A CASE STUDY OF MATHEMATICS TEACHERS' USE OF SHORT-CYCLE FORMATIVE ASSESSMENT STRATEGIES

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A single case study was used to examine two middle grades mathematics teachers' use of short-cycle formative assessment strategies. Data was collected using multiple sources to provide a description of this single case. Participant change in knowledge of short-cycle formative assessment strategies was collected and analyzed through participant pre- and post-interviews and targeted instructional support was provided through professional development sessions designed to meet diverse needs of participants. Participant change in use of short-cycle formative assessment strategies was collected and analyzed through classroom observations using Assess Today observation protocol and targeted instructional support was provided through post-observation conferences with written feedback. Findings from the study verified that changes in teachers' use of short-cycle formative assessment strategies were positively influenced by the targeted instructional support provided to each participant during the study. The study further indicated that an assessment of teacher's present knowledge and use of short-cycle formative assessment strategies should be considered before providing targeted instructional support to maximize the learning potential for each teacher. Future research is needed regarding the importance of building student self-efficacy through teacher use of short-cycle formative assessment, as well as the importance of involving students in the formative assessment process.

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CHAPTER 1

INTRODUCTION

Background

Historically, the idea of formative assessment can be traced back to Scriven (1966) and his landmark study that analyzed the methodology of evaluation. One of Scriven's main points, which has ultimately become the basis for future studies about formative assessment practices, was that formative assessment, or *evaluation* as he called it, is part of an assessment approach to help produce excellent results in student learning. For the past several decades, the research on formative assessment has expanded to include specific details on how educators can implement strategies to gather evidence of student mastery of the taught concepts (Black & Wiliam, 1998; Bloom, 1968; Popham, 2008; Stiggins & Dufour, 2009).

Statement of the Problem

Assessing student mastery of concepts taught within the same class period and adjusting instruction based on the results of that assessment is not a new idea. In the literature, this strategy is referred to as short-cycle formative assessment (Wiliam & Thompson, 2007). However, there is limited research on how targeted instructional support impacts teacher's knowledge and use of effective short-cycle formative assessment strategies in the middle grades mathematics classroom. As a result of the lack of research on short-cycle formative assessment practices, the next section will focus on the more broadly defined formative assessment

How might a teacher's use of effective short-cycle formative assessment strategies motivate students to succeed? According to the literature on formative

assessment strategies, Stiggins (2004) claimed that assessment should take place with the primary reason of encouraging students to try to learn. Stiggins and Dufour (2009) discussed the idea of formative assessment occurring in the classroom in a way that allows students to experience success along the way to mastering the end-targeted goal. Teachers communicate to students what the learning objective is for the day, instruction is aligned, the teacher and the student monitor progress throughout the lesson, and finally the student is assessed on their mastery level for the learning objective. Teachers use this data to make adjustments during their instruction, based on the gaps in learning observed during this process.

School leaders have struggled with developing a system of providing targeted instructional support to help teachers improve their short-cycle formative assessment practices. Because of this struggle, in schools where an effective short-cycle formative assessment model is lacking, students rarely receive the feedback that they need to learn the content. Thus, students may not be motivated to succeed on the daily learning objectives (Stiggins, 2004). Stiggins (2005a) described a classroom setting where motivation becomes a part of the assessment process for students when they experience incremental success as they progress towards mastery of the learning target. Students who perform satisfactorily are highly motivated by their teachers to continue to succeed. Thus, the problem remains that there is limited research on how targeted instructional support can help teachers implement short-cycle formative assessment strategies in their classroom to benefit student learning.

Purpose of the Study

Students benefit from teacher's use of effective short-cycle formative assessment practices that include a feedback cycle designed to move the student toward mastering the learning target. They internalize the communication from the teacher regarding the learning target, what mastery looks like, what the teacher feedback means, and how to best use feedback to progress toward mastery of content and process skills. Involving students in the assessment-making process could increase self-efficacy and yield favorable results for student achievement (Stiggins, 2005b).

Sadler (2010) demonstrated in his formative assessment research the importance of teachers and students knowing they are making progress toward mastering the "learning target" throughout the lesson (Sadler, 2010). Sadler's work connected with the new wave of formative assessment, in which Stiggins (2005b) built on Broadfoot et al.'s (1999) phrase, "assessment for learning," and emphasized it as assessment for learning to describe the assessments given to students during instruction. All the criteria in formative assessments, which include identifying the learning target, setting goals, and monitoring progress towards mastery of the goals, are also in assessment for learning, with a very distinct focus on an interactive relationship between the teacher and the student in the process. Stiggins (2005c) stated that assessment for learning permits all students to be successful due to heavy reliance on differentiated instruction and the building of students' confidence, optimism, and persistence toward mastery.

What is seemingly absent from the formative assessment literature is how school leaders can provide targeted instructional support to help improve teacher's knowledge

of effective short-cycle formative assessment strategies. Therefore, the purpose of this study was to examine in what ways the knowledge and use of short-cycle formative assessment strategies by middle grades mathematics teachers changed as a result of participation in targeted professional development accompanied with instructional support.

Research Question

To examine middle grades mathematics teachers' knowledge and implementation of short-cycle formative assessment instructional practices, the following research question was developed for this study:

> How does a sixth-grade mathematics teacher's knowledge and use of short-cycle formative assessment strategies change after receiving targeted instructional support?

Targeted Instructional Support

A plan for school leaders on how to provide teachers with targeted instructional support that can transform their knowledge on a particular teaching phenomenon has not been found in literature reviewed for this study and is therefore being defined here to clarify what this researcher means by this term. To develop a targeted instructional support plan for teachers, first a school leader will need to develop an instructional focus that has great impact on student achievement. Second, after selecting an instructional focus area, teacher's prior knowledge of the instructional focus area will need to be ascertained. For instance, a teacher's prior knowledge can be learned using a series of interview questions about the instructional focus area. Third, based on the prior knowledge of the teacher participants and the instructional focus, the school leader

will need to decide on what type of targeted instructional support to provide to the teacher to help change their knowledge. For instance, teachers in this study participated in a series of on-going professional development sessions to transform their knowledge of short-cycle formative assessment strategies. Lastly, after receiving targeted instructional support such as professional development, a school leader will need to determine if the targeted instructional support changed the teacher's knowledge. For example, in this study, the change in knowledge for each teacher was assessed using a post-interview.

Significance of Study

This study is significant to enlighten in what ways teachers conceptualize how to take an ambiguous topic such as formative assessment and delineate how to implement formative assessment in specific yet flexible ways. In this study, the type of formative assessment is short-cycle formative assessment. Equally important is for school leaders to examine effective methods for providing teachers targeted instructional support that will impact their knowledge and use of formative assessment strategies that lead to student success in the mathematics classroom (Stiggins, 2005b). The targeted instructional support in this study that teachers received was professional development that narrowly focused on a type of formative assessment: short-cycle formative assessment.

