team (ARDT) members learn in the process of leading the design and implementation of common formative assessments in mathematics?	Theme 3: Clarity in the Framework, Processes, and Expectations Positively Influence Implementation

Analysis of the findings identified connections between the research questions and the three overarching themes that emerged. The themes also aligned with Guskey's (2014) approach to planning professional learning using a backward design through which educational leaders use a systematic approach to influence and impact teacher instructional practices in the mathematics classroom. The next section of this chapter analyzes each thematic finding aligned with the research questions that guided this study.

### **Research Question 1**

The purpose of this research study was to develop and implement common formative assessments for mathematics teachers to inform instructional practices. The research questions guided the study by providing a framework for the surveys, one-on-one interviews, a focus group session, and data analysis. Based on the analysis of the data collected, one central theme emerged related to the first research question. The theme focused on the ideation that cyclical and relevant professional learning experiences model desired instructional practice in the classroom.

#### *Cyclical and Relevant Professional Learning Models Desired Instructional Practice*

One of the goals of the district instructional team, which served as Action Research Design Team (ARDT) members, was to support professional learning for math teachers to develop and implement common formative assessments to inform instructional practices. Following the premise of backward design, the core ARDT sought to design professional learning that included feedback and coaching, modeled new skills, created a safe learning environment, designated time for reflective collaboration, and provided teacher voice and choice. Throughout the action research study, the team regularly sought feedback from teachers regarding each professional learning experience using surveys. Additionally, the ARDT analyzed the keywords from the interviews and focus group discussions on how they could support the

professional learning experience of mathematics teachers to develop and implement common formative assessments using Edulastic.

The ARDT provided feedback regarding their observations and perception regarding the interventions implemented in this action research study. In detailing the analysis of the Team Time surveys, the team acknowledged the regular feedback from teachers about the need for professional learning to be relevant. Specific comments from K-12 mathematics teachers in the feedback surveys indicated that the training facilitated ownership of professional learning. Additionally, the ADRT team gleaned from the focus group transcript the need for professional learning to be relevant to instructional planning and instructional practices. A middle school teacher noted, “...you can’t learn everything from PD. Some of it’s just being in the trenches and learning along the way.” An elementary teacher elaborated, “...the resources are there but need to focus on instructional practices.”

Using the Plan-Do-Study-Act logic model, the instructional team further recognized the need for professional learning to be cyclical to stick. The team reflected in weekly meetings on how to identify when professional learning became an embedded sustainable part of the culture of teachers' instructional practices. The instructional team also participated in a monthly book study discussing *Professional Development: What Works* by Sally Zepeda (2019) to better understand how to develop and implement job-embedded professional learning. The findings in Chapter 4 noted that professional learning needed to be revisited in multiple touchpoints with teachers to embed in daily instructional practice. It was imperative that adult learning model the process of student learning.

To provide the support needed by teachers to effectively develop and implement common formative assessments in the mathematics classroom, the instructional team needed to focus on a

professional learning process that was relevant and cyclical. The team recognized the value in modeling skills, encouraging active involvement and engagement, providing coaching and feedback in various settings, and repeatedly intentionally for professional learning to transfer to regular classroom instructional practice. Teachers acknowledged the value of developing and implementing common formative assessments in safe, risk-free environments that allowed for feedback and coaching. The instructional team sought to provide additional opportunities to support teachers outside the monthly TEAM Time sessions.

The theme for Research Question 1 revealed that any support the district instructional team provided needed to be relevant and cyclical to model practice. Professional learning focused on the development and implementation of common formative assessments needed to follow a framework that prioritized adult learning relevant to teachers' instructional practices and provided multiple opportunities to practice toward an embedded application.

### **Research Question 2**

To better understand the impact of professional learning on the ability of mathematics teachers to develop and implement common formative assessments to inform instructional practices, the researcher analyzed data from the focus group session and a vertical team meeting with mathematics teachers who made up the action research design team. While relevant professional learning continued to emerge as a result of the findings, the data also revealed a need for time and reflection for professional learning to impact the capacity of teachers to utilize Edulastic as a common formative assessment tool to inform their instructional practices. Based on the analysis, a triangular theme of time, relevance, and reflection emerged and aligned with the second research question.

### *Time, Relevance, and Reflection Are Key*

The mathematics teachers expressed appreciation for the support received during the action research cycles. The teachers were very comfortable and transparent in their feedback regarding their professional learning experiences, which focused on using Edulastic as a common formative assessment tool. Their comments revealed three key takeaways derived from the impact of support. Time was essential, relevance was necessary, and reflection was fundamental.

As the action research study continued throughout the semester, the need for time to plan became prevalent in the focus group session. An elementary teacher expressed, “*I believe that this really the biggest barrier teachers have as far as a challenge is we need time to design and implement and analyze and discuss the information or adjustments that can be made to instruction.*” She further elaborated, “*So it takes time to, you know, design, create, implement, analyze and share it out.*” To help teachers meet the demands of designing and planning common formative assessments, principals built-in extended planning time (EPT) each month to supplement weekly common planning time. While all participants of the focus group acknowledged the benefits of EPT, the need for uninterrupted time to develop and implement common formative assessments remained the most significant barrier.

The group acknowledged that the use of Edulastic addressed the need for more time in some respects. The online tool allowed “*...a quick look at who knows something, a concept that's been assessed.*” The elementary teacher also reflected, “*When you're using Edulastic, one of the things that's a benefit of the program is the ability to redirect the assessment back to the student, which is great if you're trying to make sure the student masters a concept.*” The group concurred that Edulastic training and support provided by the district instructional team were

beneficial. *“The support of the Instructional Technology Director is fantastic! She responds quickly when you need assistance using Edulastic,”* praised an elementary teacher.

The teachers acknowledged that even with the advantages of Edulastic, the support of the instructional team, and the addition of EPT, they struggled with consistent implementation in the classroom setting. Teachers are not confident with “flying solo,” as one teacher described, using Edulastic to quickly make instructional decisions in the classroom. The need for relevant support and training in the classroom environment continued to emerge. There was an intentional effort to focus on using Edulastic to develop common formative assessments; however, simultaneously, there was a void regarding how to use the data to inform instructional practices. Teachers desired support relevant to the implementation process in the classroom setting. The ARDT recognized the challenge of teachers to slow down and reflect on their instructional practices.

Field notes indicated that time for reflection was a fundamental element of implementing common formative assessments to inform teachers' instructional practices. Repeatedly in the focus group session, mathematics teachers described the lack of time to plan, implement, analyze, and reflect on instructional practices. A middle school teacher emphasized, *“We got to remember to build in some, some time where we can delve deeper and use that data to do some redirection or remediations.”* When the researcher asked the group whether they had a toolbox for instruction practices, another middle school teacher responded, *“We're working on systems to make it work. The more people you can share in a situation is great. More minds are good.”*

With limited time for reflective conversations, one teacher shared, *“I think that the idea of data talks has forced us to promote a learning culture so that we are forced to always don't forget the connection to data, but how it impacts instruction.”* The opportunity for rich

discussion enabled teachers to analyze the impact of instructional practices on student learning and avoid getting caught up in the cycle of checking off the boxes to reflect compliance. As a teacher highlighted, *“And the concern that I have with an instructional practice is more so on the side of how do I have the proper toolset to support students moving forward.”* Similar data analysis from the mathematics vertical team meeting revealed the need for teachers to have time to reflect and discuss how assessments were informing their instructional practices.

In analyzing the data related to Research Question 2, one theme emerged that time, relevance, and reflection are key. The core ADRT members used the action research process to build the capacity of mathematics teachers to utilize common formative assessment as a tool to inform their instructional practices by acknowledging that time was essential, relevance was necessary, and reflection was fundamental. Early in the action research study, the core ADRT members provided training on using Edulastic to develop and implement common formative assessments more effectively and efficiently. Secondly, using feedback from surveys, there was an intentional focus on professional learning relevant to teachers in the classroom setting. The ADRT continued to seek teacher input in analyzing data from the focus group session and the mathematics vertical team meeting. Lastly, the ADRT emphasized the fundamental value of teacher reflection on instructional practices to build their capacity as educators in the design of professional learning.

### **Research Question 3**

The Action Research Design Team (ADRT) was an essential component of the study. The team members analyzed data and served as thought partners to the researcher throughout the case study. Research Question 3 sought to understand the ARDT perspective of leading the design and implementation of the action research study. The team used data collected from the

surveys, interviews, a focus group session, and a reflective journal to extrapolate the meaning of their roles in the process resulting in the theme that emerged from the analysis of Research Question 3 that clarity in the framework, processes, and expectations positively influence implementation.

#### *Clarity in the Framework, Processes, and Expectations Positively Influence Implementation*

The ARDT provided feedback regarding their perceptions of the interventions used in the study. In detailing the analysis of the Assessment Literacy Inventory survey, the high school assistant principal noted, *“There is a lack of understanding of assessment literacy, especially in terms of vocabulary.”* The Instructional Technology Director added, *“Our teachers have varying knowledge and expertise in creating, administering, and interpreting various assessments. Common vocabulary, training, and expectations must be established if this is a priority for the district.”* The team agreed that a need existed to establish a common vocabulary to define assessments in the district.