Truly, all students can learn; however, not every student learns at the same rate nor in the same way. By knowing and implementing effective short-cycle formative assessment strategies, teachers can positively impact student-learning outcomes. This study contributed directly to those individuals most affected by effective short-cycle

formative assessment strategies: the students. Schunk (1989) posited in his study of the relationship between student achievement and self-regulated learning that all students deserve opportunities for success. Using different types of formative assessments, such as short-cycle formative assessment, to build student confidence and ultimately student academic knowledge is a process that enables students to become successful, self-regulated learners (Schunk, 1989). With this in mind, teachers need targeted instructional support, such as feedback from classroom observations and professional development from school leaders, to improve formative assessment practices, in particular, short-cycle formative assessment practices.

Researchers have suggested that, in the age of school accountability and the relationship between accountability and the No Child Left Behind Act of 2001, more teachers struggled with understanding how to demonstrate evidence of student learning (e.g., Harlen, 2005; Roach, 2006; Linn, 2008). In the case of formative assessment, research has shown that formative assessment increases student progression toward mastery of the learning target (e.g., Black & Wiliam, 2003). Several researchers have noted the importance of using formative assessment to determine the next steps a teacher should take to ensure student success (e.g., Black & Wiliam, 1998; Popham, 2008). For example, Stiggins (2005c) stated, “Assessment for Learning turns the classroom assessment process and its results into an instructional intervention designed to increase, not merely monitor, student learning” (p. 1).

School leaders recognize that, in the case of closing achievement gaps, using student summative assessment data as the only progress-monitoring tool to determine if the gaps are closing may not be effective when the data is collected and reported only

one to two times a year. Formative assessment would enable teachers and school leaders to identify specific student learning gaps and to design appropriate intervention systems to help students progress toward mastery (Stiggins & Dufour, 2009). Capitalizing on the unique combination of summative and formative assessments could simultaneously help school leaders implement the reform efforts sought by the federal government and increase student learning.

More so, by providing teachers with targeted professional development that maintains a narrowed focus on a particular type of formative assessment, short-cycle formative assessment, to increase their knowledge and use, students, teachers, and school leaders will have evidence of both teacher and student learning (Wiliam & Thompson, 2007). The suggestions, ideas, and implications in this study reveal that short-cycle formative assessment impacted the participants in this study, and that their knowledge of how to effectively guide students toward mastery of the taught content improved.

This study adds to the present formative assessment research by demonstrating that when teachers receive professional development that focus on specific strategies related to a type of formative assessment strategy, such as short-cycle formative assessment, teachers' knowledge and use of effective formative assessment strategies can improve. Pre- and post-interviews were used in this study to ascertain teacher's prior knowledge of short-cycle formative assessment and how that knowledge changed after participating in targeted professional development focused on learning the short-cycle formative assessment core-constructs.

Definitions of Key Terms

Academic efficacy: Academic efficacy referred to a "student's perceived ability to succeed and the student's sense of control over her or his academic well-being" (Stiggins & Popham, 2008, p. 1). This definition of academic efficacy appeared throughout research on formative assessment.

Affective entry: Affective entry was used to describe both the achievement level of the students and the time they put into the learning tasks, including the time on task in the classroom (Bloom, 1974). When studying the relationship between time and learning, Bloom (1974) showed that student confidence and interest in learning increased when students were succeeding and excelling on taught concepts in the classroom. The opposite occurred when students were not succeeding on a task; their frustration levels and feelings of despair increased, and they began to dislike the subject and the class. Students who disliked a class and perceived beforehand that their work in the class would yield less-than-favorable results would not spend the necessary time engaging in the class, correcting their mistakes, self-monitoring, and self-reflecting on their progress toward mastery of content and process skills. Students with low academic efficacy grew disinterested in the learning before the learning even begins.

Evidence of learning: Evidence of learning included artifacts such as the use of white boards or individual student responses to the teacher throughout the lesson to determine learning mastery and events during the observations (Danielson, 2008).

Feedback: Feedback was the information used to alter the gap between the known and unknown (Ramaprasad, 1983). In this study, the researcher provided teachers with feedback during post-observation conferences based on their

implementation of effective short-cycle formative assessment strategies in their classrooms. Teachers used the feedback to alter the learning gap regarding their knowledge and use of effective short-cycle formative assessment strategies.

Formative assessment: Formative assessment is defined in various ways throughout the literature. Wiliam and Thompson (2007) described formative assessment as a progression of learning for the student. The progression began with teachers working with the students to help the students know where they were going and what mastery looked like. Then the teacher designed learning tasks to help students access and reach the learning target. Throughout this progression, teachers provided students feedback that helped alter the learning gap (Ramaprasad, 1983). Teachers encouraged students to become active participants in their own learning and to lean on one another as they progressed toward mastery. Wiliam and Thompson (2007) further categorized formative assessment based on timeframe. Short-cycle formative assessment occurred within a day or two-day period, medium-cycle formative assessment occurred within a period of a few weeks, and long-cycle formative assessment occurred within a period of a few months or at the end of a semester. For this study, the researcher used Wiliam and Thompson's (2007) definition of formative assessment.

Instructional adjustments: As described by Popham (2011), when teachers make instructional adjustments during the class period, they use formative assessment data to gather evidence, analyze the evidence, and make immediate changes to their instruction based on the evidence gathered. In this study, instructional adjustment was

one of the formative assessment core-constructs observed within the classroom for each teacher participant.

Learning target: For any given lesson, the learning target is geared specifically towards what students are to master on that day (Leahy, Lyon, Thompson, & Wiliam, 2005). The teacher communicated the learning target to students at the beginning of the lesson and throughout the lesson as they progressed towards mastery. In this study, learning target was one of the formative assessment core-constructs observed within the classroom for each teacher participant.

Nature of questioning: This refers to how the teacher used questioning to help diagnose problems and improve instruction to maximize student learning (Brophy & Good, 1984).

Question quality: The teacher participant's use of open-ended questions, Bloom's taxonomy (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956) of high and low level questions, and the connections that the teacher helped students make to their prior knowledge in an effort to effectively scaffold instruction and improve (Johnson, 2005) the quality of their questions.

Scaffold: When and how the teacher used questioning strategies to move students towards mastery was described as scaffolding (Ausubel, 1963). The researcher observed scaffolded instruction as part of the question quality formative assessment.

Self-evaluation: This implies the different strategies and tools that the teacher used to encourage students to improve their own learning (Black & Wiliam, 1998).

Self-regulated learning: Self-regulated learning is how the student took control of

his/her own learning by using their own thoughts, feelings, strategies, and behaviors to help meet their learning goals (Zimmerman, 1989). In this study, observation of a student regulating his or her own learning was included in the self-evaluation formative assessment core-construct.

Short-cycle formative assessment: Wiliam and Thompson's (2007) formative assessment type that occurred during the class period. The observations of teachers in this study occurred in a 45-minute lesson which is minute-by-minute, day-by-day.

Limitations

This qualitative case study focused on the knowledge and use of short-cycle formative assessment strategies for two sixth-grade mathematics teachers. Due to time and resource constraints, it was impossible to include more teachers in the study. However, the use of multiple data sources in this study added to the trustworthiness.

Second, with this study taking place on only one middle school campus in one school district in North Texas, the generalizability of the study is a limitation. The number of participants in this study was a limitation since the participants' years of experience and educational background might not translate easily to another population. Third, the use of the AssessToday™ observation protocol (Heitz, 2014) as the resource for helping teachers understand the core-constructs of short-cycle formative assessment and how to implement those strategies in their classroom may limit generalization. The AssessToday™ observation protocol is new, and its validity and reliability has been documented in only one study (Heitz, 2013) thus far. A comparison of the results from this study to future studies may prove difficult if another

short-cycle formative assessment observation tool is used. AssessToday™ observation protocol

Fourth, the researcher studied the participants' knowledge of short-cycle formative assessment strategies in a specific amount of time. Each participant's ability to understand short-cycle formative assessment and implement the strategies given the amount of time provided during the study was a limitation. Every teacher's ability to understand short-cycle formative assessment strategies and implement those strategies in the classroom is different, thus generalizing the time it takes to understand these concepts is a limitation. Fifth, the researcher was the supervisor for each of the study participants. This was a limitation in that the researcher conducted evaluations for each study participant prior to the research study and was responsible for providing feedback to help with the instructional growth of each teacher. As a result, the analysis of the findings may include some bias on the part of the researcher.

Finally, only one observer conducted classroom observations. Although teachers had multiple observations, observations from another observer may have yielded more data to be able to develop more descriptions of the participants' knowledge and implementation of short-cycle formative assessment practices. This also resulted in the researcher not being able to analyze the data based on specific content knowledge. Content knowledge was not a focus of the study; however, not having data about teacher's content knowledge may be a limitation. Moreover, with more data sources, triangulation of the data may have been easier to conduct.

Delimitations

The researcher narrowed the scope of the study by focusing on one grade level of mathematics teachers at one middle school. The participating middle school provided the researcher with easier access to the study participants, which is a limiting factor. However, the study participants' varying ranges of teaching experience when compared to the teachers in the other grade levels at this middle school offset this delimitation. The researcher focused only on teachers in the study. As a result, student voice throughout this study was not present. The researcher used the perspectives of the teachers included in this study to determine the potential benefit students gain from increased teacher knowledge of the implementation of effective short-cycle formative assessment practices. The researcher used the answers from the interview questions in this study to develop an understanding of teachers' knowledge of effective short-cycle formative assessment strategies. The researcher used open-ended interview questions that would lead to more in-depth discussions during the pre- and post- interviews and post-observation feedback conference.

CHAPTER 2

LITERATURE REVIEW

The review of literature for this study examines three aspects of research in formative assessment. The first part consists of a historical tracing of the development of formative assessment research over time. The limited research on short-cycle formative assessment is included in this section. The second section highlights formative assessment strategies that teachers can use in their classrooms. The last aspect is a close examination of how school leaders can support teachers as they develop their knowledge of how to encourage the use of formative assessment strategies.

Historical Tracing of Formative Assessment

From Summative to Formative Assessment

The notion of summative assessment helped to define formative assessment (Harlen, 2005). When Scriven (1967) described summative assessment, he intended it as a way for school leaders to determine next steps in attempting to meet the needs of students from one year to the next through programmatic change. He used the term formative to describe evaluation that occurred during the implementation of a program. He concluded that both summative and formative assessments provide unique roles in helping teachers evaluate student learning. Bloom (1968), shortly after Scriven (1967), described formative assessment as a way for teachers to measure student progress toward mastery of a learning target. He described summative assessment as an examination designed for grading purposes and the evaluation of the curriculum. Bloom (1968) specifically outlined how classroom teachers would define a set of learning goals

to help students master specific skills and the role of feedback to correct student deficiencies as they progressed toward mastery of the content and process skills. This method of formative assessment with immediate feedback has been reflected by researchers in their own studies on formative assessment decades later (Black & Wiliam, 1998; Stiggins, 2004; Stiggins & Chappius, 2005; Wiliam & Thompson, 2007).

Summative assessments have been a common practice in schools to date, with nearly all states opting for high-stakes testing of students in every content area that has set curriculum standards. On the other hand, research in formative assessment has provided how structured feedback students receive from teachers enables them to progress toward mastery prior to formal judgement of achievement. Although researchers stated that formative and summative assessments work well together, only a few countries currently promote the use of formative assessment practices as a fundamental approach to education reform (OECD, 2005). Bloom (1984) noticed that when working with graduate students, teachers instructed the entire class the same way with no variation, though students need variation due to learning differences. Bloom (1984) claimed that students learn differently; therefore, variation in instruction is necessary to ensure student success. Broadfoot et al. (1999) added to formative assessment research by explicitly connecting how teachers can use formative and summative assessment data together to help inform their next instructional steps.

Harlen (2005) noted the difference between the two forms of assessment and acknowledged the unique characteristics of summative and formative assessments, stating that there is a distinct difference between the processes. Accompanying this distinction was the conclusion that educators must know the purpose of using a

formative or summative assessment and use the appropriate assessment to meet that established purpose. It would then become critically important to understand the rationale behind using either a formative or a summative assessment because of the possible drawbacks to using the wrong type of assessment to determine if learning took place. For example, Harlen (2005) provided a comparison. In formative assessment, indicators of success are detailed and used frequently throughout the whole period of student learning to help students progress towards mastery. However, in summative assessment, indicators of success are less detailed and are used only to report levels of achievement usually only at the end stages of learning and not throughout.

Development of the Term "Short-Cycle Formative Assessment"

From this distinction between summative and formative assessment, Stiggins (2005b) transformed the notion of formative assessment into assessment for learning to describe a tool that instructors can use to promote learning rather than simply to evaluate learning. Assessment for learning fit under the broader category of formative assessment because it is situated in the context of teaching and because it focuses on improvement.