Drawing on their past professional learning experiences to acknowledge their bias, the team recognized a need based on the current action research to communicate clear expectations and processes. The data analysis left the team questioning if teachers should be accountable for implementing a practice effectively without a systematic framework and clear expectations. One team member acknowledged, *“People come from very different levels of knowledge and experiences.”* While another reflected,

*I have had training in common formative assessments, but at the time, it was not systemic – small groups of teachers participated, and there was no follow-through. As a result, there was uneven implementation. Some key concepts taught at the training have endured for some, while others have morphed or are called a different name.*

The data underscored the importance of establishing expectations and a systematic framework for professional learning, which paralleled the discussions from the book study. The team determined to provide teachers with a framework that listed expectations and processes in professional learning.

In addition to a common vocabulary and clear expectations and processes, the data revealed a critical need for robust training for staff on the development and implementation of common formative assessments. One team member proposed, *“No assumptions of prior knowledge should be made, but some effort must be made to determine what prior knowledge teachers already have to make the training relevant.”* Acknowledging the feedback from the mathematics teachers, the team established that professional learning must be relevant and cyclical. The action research process accentuated the need for professional learning to be relevant for teachers to engage actively. The team discovered that embedding the study’s logic model in professional learning provided a cyclical process for accountability.

The overarching theme that clarity in the framework, processes, and expectations positively influence implementation was transparent during the action research study. The ADRT discussed the findings that supported the need for a common vocabulary, a framework with clear expectations and processes, and robust training that was relevant and cyclical. Clarity gives teachers an understanding of a complete, clear, detailed goal. Teachers can develop and implement common formative assessments with fidelity by eliminating vagueness and ambiguity from professional learning.

### **Chapter Summary**

Three overall themes emerged from the data that related to the research questions. Research Question 1 investigated how the district leadership team can support professional

learning for mathematics teachers in developing and implementing common formative assessments to inform their instructional practices. The support of teachers exists in several ways; however, the emergent theme was that cyclical and relevant professional learning models desired instructional practice. Mathematics teachers benefitted from the TEAM Time sessions that provided relevant training using the logic model to facilitate practical application in the classroom.

Research Question 2 focused on how mathematics teachers described the impact of professional learning on their capacity to utilize common formative assessments as a tool to inform instructional practices. The theme that emerged through data was that time, relevance, and reflection are key. Mathematics teachers emphasized time as a barrier. While there were pockets of collaborative time for planning, teachers indicated that there never seemed to be enough uninterrupted time to dig deep into common formative assessments or instructional practices. Teachers expressed the need for professional learning to be relevant to their classroom practice. Additionally, there was a fundamental need for reflective practice to be a part of professional learning. By incorporating time, relevance, and reflection in professional learning, mathematics teachers felt supported in their capacity to develop and implement common formative assessments.

Research Question 3 sought the perspectives of the ARDT related to the process of leading the design and implementation of common formative assessments in mathematics. The team members acknowledged that clarity in the framework, processes, and expectations positively influence implementation. A common vocabulary, a framework with clear expectations and processes, and robust training that was relevant and cyclical were essential in professional learning. The team determined that these three fundamental elements would be part

of developing and implementing professional learning.

Chapter 6 presents the conclusions gleaned from the study and discusses the implications for future leadership practices and research.

**CHAPTER 6**  
**CONCLUSIONS, IMPLICATIONS, AND CONNECTIONS TO LEADERSHIP**  
**PRACTICES**

The purpose of this action research study was to develop and implement common formative assessments for mathematics teachers to inform instructional practices. As Moore et al. (2017) articulate, "if we have expectations for student learning that is rigorous, independent, and applicable in the real world, teachers need to be able to plan instruction that will help their students meet those goals" (p. 9). The following research questions guided this analysis to address the purpose of this research action study:

1. How can the district instructional leadership team support professional learning for math teachers to develop and implement common formative assessments to inform instructional practices?
2. How do mathematics teachers describe the impact of professional learning on their capacity to utilize common formative assessments as a tool to inform instructional practices?
3. What do Action Research Design Team (ARDT) members learn in the process of leading the design and implementation of common formative assessments in mathematics?

This chapter presents conclusions and summaries of the findings, implications for practice, policy, further research, and connections to leadership practices. The conclusions and implications in this chapter present a summary of the emerging themes related to the research questions. This chapter concludes with proposed implications and recommendations for

practitioners, policymakers, and researchers, a chapter summary, and the researcher's final thoughts.

### **Summary of the Research Design**

This action research case study began in August 2022 at Grantham School District (GSD), a small, semi-rural, city public school system. The research design used a qualitative research approach to examine how school leaders support mathematics teachers in developing and implementing common formative assessments to inform their instructional practices. Tracy (2010) describes comprehensive qualitative research as relevant, timely, significant, interesting, or evocative (p. 840). The researcher led the district's instructional team at Grantham School District in a series of action research cycles that began at the beginning of the school year with the formation and implementation of the TEAM Time professional learning sessions designed to train, encourage, assist, and mentor teachers during their collaborative planning time. The core Action Research Design Team (ARDT) aided the researcher in developing the interventions and analyzing the findings.

#### *Action Research*

The core ARDT met weekly beginning in August to design a framework of professional learning sessions intended to support the development and implementation of common formative assessments to inform the instructional practices of mathematics teachers. The researcher served as the Executive Director of Curriculum and Instruction at the time of the study. The core ARDT included the researcher, the Instructional Technology Director, the Assessment/CTAE Director, and the K-12 Mathematics Lead. The study uses three action research cycles. Each cycle began by analyzing challenges identified by teachers for developing and implementing common formative assessments in the mathematics classroom. The core ADRT developed an intervention

shared with mathematics teachers during monthly collaborative planning time. During weekly meetings, the team would debrief and reflect. The cycle would repeat to address additional challenges as they surfaced.

The primary researcher collected data for this action research study by the following methods:

1. An Assessment Literacy Inventory (ALI) and TEAM Time surveys with K-12 mathematics teachers. The researcher administered the ALI at the beginning of the second action research cycle and the TEAM Time surveys monthly.
2. Individual interviews with participating instructional coaches, assistant principals, and principals occurred during the second action research cycle. Interviews used the critical incident criteria. The individual interviews were audio-recorded using a software application for the purpose of transcription and analysis of themes;
3. A focus group session with K-12 mathematics teachers occurred during the third action research cycle. The primary researcher conducted the audio-recorded focus group using a software application for the purpose of transcription and themes;
4. Document analysis from the meeting agendas and feedback surveys from professional learning training sessions provided identification of themes;
5. The researcher's journal notes contributed to the analysis of the study.

#### *Theoretical Framework, Logic Model, and Theory of Change*

In this study, the primary researcher used the *framework for leadership in mathematics education* developed by Dynarski (2008) to clarify and focus on leading PreK-12 mathematics professional learning. A framework defined the roles of individuals who led mathematics

instruction in a classroom, school, or district through a combined focus on Dynarski's (2008) four guiding principles and Moss and Brookhart's (2019) six foundational elements.

The logic model for this study articulated how we believed change would happen, and as a result, we planned to invest time and resources to contribute to the change. The Plan-Do-Study-Act logic model provided a cyclical framework to test logical connections and communicate the study's vision, plan, and outcomes. The ARDT used the Plan-Do-Study-Act cycles to define common formative assessments, design and implement interventions to support mathematics teachers, reflect on the data collected, and make adjustments to the interventions based on the data analysis (Fullen, 2007; McLaughlin & Mitra, 2001). The logic model defined the research cycles and provided a framework for ARDT.

The theory of change process can be a powerful tool for promoting collaboration and engagement at the community level focused on products and outcomes (Connell & Kubisch, 1998). The study fostered collaboration and developed community capacity within the K-12 mathematics teachers as instructional leaders in the classroom. As Elmore (2004) advised, "Improvement is more a function of learning to do the right things in the settings where you work" p. 73). This study capitalized on the concept that teachers implement lasting change in instructional practice through the knowledge gained from job-embedded professional learning.

### **Summary and Discussion of the Findings**

Three research questions guided this study, and multiple themes emerged based on the data analysis. In addressing each research question, the researcher used the analysis of the qualitative study to formulate the themes connected to each research question and support the finding in the literature.

### *Discussion of Findings from Research Question 1*

Research Question 1 addressed how the district instructional leadership team supported professional learning for math teachers to develop and implement common formative assessments to inform instructional practices. Based on the data analysis collected, one central emerging theme related to the first research question indicated that Cyclical and Relevant Professional Learning Models Desired Instructional Practice. Just as teachers strive to create a classroom environment to encourage students to engage, learn, and grow, educational leaders are responsible for professional learning environments that encourage teachers to engage, learn, and grow.

Guskey (2014) approached the planning of professional learning using backward design and stated, "The effectiveness of any professional learning activity, regardless of its content, structure, or format, depends mainly on how well it is planned" (p.10). The backward planning case study provided a real-world exemplar of backward planning by using a systematic approach to professional learning to identify and implement a workable solution focused on student learning outcomes. Feedback from K-12 mathematics teachers gathered through surveys, and a focus group articulated the need for professional learning to be relevant to facilitate ownership and application in the classroom. Specific comments from K-12 mathematics teachers in the feedback surveys indicated that the training facilitated ownership of professional learning.