Wiliam and Thompson (2007) separated formative assessment into three categories. The first category, short-cycle formative assessment, occurs during the lesson. The second category, medium-cycle formative assessment, occurs within a two- or three-week period of learning. Finally, the third category of long-cycle formative assessment occurs over a period of months of instruction.

Another aspect of formative assessment prevalent in the research is feedback that teachers provide to students. Several researchers described the feedback process

during formative assessment and the impact on student learning (Black & Wiliam; 1998; Ramaprasad, 1983; Sadler, 1989; Stiggins, 2004; Stiggins & Chappius; 2005; Wiliam & Thompson, 2007). The following section highlights various researchers' definitions of student feedback as it relates to the formative assessment process.

Ramaprasad (1983) defined feedback as information that is used to alter the gap between what is known and what is to be known. Ramaprasad provided multiple examples of feedback and how it relates to enhancing the learners' skill set; however, each example was contextualized in the business world. At about the same time, Sadler (1983) related formative assessment to the development of student expertise. Both Ramaprasad (1983) and Sadler (1983) focused on how teacher feedback to students influenced future instruction or learning. In adding to the definition of feedback, Sadler (1989) expressed the notion that teachers are experts in knowing how to judge the students' work; furthermore, expert teachers provide an appropriate level of feedback based on predetermined criteria. In other words, the expert teacher knows what mastery looks like and can articulate to students any errors and how to resolve them so the students can progress toward mastery. Additionally, teacher feedback helps students understand the standard, what they are doing right or wrong on their way to meeting the standard and what changes they need to implement immediately to alter the learning gap as they progress toward mastery. Moreover, Sadler (2010), when discussing how feedback can help to develop students' capabilities in higher education settings, stated that "feedback is central to the development of effective learning, partly because assessment procedures play a key role in shaping learning behavior, and feedback can significantly accelerate that process" (p. 536).

Historically, formative assessment was born out of the distinction from summative assessment. Research has built on this and sought to define formative assessment in specific ways. Drawing on this research, strategies for effective use of formative assessment have been examined.

Formative Assessment Strategies

Paul Black and Dylan Wiliam are modern pioneers of formative assessment research. Black and Wiliam (1998) performed a meta-analysis of the formative assessment literature to date. Following that, they examined formative assessment strategies and how teachers interpret effective uses to improve student achievement. Their subsequent research led to the seminal work, “Inside the Black Box” (Black & Wiliam, 2010), in which they described the classroom as a black box in that there are multiple inputs placed inside the classroom (teachers, students, standards, resources, and assessments), and what emerges are knowledgeable and capable students. In their compilation, they outlined several formative assessment strategies that teachers can use to improve student-learning outcomes:

- Feedback to any pupil should be about the qualities of his or her work, with advice on what he or she can do to improve, and should avoid comparisons with other pupils.
- For formative assessment to be productive, teachers should train pupils in self-assessment so they can understand the main purposes of their learning and thereby grasp what they need to do to achieve.

- All instances of teaching should include opportunities for pupils to express their understanding, for this would initiate the interaction whereby formative assessment aids learning.
- The dialogue between pupils and a teacher should be thoughtful, reflective, focused to evoke and explore understanding, and conducted so that all pupils have an opportunity to think and to express their ideas.
- Tests and homework exercises can be an invaluable guide to learning, but the exercises must be clear and relevant to learning aims. The feedback on tests and homework should give each pupil guidance on how to improve, and each student must be given opportunity and help to work at the improvement.

These ideas summarize examples from research regarding effective use of formative assessment strategies.

Wiliam and Thompson (2007) developed a more current definition of the five key formative assessment strategies rooted in Ramaprasad's (1983) early work. Wiliam and Thompson's (2007) five key formative assessment strategies were:

1. Clarifying, sharing, and understanding goals for learning and criteria for success with learners
2. Engineering effective classroom discussions, questions, activities, and tasks that elicit evidence of students' learning
3. Providing feedback that moves learning forward
4. Activating students as owners of their own learning
5. Activating students as learning resources for one another

The formative assessment strategies William and Thompson (2007) supported are a progression of learning for the student. The progression begins with teachers working with students to help the students know where they are going and how mastery looks. Then, teachers design learning tasks to help students reach the final goal. Throughout this progression, teachers provide students with feedback that, as Ramaprasad (1983) stated, helps to alter the learning gap. Assessment for learning takes into consideration the role of two important people in the assessment process: the teacher and the student (Stiggins, 2007). Often in traditional assessment models, the teacher is the bearer of the knowledge and the holder of all information connected to that knowledge. The information that the teacher holds can include, but is not limited to, the nature of the goals, the necessary steps to reach the goals, progress toward mastery of goals, and the feedback necessary to reach the intended goals. In assessment for learning models, students are provided this information so they may be a partner in the pursuit of mastering the content.

Assessment for Learning Strategies

The idea of assessment for learning originated with Stiggins (2004), who described a view of assessment to challenge the notion that standardized testing alone can provide the information and motivation students need to be successful. Stiggins (2005a) outlined the teacher's role in implementing formative assessment strategies in the classroom, following a five-part progression. The first part involves the teacher clearly stating the lesson objective. The second part includes the teacher breaking down the lesson objective into targets that lead to mastery of the lesson objective. The third part requires that the teacher provide students with exemplars of the targets at the

beginning of the lesson so that students are familiar for what they are aiming. The fourth part includes the teacher creating high quality checks for understanding as students' progress towards mastery. Finally, the teacher works as a partner with the student throughout the learning process to ensure that the student remains on track to mastery.

Short-Cycle Formative Assessment Strategies

Stiggins (2004) dispelled a myth about assessment by describing an assessment as an individual student's mastery of the content as evidenced each day. Teachers use the assessment data daily to make immediate changes in the instructional plan for students. This type of assessment is short-cycle formative assessment, and it occurs while learning is in progress during that particular class period. Teachers gather timely information on how students are learning and how they can change their instruction immediately to ensure students are progressing toward the learning targets. Furthermore, teachers provide continuous feedback to the student for improvement, which empowers students to become partners in their own learning (Stiggins & Chappuis, 2005).

Targeted Support Strategies to Increase Student Achievement

Closing the Achievement Gaps

Dietz (2010) noted that after five years of the No Child Left Behind Act of 2001 - a federal school-accountability mandate - only one-third of students in the United States were on track to meet the federal requirements. In most states, the federal requirements include students demonstrating mastery on state-administered, summative assessments. Federal testing mandates affect all stakeholders in a school.

Much debate exists regarding whether one test at the end of the year can accurately depict students' knowledge of the content (Harlen, 2005).