The idea that professional learning should be cyclical in nature to yield implementation in the classroom environment modeled the Plan-Do-Study-Act logic model. The ADRT was essential in developing and implementing professional learning using the study's logic model. Through intentional analysis of teacher feedback, the ADRT modeled cyclical professional

learning by addressing identified challenges with solutions and training in subsequent professional learning sessions.

### *Discussion of Findings from Research Question 2*

Research Question 2 attempted to better understand the impact of professional learning on the ability of mathematics teachers to develop and implement common formative assessments to inform instructional practices. Based on the analysis, a triangular theme emerged aligned with the second research question indicating Time, Relevance, and Reflection Are Key. In addition to relevant and cyclical professional learning, teachers revealed a need for time and reflection for professional learning to impact their capacity to utilize Edulastic as a common formative assessment tool to inform their instructional practices.

It is essential to intentionally build time, relevance, and reflection into professional learning experiences embedded in instructional practices. Participants in the study expressed in feedback surveys, individual interviews, and a focus group session the importance of time to effectively develop, implement, and reflect on the use of common formative assessments to inform instructional practices. The challenges of time and teacher knowledge of common formative assessments emerged in an interview with a primary-level assistant principal who revealed, *“You have to talk about instructional practices and strategies. They don't have time. They don't make time to do that. Maybe because they don't see the value of it.”* Tam (2015) correlated that robust learning environments created teacher change through collaborative learning activities of reflection, observation, action research, and dialog. Tam (2015) stated, *“Without addressing the underlying deficit beliefs that influence teachers' behavior, launching school-based curriculum does little towards changing practice once teachers return to classrooms and close their doors”* (p. 37).

Throughout the study, the ADRT strove to design professional learning experiences that modeled and included time, relevance, and reflection. Drawing on Zepeda's (2019) practical steps to support school leaders and teachers in applying and growing professional learning activities, the ADRT allowed time to practice, provided feedback and coaching, modeled new skills, solicited authentic encouragement, created a safe space to learn and engage, designated time for collaboration and reflection, and listened to teacher voice and choice. The opportunity for rich discussion enabled teachers to analyze the impact of instructional practices on student learning and avoid getting caught up in the cycle of checking off the boxes to reflect compliance. As a teacher highlighted, *"And the concern that I have with an instructional practice is more so on the side of how do I have the proper toolset to support students moving forward."*

Similar data analysis from the mathematics vertical team meeting revealed the need for teachers to have time to reflect and discuss how assessments were informing their instructional practices. Vertical team members collaboratively unpacked a challenge identified in the classroom, provided the steps taken to address it, hypothesized the root cause, and proposed a solution. Each team used a solution-focused protocol that embedded the study's logic model and provided time, relevance, and reflection. The ADRT focused on these three priorities throughout the action research cycles to support teachers in developing and implementing common formative assessments to inform their instructional practices.

### *Discussion of Findings from Research Question 3*

Research Question 3 sought to understand the ARD's perspective of leading the design and implementation of the action research study. The team used data collected from the surveys, interviews, a focus group session, and a reflective journal to extrapolate the meaning of their roles in the process, and the theme that emerged from the analysis of Research Question 3 was

Clarity in the Framework, Processes, and Expectations Positively Influence Implementation. If clarity influences implementation, the ADRT core ADRT realized early in the study the importance of their role in sustaining continuous improvement by focusing continuous efforts on professional learning designed to facilitate teacher growth towards creating and improving student assessments and analyzing data to focus on student learning. Jones and Thessin (2017) reference the overarching question that educators continually circle back to, "How do districts sustain continuous improvement of professional learning that has developed and implemented PLCs successfully?"(p.237).

Throughout the study, the ADRT reflected on their responsibility to create a framework for professional learning that built in the components of time, relevance, and reflection in a cyclical nature to support and build the instructional capacity of teachers. By pairing the principles of adult learning with job-embedded professional learning, teachers are more likely to increase their capacity as they continue to learn and improve (Zepeda, 2019). When reflecting on the use of common formative assessments to inform instructional practices, the Instructional Technology Director noted, *"Our teachers have varying knowledge and expertise in creating, administering, and interpreting various assessments. Common vocabulary, training, and expectations must be established if this is a priority for the district."* The ADRT analyzed data from the ALI, individual interviews, and a focus group session to determine the need for clarity through a common vocabulary and a framework with clear expectations and processes.

### **Limitations of the Current Study**

Limitations of a study are indicated by Bloomberg and Volpe (2018) as "those characteristics of design or methodology that impacted or influenced the interpretation of the findings from your research" (p. 207). The limitations of this study arose from the nature of

qualitative research. The researcher served as a participant and observer in the study, which influenced the amount of researcher bias. Merriam (2009) asserts that the participant-observer role will impact the study by providing guidance and facilitating collective sense-making of the data. Additionally, the researcher held a position of power within the district, limiting the findings. Participation in the research was voluntary and would not impact any participant's current role or position within the district. The researcher strove to establish an environment free of evaluation to encourage participants to exchange dialogue and perspectives openly.

Other limitations were due to the specific context of the study. The small size of the school district impacted the number of participants. Another limitation was the timing and length of the study. The study was conducted from August 2022 to January 2023, which prescribed the number of intervention cycles, limiting the diversity of experiences throughout the study.

Inherently, case studies have limitations but are suitable for research in complex social units (Merriam, 2009). The real-life application of mathematics using common formative assessments to inform instructional practices was well-suited for an action research case study despite the limitations because the findings offer insight into possible avenues of sustainable development.

### **Implications and Recommendations for Practitioners**

The findings from the present study offer implications for practitioners at Grantham School District (GSD) and practitioners in other school contexts. The need to design job-embedded professional learning on the development and implementation of common formative assessments to inform teachers' instructional practices extends to all classrooms. Moss and Brookhart (2019) indicate common formative assessments are implemented in classrooms

worldwide using a myriad of teaching methods and strategies in a concerted effort toward closing the equity gap in student learning.

The study's findings arose from the need for time, relevance, and reflection to be fundamental tenets of job-embedded professional learning. Mitigation through intentional scheduling structures that facilitate collaborative planning in an uninterrupted space resolves the time issue. Teachers are more likely to engage in professional learning relevant to common formative assessments and instructional practices. Instructional leaders can facilitate ownership of professional learning activities by modeling new skills, providing feedback and coaching, creating a safe environment, and fostering collaboration. Professional learning designed with time for reflection provides teachers with an opportunity to engage in rich dialogue focused on improving instructional practices and building the capacity of teachers.

In addition to intentionally providing time, relevance, and reflection in professional learning, the findings from the case study support the need for instructional leaders to provide clarity to support teachers. Based on the study findings, perspectives emerged to suggest that a common vocabulary and clear expectations and processes are critical components of job-embedded professional learning to impact teachers' instructional practices. The study's findings also highlight that professional learning must be cyclical to build the capacity of teachers and become embedded in classroom practices.

### **Implications and Recommendations for Policy**

The findings of the study may offer implications for policy related to other city and larger school districts. The district instructional team at Grantham School District regularly designed and implemented professional learning activities in school and district-wide staff training

sessions. It was the collaborative efforts of principals to schedule time for training and to hold teachers accountable for applying the training to their instructional practices.

Local, state, and federal policymakers often prioritize assessments for student learning. Reagan et al. (2016) explored the policy implications of assessments and outlined the tensions between local control vs. professionalism, marginalizing vs. privileging groups and ideas, and dual roles as both formative and summative assessments. Stobart and Eggen (2012) noted that raising standards and accountability does not correlate to impactful teaching and learning. The study's findings revealed that it is time for policymakers to focus on building the capacity of teachers through the intentional development and implementation of professional learning to design and implement a common formative assessment to inform instructional practices through a cycle that includes time, relevance, and reflection.

### **Implications and Recommendations for Researchers**

The study conducted in a specific context at Grantham School District (GSD) provides further research regarding how district leaders support teachers in developing and implementing common formative assessments to inform their instructional practices through professional learning. Grantham School District is a semi-rural city public school system with approximately 40 mathematics teachers in kindergarten through twelfth grades at the time of the study. The study's findings are specific to the context and the mathematics teachers at GSD. Larger school districts may employ a more significant number of mathematics teachers. Additional research on professional learning designed for developing and implementing common formative assessments to inform the instructional practices of mathematics teachers may uncover additional findings. Can an online formative assessment tool provide teachers with the capacity to inform instructional practices while simultaneously facilitating horizontal and vertical alignment in

mathematics classrooms? How can district leaders impact the capacity to develop, align, and implement the use of a common formative assessment tool to inform instructional practices in all classrooms district-wide?

### **Concluding Thoughts**

This study aligns with the analysis of Moore et al. (2017), who articulated, “if we have expectations for student learning that is rigorous, independent, and applicable in the real world, teachers need to be able to plan instruction that will help their students meet those goals” (p. 9). The emerging themes of this case study reflected the need for teachers to improve their instructional practices through a reflective lens of observing and analyzing student assessment data. The purpose of this action research study was to develop and implement common formative assessments for mathematics teachers to inform instructional practices. Grantham School District recognized the need to develop, align, and implement common formative assessments in every classroom and provided identified K-12 mathematics teachers with professional learning by using an online resource to measure student growth during the learning process.

The findings from the current study data revealed that the use of common formative assessments facilitates collaborative planning in the development of the assessment, teacher efficacy in the implementation of the assessment, and reflective discussion in the analysis of the assessment results. Student data from common formative assessments communicate two-fold to the student and the teacher (Jarvis, 2015). Students receive feedback regarding where they are in the learning continuum, and teachers gain knowledge of the impact of their instructional practices. Jarvis (2015) looked at the positive power of formative assessment practices as a critical part of the teaching and learning process that has a significant, positive impact on student achievement. By referring to formative assessment as a process rather than a specific task, Jarvis

(2015) argues that participation in a variety of formative assessments aligns with three top strategies considered by Professor John Hattie (2018) to have a significant effect size on student learning: providing formative evaluation with an effect size of .90, feedback with an effect size of .73, and questioning with an effect size of .46. When the teacher maximizes the outcomes from common formative assessments, the trajectory of student learning compounds.

Given the intentional focus on funding and support to mitigate learning loss due to the impact of COVID-19, the need for teachers to use common formative assessments to inform their instructional practices is more critical than ever. The investment in professional learning designed to support the development and implementation of common formative assessments to inform instructional practice in the Grantham School District holds the potential to reap long-lasting benefits.

The action research process left a residual impact on the district on multiple levels. Evidence of intentional and continued use of Edulastic as a common formative tool through the school-level Impact Checks, the principals' State of the School Addresses, and a recent Multi-Tiered Systems of Supports (MTSS) audit findings report. Teachers and leaders plan to continue developing and implementing common formative assessments to inform instructional practices beyond the mathematics classroom. The district instructional team recognized the benefits of action research and planned to incorporate the action research process towards the district's continuous improvement focused on establishing a firm Tier 1 foundation founded on solid assessments and powerful instructional practices.

## References

- Abbakumov, D., Desmet, P., & Van den Noortgate, W. (2020). Rasch Model Extensions for Enhanced Formative Assessments in MOOCs. *Applied Measurement in Education*, 33(2), 113-123. <https://doi.org/10.1080/08957347.2020.1732382>
- Arnove, R. F. Imagining what education can be post-COVID-19. *Prospects* 49, 43–46 (2020). <https://doi.org/10.1007/s11125-020-09474-1>
- Aubrecht II, G. J., Esswein, J., Schmitt, B., & Creamer, J. (2015). Using Common Formative Assessments (CFAs) as a Means to Quantify Perceived Student Changes in IMPACTed Teachers. *AURCO Journal*, 21, 1-18. \_
- Black, P. & Wiliam, D. (2010). Inside the black box: Raising standards through classroom assessment. *The Phi Delta Kappan*., 92(1). <https://doi.org/10.1177/003172171009200119>
- Bloomberg, L. D., & Volpe, M. (2018). Completing your qualitative dissertation: A road map from beginning to end.
- Botzakis, S., Burns, L. D., & Hall, L. A. (2014). Literacy reform and common core state standards: Recycling the autonomous model. *Language Arts*., 91(4).
- Bourke, B. (2014). Positionality: Reflecting on the Research Process. *The Qualitative Report*, 19(33), 1-9. <https://proxy.openathens.net/login?entityID=https://idp.wa.galileo.usg.edu/entity&qurl=https://www.proquest.com/scholarly-journals/positionality-reflecting-on-research-process/docview/2486198787/se-2>
- Calvert, L. (2016). Moving from compliance to agency: What teachers need to make professional learning work. Oxford, OH: Learning Forward and NCTAF. Retrieved from <https://learningforward.org/publications/teacheragency>

- Care, E., Scoular, C., & Griffin, P. (2016). Assessment of Collaborative Problem Solving in Education Environments. *Applied Measurement in Education*, 29(4), 250-264.  
<https://doi.org/10.1080/08957347.2016.1209204>
- Carroll, S. (2016). *The Big Picture*. Penguin Publishing Group.
- Clark, I. (2011). Formative assessment: Policy, perspectives, and practice. *Florida Journal of Educational Administration & Policy*., 4(2).
- Coghlan, D., & Brannick, T. (2014). *Doing action research in your own organization* (4<sup>th</sup> ed.). Los Angeles: SAGE.
- Connell, J. P., & Kubisch, A. C. (1998). Applying a theory of change approach to the evaluation of comprehensive community initiatives: progress, prospects, and problems. *New approaches to evaluating community initiatives*, 2(15-44), 1-16.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Los Angeles: SAGE.
- Datnow, A., Park, V., & Kennedy-Lewis, B. (2012). High school teachers' use of data to inform instruction. *Journal of Education for Students Placed at Risk*., 17(4).  
<https://doi.org/10.1080/10824669.2012.718944>
- Denzin, N. K., & Lincoln, Y. S. (Eds.). (2013). *The Sage handbook of qualitative research* (4<sup>th</sup> ed.). Thousand Oaks, CA: Sage.
- Denzin, N. K., & Lincoln, Y. S. (Eds.). (2018). *The Sage handbook of qualitative research* (5<sup>th</sup> ed.). Thousand Oaks, CA: Sage.
- Dorn, S. (2010). The political dilemmas of formative assessment. *Exceptional Children: Journal of the International Council for Exceptional Children*., 76(3).  
<https://doi.org/10.1177/001440291007600305>

Dynarski, M. (2008). Comments on Slavin: Bringing Answers to Educators: Guiding Principles for Research Syntheses. *Educational Researcher*, 37(1), 27–29.

<https://doi.org/10.3102/0013189X08315011>

Eliot and Associates. (2005). Guidelines for Conducting a Focus Group.

Elmore, R. F. (2004). *School reform from the inside out: Policy, practice, and performance*. Cambridge, MA: Harvard University Press.

Flanagan, J. C. (1954), "The critical incident technique", *Psychological Bulletin*, Vol. 51 No. 4, pp. 327-358.

Fullan, M. (2007). Change theory as a force for school improvement. In *Intelligent leadership* (pp. 27-39). Springer, Dordrecht.

Genlott, A. A., & Grönlund, Å. (2016). Closing the gaps – Improving literacy and mathematics by ict-enhanced collaboration. *Computers and Education*, 99, 68-80.

<http://dx.doi.org/10.1016/j.compedu.2016.04.004>

Glanz, J. (2014). *Action research: An educational leader's guide to school improvement*. Rowman & Littlefield.

González-Gómez, D., Jeong, J. S., & Cañada-Cañada, F. (2020). Examining the Effect of an Online Formative Assessment Tool (OFAT) of Students' Motivation and Achievement for a University Science Education. *Journal of Baltic Science Education*, 19(3), 401-414.

<https://doi.org/10.33225/jbse/20.19.401>

Gulikers, J. T. M., Biemans, H. J. A., Wesselink, R., & van der Wel, M. (2013). Aligning Formative and Summative Assessments: A Collaborative Action Research Challenging Teacher Conceptions. *Studies in Educational Evaluation*, 39, 116-124.

<http://dx.doi.org/10.1016/j.stueduc.2013.03.001>

Guskey, T. R. (2014). Planning professional learning. *Educational Leadership*, 71(8), 10- 16.

Retrieved from <http://www.ascd.org/publications/educationalleadership.aspx>

Hall, J. N. (2020). *Focus groups: Culturally responsive approaches for qualitative inquiry and program evaluation*. Myers Education Press.

Hattie, J. (2018). Visiblelearningplus.com

Heredia, S. C., Furtak, E. M., Morrison, D., & Renga, I. P. (2016). Science Teachers' Representations of Classroom Practice in the Process of Formative Assessment Design. *Journal of Science Teacher Education*, 27(7), 697-716.

<https://doi.org/10.1007/s10972-016-9482-3>

Hughes, H. (2006). Responses and influences: a model of online information use for learning. *Information Research* 12(1), paper 279. Retrieved June 18, 2007, from

<http://InformationR.net/ir/12-1/paper279.htm>

“Instructional Strategies.” *Encyclopedia of Education*. Retrieved January 24, 2022 from

Encyclopedia.com: <https://www.encyclopedia.com/education/encyclopedias-almanacs-transcripts-and-maps/instructional-strategies>

Jarvis, J. (2015). STUDENT ACHIEVEMENT.

Jaworski, B. (2003). Research practice into/influencing mathematics teaching and learning development: Towards a theoretical framework based on co-learning partnerships. *Educational studies in mathematics*, 54(2), 249-282.