The design of these state-administered summative assessments was to assist in the process of closing achievement gaps by providing school leaders with data for specified-grade-level content exams. The practice of providing school leaders with feedback regarding meeting the state and federal passing based on research was intended to promote equity among all schools (Duffy, Giordano, Farrell, Paneque, & Crump, 2008; Heritage, 2007; Jordan, 2010; Linn, 2008). Proponents of federal accountability standards agreed that there should be a way to promote equity across the country for students. Two studies contribute to this discussion: Hoppman (2008) looked closely at how campuses addressed accountability standards, and Hvistendahl and Roe (2004) examined Norwegian minority students and their achievement level. Similar results showed that despite the optimistic efforts of school leaders and, more specifically, teachers, gaps still existed in achievement levels of minority students when compared to majority students. Another misnomer in education policy that surfaced was the assumption that achievement gaps can close if teachers are equipped with the proper skills. Research in formative assessment showed, and continues to show, that teachers who understand the different types of assessments and how to respond to the assessment data have a better opportunity to close achievement gaps.

In response to the pressures placed on school districts, administrators, and teachers to meet these federal requirements, a heavier emphasis on test-taking preparation has occurred, coupled with a decrease in motivational strategies to encourage students, especially in high schools, and this has led to more student

dropouts (Berliner, 2011). Additionally, Duffy et al. (2008) showed the negative effect that rating schools had on promoting equity among schools. They found that struggling students are often in lower level classes, which further separates them from their more successful counterparts.

The National Assessment of Educational Progress (NAEP) tests have provided data that describes a narrowing of the achievement gap between Black and Hispanic students in reading and mathematics when compared to White peers (Roach, 2006). Researchers attributed the narrowing of the achievement gap to the use of standards-based assessments. Additionally, as part of the requirements, school leaders have communicated progress toward meeting the standards with students and parents using regular standards-based progress reports similar to traditional report cards and progress reports that have only numerical or alpha grades on them (Welsh, D'Agostino, & Kaniskan, 2013). The design inherent in use of standards-based assessments, determining what students should learn and communicating that information, could be aligned to the goal of formative assessment. Determining what students are supposed to know based on the set standards is one of the steps in formative assessments. The difference lies in the strategies used during instruction. It is important in standards-based learning and assessment for teachers to unpack the standards to examine specific skills imbedded in them.

Using Assessment Data to Meet Individual Student Needs

Educational leaders in various states approach instruction differently to meet federal testing accountability requirements. This has been due in great part to the federal accountability standards being less specific in identifying what proficiency

means in the language of the mandate (Linn, 2008). Linn (2008) discussed how standardized testing has had significant implications for teaching and learning in the classroom, with the most important the rating of schools based on individual student achievement. As state educational leaders gather more information on how to meet federal standards and provide school leaders with the best possible chance of meeting those standards, measuring student growth and determining the best type of assessment continues to be at the forefront of accountability conversations.

For example, although school districts in Nebraska struggled with receiving approval from the federal government regarding their alternative assessment approach, they have taken the initiative to create a more classroom-centered assessment that relies on the expertise of the classroom teacher to ensure student success. Nebraska's educational system supported teachers in the creation of rigorous assessments at the local level (Borja, 2007). They reported that when they gave teachers the opportunity to create their own assessments, the locally developed, teacher-made assessments provided teachers with the data needed to adjust instruction immediately.

In another example, Florida implemented several reform efforts to address the needs of their students, focusing on specific needs that highlighted the achievement gap between minority and majority students. One such need identified by state policymakers was the low reading ability of their students (Ladner & Lips, 2009). In response, Florida implemented a comprehensive reading program with extensive reading instruction training for their teachers so that they would be able to implement remedial instruction for identified low-performing readers (Ladner & Lips, 2009). A stark difference between Nebraska's and Florida's educational leaders' actions was that

although there is an achievement gap between minority and majority students in Florida, the focus was not about closing the achievement gap, but rather closing student-learning gaps. The contrast in the focus from achievement gaps of student populations and simply learning gaps of all students resulted in closing the achievement gap between minority and majority students because individual students were receiving the instruction they needed to be successful (Ladner & Lips, 2009; Larocque, 2007).

When considering strategies for closing student learning gaps, data-driven decision-making has shown to be an important component. Data-driven decision-making includes ensuring that students who are not meeting benchmarks receive the academic support that they need to be successful. Academic support includes frequent monitoring of student work as a plan for implementation for successful schools. Teachers who monitor students, effectively gather data, and routinely follow the collection of data with feedback and intervention have a better chance of increasing student-learning outcomes.

Unlike the examples in Florida and Nebraska school districts, educational leaders of rural schools in Mississippi struggled with meeting the federal requirements for accountability (Lamb, 2007). One such reason focused on the concern that rural students enter the classroom with gaps due to a lack of effective schooling in the early grades. To close these gaps, teachers created lessons that not only engaged students, but also provided students with meaningful connections to increase the opportunity to retain the information. Lamb (2007) pointed out that federal accountability mandates and, more specifically, end-of-year state assessments, created an environment in which

teachers struggled to design lessons that help individual students develop necessary skills to become successful.

Suggestions about the potential benefits of using formative assessment in the classroom and its implications on the school-wide system of assessment was found in the following case study with university professionals and pre-kindergarten mathematics teachers as participants (Komara & Herron, 2012). This case study was particularly unique because, in the past, pre-kindergarten has not been a grade level that commonly addressed the issue of assessment and accountability. In Komara and Herron (2012), two university professors and three pre-kindergarten mathematics teachers developed a mathematics curriculum that incorporated some critical components of formative assessment such as: alignment to the state curriculum, frequent progress monitoring, and immediate changes in the instruction based on collected student data. At the end of the study, teachers shared with the professors that they collected data and used formative assessment strategies to inform future instructional practices. This case study example demonstrated that, with collaboration amongst the teacher leaders, teachers, and students, formative assessments can prove useful when responding to calls for heightened accountability.

Assessment Data as a Formative Assessment Tool

The use of formative assessments in the classroom yields positive results for student progression towards mastery of the learning target (Black & Wiliam, 1998). Black and Wiliam (1998, 2003, 2009, 2010) showed that increases in student mastery of the content occurred when formative assessments were effectively implemented. The research supported the use of formative assessment; however, school leaders found

that the state assessment requirements do not always yield positive results similar to that of formative assessments. Teachers can use the data from formative assessments to inform the instruction of individual students, small groups within the classroom, and/or the entire classroom. If a teacher identifies through regular use of formative assessments that students are missing critical prerequisite skills required for success in the grade-level content, then the teacher must decide whether to fill those learning gaps before students move forward. Each year, teachers use a set of pre-determined state standards for their grade level and content area to plan their instruction. Teachers use these state standards to prepare their students for the end-of-year state assessment. Thus, students who are missing prerequisite skills from the prior year have learning gaps that are challenging or impossible to close in one school year. For this reason, it is important for teachers to know where students are throughout the instructional process in relation to end goals. The effective and consistent use of formative assessment can help with this effort.