Jones, C. M., & Thessin, R. A. (2017). Sustaining Continuous Improvement through Professional Learning Communities in a Secondary School. *Journal of School Leadership*, 27(2), 214–241. <https://doi.org/10.1177/105268461702700203>

- Kannel-Ray, V. (2006). GUIDING PRINCIPLES AND EMERGING PRACTICES FOR ENVIRONMENTALLY SUSTAINABLE EDUCATION. *Curriculum & Teaching Dialogue*, 8.
- Kanuka, H. (2002). Guiding principles for facilitating higher levels of web-based distance teaching and learning in post-secondary settings. *Distance Education*, 23(2), 163-182.
- Kemmis, S., McTaggart, R., & Nixon, R. (2014). *The action research planner: doing critical participatory action research*. Springer.
- Krueger, R. (2002). *Designing and Conducting Focus Group Interviews*.  
[www.eiu.edu/ihec/Krueger-FocusGroupInterviews.pdf](http://www.eiu.edu/ihec/Krueger-FocusGroupInterviews.pdf)
- Lin, J., & Lai, Y. (2013). Harnessing Collaborative Annotations on Online Formative Assessments. *Educational Technology & Society*, 16(1), 263-274. <https://www.jstor.org/stable/jeductechsoci.16.1.263>
- Loughland, T., & Ryan, M. (2021). Beyond the measures: The antecedents of teacher collective efficacy in professional learning. *Professional Development in Education*, 1-10.  
<https://doi.org/10.1080/19415257.2021.1711801>
- Marzano, R. J. (2009). Setting the Record Straight on "High-Yield" Strategies. *Phi Delta Kappan*, 91(1), 30–37. <https://doi.org/10.1177/003172170909100105>
- McLaughlin, M. W., & Mitra, D. (2001). Theory-based change and change-based theory: Going deeper, going broader. *Journal of educational change*, 2(4), 301-323.
- McNiff, J. (2018). *Action research: All you need to know*. Thousand Oaks, CA: Sage.
- Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. Jossey-Bass.
- Mertler, C. A. (2017). *Action research: Improving schools and empowering educators*. SAGE Publications, Inc.

- Mertler, C. A., & Campbell, C. (2005). Measuring Teachers' Knowledge & Application of Classroom Assessment Concepts: Development of the "Assessment Literacy Inventory". *Online Submission*.
- Moore, C., Toth, M., & Marzano, R. J. (2017). *The Essentials for Standards-Driven Classrooms: A Practical Instructional Model for Every Student to Achieve Rigor*. Learning Sciences International.
- Moss, C. M., & Brookhart, S. M. (2019). *Advancing Formative Assessment in Every Classroom*. Association for Supervision & Curriculum Development.
- Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods*, 16, 1-13. <https://doi.org/10.1177/1609406917733847>
- Oviawe, J. I. (2020). Technical Education Lecturers' Knowledge of Students' Engagement in Application of Interactive Instructional Strategies. *Journal of Technology and Humanities*, 1(1), 1-10. <https://doi.org/10.53797/jthkkss.v1i1.1.2020>
- Peel, K. L. (2020). A beginner's guide to applied educational research using thematic analysis. *Practical Assessment, Research, and Evaluation*, 25(1). <https://doi.org/10.7275/ryr5-k983>
- Phillips, V. & Wong, C. (2010). Tying together the common core of standards, instruction, and assessments. *The Phi Delta Kappan*, 91(5). <https://doi.org/10.1177/003172171009100511>
- Reagan, E. M., Shram, T., McCurdy, K., Chang, T., & Evans, C. M. (2016). Politics of policy: Assessing the implementation, impact, and evolution of the Performance Assessment for

- California Teachers (PACT) and edTPA. Education Policy Analysis Archives., 24.  
<https://doi.org/10.14507/epaa.24.2176>
- Real-Fernández, A., Molina-Carmona, R., & Llorens-Largo, F. (2019, October). Instructional strategies for a smart learning system. In *Proceedings of the Seventh International Conference on Technological Ecosystems for Enhancing Multiculturality* (pp. 671-679).  
DOI:<https://doi.org/10.1145/3362789.3362915>
- Roulston, K. (2010). *Reflective interviewing: A guide to theory and practice*. Los Angeles: SAGE.
- Sach, E. (2010). Teachers and testing: an investigation into teachers' perceptions of formative assessment. *Educational Studies*, 38(3), 261-276.  
<https://doi.org/10.1080/03055698.2011.598684>
- Schoenfeld, A. (2015). Summative and formative assessments in mathematics supporting the goals of the common core standards. *Theory into Practice*., 54(3).  
<https://doi.org/10.1080/00405841.2015.1044346>
- Søndergaard, H., & Mulder, R. A. (2012). Collaborative learning through formative peer review: pedagogy, programs and potential. *Computer Science Education*, 22(4), 343-367.  
<http://dx.doi.org/10.1080/08993408.2012.728041>
- Spector, J. (2013). Emerging educational technologies and research directions. *Educational Technology & Society: Journal of International Forum of Educational Technology & Society and IEEE Learning Technology Task Force*., 16(2).
- “Standards for Teacher Competence in Educational Assessment of Students” (1990). Standards for Teacher Competence in Educational Assessment of Students. Educational

- Measurement: Issues and Practice, 9: 30-30. <https://doi.org/10.1111/j.1745-3992.1990.tb00391.x>
- Stiggins, R. J. (1999). Are you assessment literate? *The High School Journal*, 6(5), 20-23.
- Stobart, G. & Eggen, T. (2012). High-stakes testing—value, fairness, and consequences. *Assessment in Education: Principles, Policy & Practice.*, 19(1).  
<https://doi.org/10.1080/0969594X.2012.639191>
- Stringer, E. T. (2014). *Action research (4<sup>th</sup> ed.)*. Los Angeles: SAGE.
- Tam, A. C. F. (2015). The role of a professional learning community in teacher change: A perspective from beliefs and practices. *Teachers and Teaching*, 21(1), 22-43.  
<https://doi.org/10.1080/13540602.2014.928122>
- Teacher Burnout in Georgia Voices from the Classroom (2022). Carl Vinson Institute of Government, University of Georgia. <https://www.gadoe.org/External-Affairs-and-Policy/communications/Documents/Teacher%20Burnout%20Task%20Force%20Report.pdf>
- Tracy, S. J. (2010). Qualitative quality: Eight "big-tent" criteria for excellent qualitative research. *Qualitative Inquiry*, 16(10), 837-851.
- van der Kleij, F. M. (2019). Comparison of teacher and student perceptions of formative assessment feedback practices and association with individual student characteristics. *Teaching and Teacher Education*, 85, 175-189.  
<https://doi.org/10.1016/j.tate.2019.06.010>
- Visone, J. (2018). Developing social and decisional capital in US National Blue Ribbon Schools. *Improving Schools.*, 21(2). <https://doi.org/10.1177/1365480218755171>Buttram, J.

- (2016). The role of principals in professional learning communities. *Leadership and Policy in Schools*, 15(2). <https://doi.org/10.1080/15700763.2015.1039136>
- Yin, Y., Tomita, M. K., & Shavelson, R. J. (2014). Using formal embedded formative assessments aligned with a short-term learning progression to promote conceptual change and achievement in science. *International Journal of Software Engineering*, 36(4). <https://doi.org/10.1080/09500693.2013.787556>
- Young, J. E. J., & Jackman, M. G. (2014). Formative assessment in the Grenadian lower secondary school: teachers' perceptions, attitudes and practices. *Assessment in Education: Principles, Policy & Practice*, 21(4), 398-411. <https://doi.org/10.1080/0969594X.2014.919248>
- Woolsey, L. K. (2011). The Critical Incident Technique: An Innovative Qualitative Method of Research. *Canadian Journal of Counselling and Psychotherapy*, 20(4). Retrieved from <https://cjc-rcc.ucalgary.ca/article/view/59733>
- Zepeda, S. J. (2019). *Professional development: What works* (3<sup>rd</sup> ed.). New York, NY: Routledge.

## APPENDIX A

### Empirical Findings Table

APA Citation	Findings
<p>Black, P. &amp; Wiliam, D. (2010). Inside the black box: Raising standards through classroom assessment. <i>The Phi Delta Kappan.</i>, 92(1).  <a href="https://doi.org/10.1177/003172171009200119">https://doi.org/10.1177/003172171009200119</a></p>	<p><b>Common Formative Assessments:</b> This article applies the “black box” analogy to the classroom and refers to external inputs that feed into the box with little consideration of what is happening inside the box.</p>
<p>Clark, I. (2011). Formative assessment: Policy, perspectives, and practice. <i>Florida Journal of Educational Administration &amp; Policy.</i>, 4(2).</p>	<p><b>Common Formative Assessments:</b> This article begins with a historical perspective of the evolution of formative assessments in the United States.</p>
<p>Datnow, A., Park, V., &amp; Kennedy-Lewis, B. (2012). High school teachers' use of data to inform instruction. <i>Journal of Education for Students Placed at Risk.</i>, 17(4).  <a href="https://doi.org/10.1080/10824669.2012.718944">https://doi.org/10.1080/10824669.2012.718944</a></p>	<p><b>Common Formative Assessments:</b> This article identifies the potential challenges of common formative assessments.</p>
<p>González-Gómez, D., Jeong, J. S., &amp; Cañada-Cañada, F. (2020). Examining the Effect of an Online Formative Assessment Tool (OFAT) of Students' Motivation and Achievement for a University Science Education. <i>Journal of Baltic Science Education</i>, 19(3), 401-414.  <a href="https://doi.org/10.33225/jbse/20.19.401">https://doi.org/10.33225/jbse/20.19.401</a></p>	<p><b>Common Formative Assessments:</b> This article highlights the effective integration of online formative assessments tools has a powerful potential for significant interactions among teachers and students.</p>
<p>Moss, C. M., &amp; Brookhart, S. M. (2019). <i>Advancing Formative Assessment in Every Classroom</i>. Association for Supervision &amp; Curriculum Development.</p>	<p><b>Common Formative Assessments:</b> This article defines common formative assessment as a driven and dependent process consisting of six fundamental elements.</p>

<p>Schoenfeld, A. (2015). Summative and formative assessments in mathematics supporting the goals of the common core standards. <i>Theory into Practice.</i>, 54(3).  <a href="https://doi.org/10.1080/00405841.2015.1044346">https://doi.org/10.1080/00405841.2015.1044346</a></p>	<p><b>Common Formative Assessments:</b> This article highlights that common formative assessments build the capacity for an improved classroom environment.</p>
<p>Spector, J. (2013). Emerging educational technologies and research directions. <i>Educational Technology &amp; Society: Journal of International Forum of Educational Technology &amp; Society and IEEE Learning Technology Task Force.</i>, 16(2).</p>	<p><b>Common Formative Assessments:</b> This article identifies potential challenges of common formative assessments when not partnered with properly trained, persistent, and dedicated teachers.</p>
<p>Stobart, G. &amp; Eggen, T. (2012). High-stakes testing–value, fairness, and consequences. <i>Assessment in Education: Principles, Policy &amp; Practice.</i>, 19(1).  <a href="https://doi.org/10.1080/0969594X.2012.639191">https://doi.org/10.1080/0969594X.2012.639191</a></p>	<p><b>Common Formative Assessments:</b> This article asserts that high-stakes testing does not necessarily raise standards.</p>
<p>Yin, Y., Tomita, M. K., &amp; Shavelson, R. J. (2014). Using formal embedded formative assessments aligned with a short-term learning progression to promote conceptual change and achievement in science. <i>International Journal of Software Engineering.</i>, 36(4).  <a href="https://doi.org/10.1080/09500693.2013.787556">https://doi.org/10.1080/09500693.2013.787556</a></p>	<p><b>Common Formative Assessments:</b> This article supports that embedded common formative assessments determine the expected level for student learning, establish a data baseline, identify the gap between the baseline and the expected level, and take action to close the gap.</p>
<p>Aubrecht II, G. J., Esswein, J., Schmitt, B., &amp; Creamer, J. (2015). Using Common Formative Assessments (CFAs) as a Means to Quantify Perceived Student Changes in IMPACTed Teachers. <i>AURCO Journal</i>, 21, 1-18.</p>	<p><b>Instructional Practices:</b> This article focuses on using common formative assessments in the classroom as a way for teachers to gauge what students know to prepare and alter instruction methods to foster a more reflective teaching practice.</p>

<p>Black, P. &amp; Wiliam, D. (2010). Inside the black box: Raising standards through classroom assessment. <i>The Phi Delta Kappan.</i>, 92(1).  <a href="https://doi.org/10.1177/003172171009200119">https://doi.org/10.1177/003172171009200119</a></p>	<p><b>Instructional Practices:</b>  This article focuses on the concept of the classroom as the "black box." Inputs from the outside include pupils, teachers, other resources, management rules and requirements, parental anxieties, standards, and high-stakes testing feed into the box.</p>
<p>Jarvis, J. (2015) STUDENT ACHIEVEMENT.</p>	<p><b>Instructional Practices:</b>  This article supports the notion that formative assessment is as the heart of teaching.</p>
<p>Real-Fernández, A., Molina-Carmona, R., &amp; Llorens-Largo, F. (2019, October). Instructional strategies for a smart learning system. In <i>Proceedings of the Seventh International Conference on Technological Ecosystems for Enhancing Multiculturality</i> (pp. 671-679).</p>	<p><b>Instructional Practices:</b>  This article supports the use of a smart learning system to meet individual student needs through instructional strategies.</p>
<p>Sach, E. (2010). Teachers and testing: an investigation into teachers' perceptions of formative assessment. <i>Educational Studies</i>, 38(3), 261-276.  <a href="https://doi.org/10.1080/03055698.2011.598684">https://doi.org/10.1080/03055698.2011.598684</a></p>	<p><b>Instructional Practices:</b>  This article defines the impact of teacher perception of common formative assessments identified by five key themes highly relevant to the implementation process.</p>
<p>Tam, A. C. F. (2015). The role of a professional learning community in teacher change: A perspective from beliefs and practices. <i>Teachers and Teaching</i>, 21(1), 22-43.  <a href="https://doi.org/10.1080/13540602.2014.928122">https://doi.org/10.1080/13540602.2014.928122</a></p>	<p><b>Job-embedded Professional Learning:</b> This article addresses the beliefs of teachers to develop collective efficacy to effectively change practice in the classroom.</p>
<p>Visone, J. (2018). Developing social and decisional capital in US National Blue Ribbon Schools. <i>Improving Schools.</i>, 21(2). <a href="https://doi.org/10.1177/1365480218755171">https://doi.org/10.1177/1365480218755171</a>Buttram, J. (2016). The role of principals in professional learning</p>	<p><b>Job-embedded Professional Learning:</b> This article focused on learning and</p>

<p>communities. <i>Leadership and Policy in Schools</i>, 15(2).  <a href="https://doi.org/10.1080/15700763.2015.1039136">https://doi.org/10.1080/15700763.2015.1039136</a></p>	<p>growing together through collegial visits to facilitate rich dialogue to promote teacher and student learning.</p>
<p>Zepeda, S.J. (2019). <i>Professional development: What works</i> (3rd ed.). New York, NY: Routledge.</p>	<p><b>Job-embedded Professional Learning:</b> Chapter 6 provides a valuable overview of the processes and practices that characterize learning communities.</p>

## APPENDIX B

### IRB Approval and Exempt Determination



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Human Research Protection Program

#### EXEMPT DETERMINATION

August 16, 2022

Dear [Karen Bryant](#):

On 8/16/2022, the Human Subjects Office reviewed the following submission:

Title of Study:	The Development and Implementation of Common Formative Assessments to Inform the Instructional Practices of Mathematics Teachers
Investigator:	<a href="#">Karen Bryant</a>
Co-Investigator:	Lisa Wolaver
IRB ID:	PROJECT00004913
Review Category:	Exempt Flex 7

We have determined that the proposed research is Exempt. The research activities may begin 8/16/2022.

Since this study was determined to be exempt, please be aware that not all future modifications will require review by the IRB. For more information please see Appendix C of the Exempt Research Policy (<https://research.uga.edu/docs/policies/compliance/hso/IRB-Exempt-Review.pdf>). As noted in Section C.2., you can simply notify us of modifications that will not require review via the "Add Public Comment" activity.

- The local school has approved this action research project. We have determined that the proposed research is Exempt.
- The researcher has confirmed that the IRB submission and materials contain descriptions of voluntary research activities only, and participant consent will be obtained for research activities under conditions that minimize the possibility of coercion or undue influence.

- The PI is responsible for ensuring that UGA HRPP policies pertaining to research involving external sites, recruitment, and recommended consent disclosures for Exempt research are followed.

A progress report will be requested prior to 8/16/2027. Before or within 30 days of the progress report due date, please submit a progress report or study closure request. Submit a progress report by navigating to the active study and selecting Progress Report. The study may be closed by selecting Create Version and choosing Close Study as the submission purpose.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103).

Sincerely,

Jennifer Queen, Quality Assurance Officer  
Human Subjects Office, University of Georgia

## APPENDIX C

### Survey Questions

# Assessment Literacy Inventory



Cynthia Campbell, Ph.D.  
Northern Illinois University

and

Craig A. Mertler, Ph.D.  
Bowling Green State University

#### Description of the ALI:

The **Assessment Literacy Inventory (ALI)** consists of five scenarios, each followed by seven questions. The items are related to the seven "Standards for Teacher Competence in the Educational Assessment of Students." Some of the items are intended to measure general concepts related to testing and assessment, including the use of assessment activities for assigning student grades and communicating the results of assessments to students and parents; other items are related to knowledge of standardized testing, and the remaining items are related to classroom assessment.

#### Directions:

Read each scenario followed by each item carefully; select the response you think is the best one and *mark your response on the answer sheet*. Even if you are not sure of your choice, *mark the response you believe to be the best*.

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**Scenario #1**

Ms. O'Connor, a math teacher, questions how well her 10<sup>th</sup> grade students are able to apply what they have learned in class to situations encountered in their everyday lives. Although the teacher's manual contains numerous items to test understanding of mathematical concepts, she is not convinced that giving a paper-and-pencil test is the best method for determining what she wants to know.

1. Based on the above scenario, the type of assessment that would *best* answer Ms. O'Connor's question is called a/an
  - A. performance assessment.
  - B. authentic assessment.
  - C. extended response assessment.
  - D. standardized test.
  