When discussing formative assessment and its connections to student evaluation, researchers note the role of the student in the process. Before state accountability became a focus in schools with the inclusion of stringent accountability measures, Sadler (1983) explored evaluation and improvement plans, using examples of himself as a teacher assessing his own students. He critiqued the popular evaluation systems in which feedback is a one-time outcome rather than a process that can become cyclical between the teacher and the student. Most students, especially those from underrepresented populations with learning gaps, need feedback to be cyclical and

not a one-time occurrence. In the case of state assessments, the results occur one time for the teacher and student, and, alone, are insufficient to help close gaps.

Using Assessment Data to Make Curriculum Changes

The National Governors Association provided resources to school district leaders to develop a set of core curriculum standards and identify the skills and concepts that students should know and master at each grade level from kindergarten through twelfth grade (Porter-Magee & Stern, 2013). Arnie Duncan, the US Secretary of Education at that time, later supported this initiative and attached it to education funding. State education leaders identified common core standards for students, and they created and mandated the use of assessments to measure individual student success on state curriculum standards. As a response to this new heightened accountability around effective implementation of state curriculum and performance on state assessments aligned to the curriculum, school district leaders sought ways to close achievement gaps.

For students in the lower grades, school district leaders took the approach of narrowing the curriculum focus and to allow students more time to focus on learning the identified curriculum. The sacrifices that school leaders have made as they prepare students for summative and long-cycle formative assessments are discouraging. Berliner (2011) likened the effects that curriculum decisions by school leaders have had on the educational development of poor students to those of Apartheid. Berliner's (2011) comparison is apt since poor students are more likely to need additional seat time in the tested area subjects due to the achievement gap that already exists because of factors outside the poor student's control.

In summary, this chapter discussed the relevant literature in the formative assessment field, beginning with the historical background of formative assessment, followed by the development of different types of formative assessment strategies such as short-cycle formative assessment, and finally narrowed the focus to the impact school leadership has had on the implementation of formative assessment in the classrooms. The next chapter includes a detailed description of the case study research design, data collection methods, and data analysis used as the method and methodology for this study.

CHAPTER 3

METHODOLOGY

This chapter describes the process by which the researcher gathered the data needed to answer the research question in this study. After describing the research design, participants, setting and restating the research question, a description of the analytical framework for this study follows.

The purpose of this study was to examine how two sixth-grade mathematics teacher's knowledge and use of short-cycle formative assessment changed after receiving targeted instructional support that focused on effective short-cycle formative assessment strategies. Previous researchers described effective formative assessment strategies and the positive impact that effective implementation of these formative assessment strategies can have on student achievement (Wiliam & Thompson, 2007; Black & Wiliam, 1998; Stiggins, 2005b). Research in this field provided the basis for the importance of increasing teachers' knowledge and use of effective short-cycle formative assessment practices. It also described different ways school leaders can support the development of teacher's knowledge and use of effective formative assessment practices to improve student learning. This study is unique because the data collection methods explored in-depth changes in teachers' knowledge and use of effective short-cycle formative assessment practices when provided with targeted instructional support such as professional development. Furthermore, the specificity in identifying the type of formative assessment practice about which teachers learned (i.e., short-cycle formative assessment strategies) and implemented in their classrooms appears to be a new phenomenon. Previous research focused on the effective implementation of formative

assessment practices in general, but not specifically on short-cycle formative assessment. This specificity was included in this study.

Research Design

This study was a case study that focused on how sixth-grade mathematics teachers' knowledge and use of short-cycle formative assessment strategies changed when teachers were provided with feedback about their implementation of short-cycle formative assessment strategies in the classroom. Furthermore, the design of the study intended to inform school leaders about how the use of professional development as a targeted instructional support helped to change teachers' knowledge and use of short-cycle formative assessment practice. The researcher used the following research question for this study:

> How does a sixth-grade mathematics teacher's knowledge and use of short-cycle formative assessment strategies change after receiving targeted instructional support?

Because the purpose of this study was to examine changes in knowledge and use of short-cycle formative assessment strategies when using targeted instructional support, the researcher conducted a case study by collecting qualitative data through interviews, professional development sessions, observations, and post-observation conferences.

Single Case Study

Case study methodology emerged from the debate regarding qualitative and quantitative methods (Miles & Huberman, 1984). To more clearly outline and describe case study, Stake (1995) described it as an inquiry strategy in which the researcher explored a topic in-depth. The topic could focus on an individual person, a group of

people, program, activity, or process. Researchers have used case studies to explore and report on different issues that require special attention that only a case study could provide (Hamel, 1993). As defined by Yin (2008), a case study progresses through its various stages and makes connections that require researchers to retrace their research to develop a better understanding of the phenomenon being studied. Case study methodology is an investigation of a contemporary phenomenon in its real-world context.

Furthermore, Yin (2008) stated that a case study is the preferred choice of research design when there is a minimal chance for manipulating observable behaviors. For example, in this study the researcher observed classrooms and transcribed the participants' answers to the interview questions. Case studies are unique in that they can handle the collection of multiple data sources to describe the phenomenon (Yin, 2008). To design an effective case study, a researcher must address the following five components: (1) research questions; (2) propositions or purpose of study; (3) unit analysis; (4) logic that links data to propositions; and, (5) criteria for interpreting findings (Yin, 2008).

The most appropriate types of research questions for case studies are those that answer "how" and "why," and in this study the question was "how." Secondly, a case study researcher must formulate a proposition. For this study, the researcher relied on the theoretical proposition that targeted instructional support for middle grades mathematics teachers can positively influence teachers' implementation of short-cycle formative assessment practices in the classroom. For the third component, the designated case in this study was sixth-grade mathematics teachers. Although there

were two teachers, the knowledge of the teachers was studied together based on the targeted instructional support provided to each teacher by the researcher. Therefore, each teacher was an embedded unit of analysis within a single-case study.

Linking data to the propositions established at the beginning of the study is the fourth component of case study research design (Yin, 2008). For this study, the researcher linked the theoretical proposition to the sequence of data collection throughout the study to answer the research question. The description of how the teachers' knowledge and use of short-cycle formative assessment strategies changed over time when provided with targeted instructional supports further answered the research question for this study. The fifth component described how to interpret a case study's findings by addressing rival explanations for findings (Yin, 2008). For example, as the researcher analyzed the data to develop a description of the findings, explanations that may contradict the theoretical proposition that targeted professional support can positively influence teacher's implementation of effective short-cycle formative assessment strategies in the classroom was reported in the analysis and discussion section of the study.