2. In order to grade her students' knowledge accurately and consistently, Ms. O'Connor would be well advised to
  - A. identify criteria from the unit objectives and create a scoring rubric.
  - B. develop a scoring rubric after getting a feel for what students can do.
  - C. consider student performance on similar types of assignments.
  - D. consult with experienced colleagues about criteria that has been used in the past.
  
3. To get a general impression of how well her students perform in mathematics in comparison to other 10<sup>th</sup> graders, Ms. O'Connor administers a standardized math test. This practice is acceptable *only* if
  - A. the reliability of the standardized test does not exceed .60.
  - B. the standardized test is administered individually to students.
  - C. the content of the standardized test is well known to students.
  - D. the comparison group is comprised of grade level peers.
  
4. Which of the following is an *inappropriate* use of the results from this standardized math test?
  - A. planning instruction
  - B. assigning student grades
  - C. determining students' strengths and weaknesses
  - D. developing curriculum
  
5. Throughout instruction, Ms. O'Connor assesses how well her students are grasping the material. These assessments range from giving short quizzes following introduction to a new topic, to administering an end-of-the-unit final exam. In order to improve the validity of this grading procedure, Ms. O'Connor should
  - A. make the grading scale the same for all assessments.
  - B. consider students' prior performance before assigning a final grade.
  - C. weight assessments according to their relative importance.
  - D. take into consideration each student's effort when calculating grades.
  
6. During a parent teacher conference, one of the parents of a student in Ms. O'Connor's class wants to know what it means that his daughter scored in the 80<sup>th</sup> percentile in mathematics. Which of the following provides the *best* explanation of this student's score?
  - A. She got 80% of the items on the math test correct.
  - B. She is likely to earn a grade of 'B' in her math class.
  - C. She is demonstrating above grade level performance in math.
  - D. She scored the same or better than 80% of the norm group.
  
7. Which of the following is an appropriate use of assessment information?
  - A. Utilize information from a variety of assessments when making decisions about student learning.
  - B. Use scores from standardized tests to determine teacher instructional effectiveness.
  - C. Use scores from a standardized test as the primary indicator of student retention.
  - D. Post final grades in order to provide normative information to students in the class.

**Scenario #2**

Mr. Okawa, a fifth-grade teacher, is planning his instruction for the next grading period, aware of the fact that his students will be taking the statewide achievement test near the end of the grading period.

8. Mr. Okawa's mathematics unit for this grading period will focus on multi-step problem-solving. He wants to assess his students' problem-solving abilities at the end of the unit to determine if any reinstruction will be necessary prior to the statewide test. Which of the following assessment strategies would be the most appropriate choice?
  - A. He should choose the assessment included in the teacher's manual from the textbook he uses.
  - B. He should choose an assessment which is consistent with the content and skills he taught.
  - C. He should choose a different standardized assessment that provides a score on similar skills.
  - D. He should choose an assessment which covers single-step problem-solving skills.
9. Mr. Okawa decides to develop his own assessment in order to determine if any reinstruction will be necessary. He also wants to use his assessment as a means of anticipating how his students will perform on the statewide assessment. In order for him to accurately approximate his students' performance, which of the following would be the most appropriate type of assessment for him to develop?
  - A. a performance assessment
  - B. a multiple-choice test
  - C. a portfolio assessment
  - D. an essay test
10. Julie, one of Mr. Okawa's students, receives a percentile rank of 60 on the problem-solving skills subtest of the statewide assessment. This score is most appropriately interpreted as which of the following?
  - A. Julie scored above average.
  - B. Julie scored below average.
  - C. Julie scored at the national average.
  - D. Not enough information to determine.
11. Juan, another student in Mr. Okawa's class, receives a scaled score of 196 on the reading comprehension portion of the statewide assessment. The cut score is 200; therefore, Juan does not pass this subtest. However, the subtest has a standard error of measurement equal to 6. Which of the following is the best decision for Mr. Okawa to make regarding instruction appropriate to meet Juan's needs?
  - A. Juan has clearly not achieved the minimum level of reading comprehension and should receive remedial reading instruction.
  - B. Mr. Okawa knows that Juan could have scored higher, so the results of the test should be ignored.
  - C. Juan may likely have achieved the minimum level of reading comprehension and nothing different or additional should be done.
  - D. Mr. Okawa knows that Juan should have scored much lower, so the results of the test should be ignored.
12. Which grading practice being considered by Mr. Okawa would result in grades that would least reflect achievement?
  - A. grades based on daily homework and chapter tests
  - B. grades based on daily homework and chapter tests, with points deducted for poor effort
  - C. grades based on daily homework and chapter tests, where students are permitted to redo assignments in order to meet higher standards
  - D. grades based on chapter tests, where daily homework is not formally graded
13. Barbara scores at the 60<sup>th</sup> percentile on mathematics problem-solving and at the 56<sup>th</sup> percentile on reading comprehension. The percentile bands for each test are five percentile ranks wide. What advice should Mr. Okawa give to Barbara's parents?
  - A. They should ignore the difference; her performance was essentially the same on the two tests.
  - B. They should seek additional tutoring help for Barbara in reading.
  - C. They should force Barbara to read more at home.
  - D. They should provide enrichment experiences for Barbara in math, which is her better performance area.
14. Mr. Okawa was worried that his students would not perform well on the statewide assessment. He did all of the following to help increase students' scores. Which was unethical?
  - A. He instructed students in strategies for taking multiple-choice tests, such as how to use answer sheets.
  - B. He planned his instruction so that it focused on concepts and skills to be covered on the test.
  - C. He encouraged the students to do their best, and provided them with a reward after testing was complete.
  - D. He allowed students to practice with items from an alternate form of the test.

**Scenario #3**

Ms. Green is an eighth-grade American History teacher. She has just finished teaching a unit on the Industrial Revolution and wishes to make decisions about her students regarding their higher-order thinking skills. Ms. Green has decided to give her students a single assessment in the form of an end-of-unit multiple-choice test. She anticipates that most of her students will perform well on the test.

15. Based on her goal, what can you conclude about her decision to administer a multiple-choice test?
  - A. This is an appropriate choice for a unit assessment.
  - B. The test scores may not be valid for this purpose.
  - C. The test scores may not be reliable for this purpose.
  - D. A true-false test would be more appropriate.
  
16. To determine the quality of her multiple-choice test, Ms. Green should conduct an item analysis and examine all of the following except
  - A. item difficulty values.
  - B. item discrimination values.
  - C. reliability coefficients.
  - D. validity coefficients.
  
17. Ms. Green decides to score the tests using a 100-percent correct scale. Generally speaking, what is the proper interpretation of a student score of 85 on this scale?
  - A. The student answered 85% of the items on the test correctly.
  - B. The student knows 85% of the content covered by this instructional unit.
  - C. The student scored higher than 85% of other students who took this test.
  - D. The student scored lower than 85% of other students who took this test.
  
18. Some of Ms. Green's students do not score well on the multiple-choice test. She decides that the next time she teaches this unit, she will begin by administering a pretest to check for students' prerequisite knowledge. She will then adjust her instruction based on the pretest results. What type of information is Ms. Green using?
  - A. norm-referenced information
  - B. criterion-referenced information
  - C. both norm- and criterion-referenced information
  - D. neither norm- nor criterion-referenced information
  
19. The Industrial Revolution test is the only student work that Ms. Green grades for the current grading period. Therefore, grades are assigned only on the basis of the test. What is the major criticism of this practice?
  - A. The test, and therefore the grades, reflect too narrow a curricular focus.
  - B. These grades, since based on tests alone, is probably biased against some minority students.
  - C. She should add extra points to the scores of students who scored low on the test.
  - D. Decisions like grades should be based on more than one piece of information.
  
20. Mr. Simpson, another American History teacher, bases his grades primarily on his observations of students during class. The primary distinction between his system of assigning grades and that used by Ms. Green is *best* characterized as which of the following?
  - A. Ms. Green uses formal assessment; Mr. Simpson uses informal assessment.
  - B. Ms. Green uses formative assessment; Mr. Simpson uses summative assessment.
  - C. Ms. Green uses standardized assessment; Mr. Simpson uses nonstandardized assessment.
  - D. Ms. Green uses traditional assessment; Mr. Simpson uses alternative assessment.
  
21. Based on their grades from last year, Ms. Green believes that some of her low-scoring students are brighter than their test scores indicate. Based on this knowledge, she decides to add some points to their test scores, thus raising their grades. Which of Ms. Green's actions was unethical?
  - A. examining her student's previous academic performance
  - B. adjusting grades in her course
  - C. using previous grades to adjust current grades
  - D. adjusting some students' grades and not others'

**Scenario #4**

Mr. Valdez is an English teacher in the newly built middle school. Experienced in issues of classroom assessment, Mr. Valdez is often asked to respond to the district's questions concerning best practices for evaluating student learning.