Theoretical Proposition

Yin (2008) suggested using several different strategies to analyze a case study. As previously stated, for this research study the researcher relied on the theoretical proposition that targeted instructional support of mathematics teachers can positively influence teachers' implementation of short-cycle formative assessment practices in the classroom. This theoretical proposition was the basis for the formulation of the research question, the review of literature, and further propositions about the use of short-cycle

formative assessment practices. Thus, the purpose of this case study was to describe how each participant's knowledge and use of effective short-cycle formative assessment practices changed over time. The theoretical proposition helped guide the case study analysis (Yin, 2008).

Setting

This study was conducted in North Texas in an urban middle school. In the 2014–2015 Texas Academic Performance Report (TAPR), the school reported having 1,351 students consisting of 75.5% Hispanic students, 22.4% African-American students, and 1.5% White students. Of the 1,351 students, 89.0% were economically disadvantaged, and 50.9% were limited in their English proficiency.

Students received mathematics instruction in a 45-minute class period every day. All core subject teachers (mathematics, reading, science, and social studies) received two 45-minute planning periods every day. Teachers used the first 45-minute planning period for interdisciplinary team planning. An example of an activity that took place in interdisciplinary team planning included developing individual student behavior plans and monitoring the progress of those plans. The second 45-minute planning period was for vertical and horizontal content planning. For example, an instructional activity that took place in horizontal content planning included lesson plan writing. An example of an activity that took place in vertical content planning included professional development on middle grades mathematics problem solving strategies. The sixth-grade mathematics team met once weekly with their vertical content teams and once weekly with their mathematics coach, administrator, and horizontal content team. The other days were used as optional planning time with their content teams.

Participants

Each grade level consisted of three mathematics teachers, and each teacher was assigned approximately 150 students. For this study, two of the three sixth-grade mathematics teachers participated. The third sixth-grade mathematics teacher, unfortunately, was unavailable due to a medical leave of absence during the research study. Data referenced the two participants as Ms. Anderson and Ms. Thomas, which are pseudonyms.

Ms. Anderson was a 23-year old African-American female teacher in her first year of teaching. Her teaching load consisted of five sections of regular sixth-grade mathematics and one section of sixth grade pre-AP mathematics. She held a bachelor's degree in mathematics with a teaching certificate for all core subjects Grades 4–8. She was alternatively certified from a state of Texas approved certification program. Before obtaining her first teaching job at the research study school, Ms. Anderson worked as a mathematics interventionist in a charter school. In that teaching capacity, she worked with middle school students in need of remediation based on their performance on the state assessment for the prior year.

Ms. Thomas was a 26-year old African-American female teacher in her third year of teaching sixth-grade mathematics at the same middle school. She held a degree in mathematics education with a teaching certificate for mathematics Grades 4–8. She was traditionally certified, having received her probationary teaching certificate before entering the classroom. Additionally, she started her first year of teaching in the middle of the school year. Her teaching load consisted of four sections of regular sixth-grade mathematics and two sections of sixth-grade pre-AP mathematics. In the past, she

taught sixth-grade only; however, she taught eighth-grade students who failed to pass the State of Texas Assessment for Academic Readiness (STAAR) during summer school. She served as the grade-level content lead because of her extensive content knowledge and above-proficient student performance on local and state assessments.

The Researcher

The researcher was the professional content supervisor for the participants. She was a certified middle grades mathematics teacher who had moved over to the role of school assistant principal. In this role, the researcher was responsible for evaluating the mathematics instruction of each teacher through classroom observations, providing both formal and informal feedback to each teacher after every classroom observation, and providing targeted professional development based on the individual instructional needs of each teacher to ensure teacher instructional growth. Through this process the researcher developed a professional relationship with each participant related to enhancing teacher's instructional practices. Additionally, before the data collection for the study began, each participant was familiar with receiving feedback, discussing, and implementing changes in instructional practices based on conversations with the supervisor/researcher. Furthermore, the structure of the school day at this middle school created a culture of regular participation in professional development.

Data Collection Methods

For this study, the researcher collected data to focus on participant knowledge and use of short-cycle formative assessment. Data collection for this case study took place at various moments and in different ways. The first format was classroom observations of the teachers' use of short-cycle formative assessment strategies,

followed by targeted instructional support during post-observation feedback conferences that included written feedback. The next format was pre-interviews that were implemented at the beginning of the study to ascertain prior knowledge of short-cycle formative assessment practices, followed by detailed descriptions of the professional development sessions, and then concluding with post-interviews to ascertain the change in teacher knowledge of short cycle formative assessment.

The data sources for the assessment of participant knowledge of short-cycle formative assessment strategies were: 1) transcripts of pre- and post-interviews; and, 2) a detailed description of the professional development sessions. The data sources for the assessment of participant use of short-cycle formative assessment strategies were: 1) classroom observation field notes; and, 2) post observation conference written feedback. The researcher planned to conduct five observations of each participant using AssessToday™ observation protocol followed by a post-observation conference with written feedback. Denzin and Lincoln (2005) argued that the use of multiple methods or *saturation* develops a more robust understanding of the phenomena. They suggested the idea of saturation as a way for the researcher to attempt to bring complexity and depth during the inquiry process. The multiple data sources allowed for saturation and achieved “the goal of adequate variety” (Morrow, 2005, p. 255). The researcher used multiple types of qualitative data collection to interpret meanings in the phenomena being studied (Denzin & Lincoln, 2005).

The collection of data sources outlined in Figure 1 shows a weekly timeline for the researcher to examine the phenomena of the participant knowledge and use of effective short-cycle formative assessment practices, and if they changed over the course of study based on targeted professional development and instructional support.