22. Ms. Franklin, also an English teacher, asks what type of assessment is best for evaluating her 6<sup>th</sup> graders' writing skills. Which of the following methods is likely to provide the *best* response to her question?
  - A. selected response methods
  - B. true/false statements
  - C. completion items
  - D. essay prompts
23. One of the middle school math teachers is redesigning her tests to make greater use of "story problems" as a way to check students' math understanding. She consults with Mr. Valdez to see what, if any, concerns she should be aware of when constructing assessments of this type. Which statement is *not* an appropriate recommendation when designing story-based math tests?
  - A. make sure that the reading level is grade appropriate
  - B. avoid scenarios more familiar to certain groups over others
  - C. check for clarity of sentence construction
  - D. incorporate scenarios used during instruction
24. Isabel, a student in Mr. Valdez's class, scored 78 points on a standardized English test which had a mean of 80 and a standard deviation of 4. She scored 60 points on the science portion of this test which had a mean of 50 and a standard deviation of 3. Based on the above information, in comparison to her peers, which statement provides the most accurate interpretation?
  - A. Isabel is better in English than in science.
  - B. Isabel is better in science than in English.
  - C. Isabel is below average in both subjects.
  - D. Isabel is close to average in both subjects.
25. At the end of each class period, Mr. Valdez does a quick "check in" with his students to get an impression of their understanding. In this example, the primary purpose for conducting formative assessment is to
  - A. identify cumulative knowledge.
  - B. determine content for the final exam.
  - C. plan classroom instruction.
  - D. evaluate curriculum appropriateness.
26. To prepare students for state testing and identify areas of school improvement, all 6<sup>th</sup> grade English teachers give a common final exam which contains a series of essay items. Recently, however, several teachers have expressed concern that the time and effort necessary to complete grading on a timely basis may result in inconsistent scoring. They consult with Mr. Valdez. Which of the following provides the *best* response to the teachers' concern for consistency?
  - A. grade all responses to essay #1 before grading responses to essay #2
  - B. during grading, adjust rubric criteria to reflect exemplary student work
  - C. utilize a holistic scoring method to minimize teacher subjectivity in scoring
  - D. all things being equal, it is best to limit the use of multiple essay exams
27. Jeremy, a 6<sup>th</sup> grade student in Mr. Valdez's class, received a grade equivalent score of 7.2 on a standardized reading test. Jeremy's parents wonder what this means. Based on the above information, which of the following statements provides the most appropriate interpretation of this student's score?
  - A. Jeremy is reading at the 7<sup>th</sup> grade level.
  - B. Jeremy is reading better than the majority of students in his class.
  - C. Jeremy is reading 6<sup>th</sup> grade material as expected.
  - D. Jeremy should be placed in a 7<sup>th</sup> grade reading class.
28. "To ensure that standardized test results provide an accurate picture of what students *really* know, it is recommended that teachers clarify items that are confusing to students."  
Based on best practices of assessment, which of the following is an appropriate response to the above statement?
  - A. The above statement is an acceptable way to reduce error in testing.
  - B. The above statement is an acceptable way to increase test validity.
  - C. The above statement is unacceptable because it labels students as poor readers.
  - D. The above statement is unacceptable because it breaks standardization.

**Scenario #5**

Ms. Hawkins is responsible for teaching science at the 4<sup>th</sup> grade level. Over the past couple of years, her students have really seemed to struggle with investigations of how water changes from one state to another (i.e., freezing, melting, condensing, and evaporating), but she is unsure of where the specific difficulties lie. She is aware that her students need to improve their conceptual understanding of this content standard.

29. Ms. Hawkins wishes to conduct some sort of assessment in order to identify the specific difficulties her students are experiencing. Which of the following would *best* meet her needs?
  - A. a diagnostic assessment
  - B. an informal assessment
  - C. a standardized assessment
  - D. a summative assessment
30. In an effort to refine both her instruction and assessment of this content, Ms. Hawkins conducts an item analysis of student scores from last year's final unit test over this material. She should definitely discard or substantially revise a test item that
  - A. has a difficulty value between .50 and .75.
  - B. has a discrimination value equal to +.30.
  - C. has a discrimination value equal to -.50.
  - D. has a difficulty value equal to .90.
31. Ms. Hawkins' unit test also includes a restricted-response essay item. She is concerned with the demonstrated level of understanding of several specific criteria in her students' responses. Which of the following would *best* facilitate her scoring of these responses?
  - A. an objective answer key
  - B. a holistic rubric
  - C. a checklist
  - D. an analytic rubric
32. Following the completion of the unit, Ms. Hawkins determines that her students have satisfactorily mastered these concepts. However, when her students take the statewide standardized assessment in the spring, she notices that her students perform very poorly on items addressing these same concepts. Considering the discrepancy between students' classroom performance and their standardized test results, what action is most appropriate when making decisions concerning school improvement?
  - A. recommend that classroom instruction be consistent among 4<sup>th</sup> grade science teachers
  - B. ensure alignment between instruction and what is measured on the standardized test
  - C. select a standardized test that is more likely to yield higher scores in science
  - D. identify the percentage of students predicted to perform well in advanced science classes
33. Ms. Hawkins wants to be sure that the term grades she assigns to her students' performance in science reflect each student's respective level of content mastery for that unit. Which of the following grading systems would *best* accomplish this goal?
  - A. a criterion-referenced grading system
  - B. a norm-referenced grading system
  - C. a pass-fail grading system
  - D. a portfolio grading system
34. Nolan is a student in Ms. Hawkins' class. He receives a raw score of 12 items answered correctly out of a possible 15 on the physical science portion of a standardized test. This raw score equates to a percentile rank of 45. His parents are confused about how he could answer so many items correctly, but receive such a low percentile rank. They approach Ms. Hawkins for a possible explanation. Which of the following is the appropriate explanation to offer to his parents?
  - A. "I don't know...there must be something wrong with the way the test company figured the scores."
  - B. "Although Nolan answered 12 correctly, numerous students answered more than 12 correctly."
  - C. "Raw scores are purely criterion-referenced and percentile ranks are merely one form of norm-referenced scoring."
  - D. "Raw scores are purely norm-referenced and percentile ranks are merely one form of criterion-referenced scoring."
35. In an attempt to try to encourage and motivate her students who are struggling academically, Ms. Hawkins decides to share her gradebook, especially test scores, with them in order to demonstrate how well others are performing. Another teacher advises her not to do this, as it is a clear violation of
  - A. *The Code of Fair Testing Practices in Education.*
  - B. *The Family and Education Rights and Privacy Act.*
  - C. *The Standards for Teacher Competence in the Educational Assessment of Students.*
  - D. *The No Child Left Behind Act.*

**Assessment Literacy Inventory**  
**Scoring Key**

1. B
2. A
3. D
4. B
5. C
6. D
7. A
8. B
9. B
10. A
11. C
12. B
13. A
14. D
15. B
16. D
17. A
18. B
19. D
20. A
21. D
22. D
23. D
24. B
25. C
26. A
27. C
28. D
29. A
30. C
31. D
32. B
33. A
34. B
35. B

**Alignment of Standards with items on ALL:**

*Standard 1*—Items 1, 8, 15, 22, 29

*Standard 2*—Items 2, 9, 16, 23, 30

*Standard 3*—Items 3, 10, 17, 24, 31

*Standard 4*—Items 4, 11, 18, 25, 32

*Standard 5*—Items 5, 12, 19, 26, 33

*Standard 6*—Items 6, 13, 20, 27, 34

*Standard 7*—Items 7, 14, 21, 28, 35

## **APPENDIX D**

### **Critical Incident Interview Questions**

#### **Critical Incident One**

**Prompt:**

Think about a time when you observed using a common formative assessment to inform your instructional practice. What happened? How did it turn out? What was it about this incident that made it seem significant? What reflections did you draw from this incident? How have these reflections further impacted your use of common formative assessments in the mathematics classroom? Can you describe the impact that your instructional practices had on student learning?

#### **Critical Incident Two**

**Prompt:**

Think about a time when you observed or experienced barriers to using common formative assessments to inform instructional practices in the mathematics classroom. What happened? Who was involved [no name, just roles]? How did you handle it? How did it turn out? What was it about this incident that made it seem significant? What conclusions did you draw from this incident?

#### **Critical Incident Three**

**Prompt:**

Think about a time when you supported the development and implementation of common formative assessments to inform instructional practices in the mathematics classroom as a school leader. What happened? Who was involved [no name, just roles]? How did you handle it? How did it turn out? What was it about this incident that made it seem significant? What conclusions did you draw from this incident?

#### **Final Question**

In light of what you have now talked about, is there anything else you would like to tell me (or think I should know) about the development and implementation of common formative assessments to inform instructional practices in the mathematics classroom?

## APPENDIX E

### Focus Group Questions

#### Introductory/Transition Questions

How do you develop and implement common formative assessments in your classroom as a mathematics teacher?

How have common formative assessments impacted your instructional practices as a mathematics teacher?

#### Key Questions

From your perspective, what challenges do teachers have to develop and implement common formative assessments to inform instructional practices? How have those challenges been addressed?

Are there barriers to developing and implementing common formative assessments to inform instructional practices in the mathematics classroom? If so, what are they? How can those barriers be removed?

How have you received support to develop and implement common formative assessments to inform instructional practices in the mathematics classroom?

How can instructional leaders foster a learning culture that uses common formative assessments to inform instructional practices in the mathematics classroom to impact student learning?

#### Ending Questions

Is there anything you want to add but did not have the opportunity to talk about?

Note: Additional follow-up or clarification questions may be asked as needed.