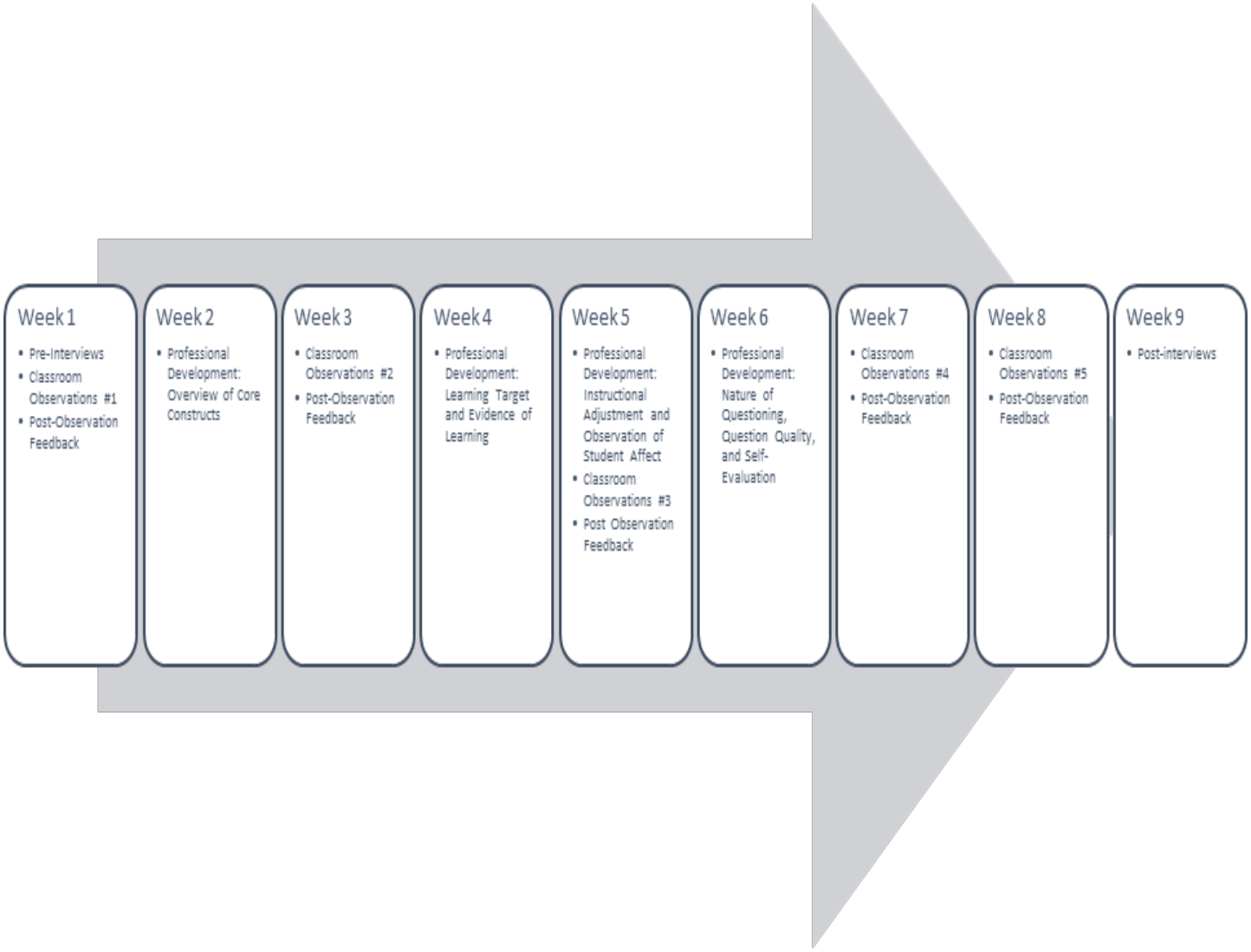

Figure 1. Timeline of study.

Researcher Approval and Training

The researcher received approval to conduct this study from both the university Institutional Review Board (IRB) and the school district's review board. Additionally, the researcher obtained written consent from each participant. The following describes the data-collection procedures, including the researcher training, the selection of data sources, and a description of each type of data source.

The researcher participated in six hours of training from a certified trainer in order to use the AssessToday™ observation protocol. The trainer conducted multiple classroom observations using the AssessToday™ observation protocol after receiving training by the developers of the protocol and was considered an expert observer by the developers. The first part of the training consisted of a one-hour review of the seven constructs on the AssessToday™ observation protocol. During the review, the researcher asked the trainer clarifying questions regarding the different constructs as needed during the training. One such clarifying question was, "What type of evidence do you write down for the observation of student affect core-construct?" Additionally, the trainer provided examples of AssessToday™ observation protocol field notes that were completed in prior observations. While reviewing those examples, the trainer highlighted different types of notes that could be utilized during the classroom observation to help score the observations effectively.

The second part of the training consisted of four hours of classroom observations with the trainer. There were two classroom observations conducted in two seventh-grade mathematics classrooms. Each observation lasted 45 minutes. Both the trainer

and researcher gathered data for each of the seven core-constructs during the observations. The trainer and researcher spent approximately fifteen minutes after each observation to separately score each observation using the AssessToday™ observation protocol before the next observation began.

The last part of the training consisted of an hour debriefing session between the trainer and the researcher. During the debrief session, the trainer and researcher reached established reliability agreement on the ratings of each classroom observation. The process for reaching agreement included sharing individual ratings for each core-construct and the evidence that supported each rating. For each of the seven core-constructs, the researcher and trainer agreed on the ratings based on the classroom observation evidence.

Data to Analyze Participant Knowledge of Formative Assessment Strategies

Teacher pre- and post- interviews. One qualitative data source in this study was a set of semi-structured teacher interviews. By using a semi-structured interview protocol, the researcher elicited knowledge of short-cycle formative assessment strategies. Merriam (1998) discussed the idea of semi-structured interviews and the ability of the interviewer to respond instantaneously to the gathered information. Further, Merriam (2002) described the use of interview data as a tool that can help with transferability of study results due to the in-depth nature of the information provided during the interview.

The researcher interviewed each participant at the beginning of the study using the pre-interview questions (Appendix B) and at the end of the study using the post-interview questions (Appendix C) to determine if there were any changes in participant

knowledge of short-cycle formative assessment strategies after receiving targeted instructional support. The researcher recorded and transcribed each interview session then constructed a comparison of the pre-and post-interview data as it related to the teachers participation in professional development.

Formative assessment professional development sessions. The researcher created professional development sessions that focused on short-cycle formative assessment. The participants engaged in five professional development sessions that specifically focused on learning and applying the seven core-constructs of short-cycle formative assessment from the AssessToday™ observation protocol. The professional development series started in Week 2 and concluded in Week 6 of the study. Table 1 provides an outline of each session's topic, description, and learning objectives.

Sadler (2010) stated that for feedback to achieve its goal of being a part of formative assessment, the feedback must be both specific and general. Specific feedback helps students make corrections to their present work as they progress towards mastery of the learning target. General feedback helps the student make connections to mastering learning targets connected to the broader unit goals. Thus, teacher feedback is an important part of effective short-cycle formative assessment implementation. In a similar way, the researcher took into consideration the variation in the pedagogical-content knowledge as it related to feedback in the context of effective short-cycle formative assessment implementation when developing the professional development sessions. Furthermore, data from the observations and post-observations led to adaptations in the ongoing professional development sessions.

Table 1

Professional Development Session Topics and Objectives

Session Title	Session Objectives
Core-constructs of Short-cycle Formative Assessment	By the end of the short-cycle Formative Assessment PD Series #1 and #2, teachers will be able to • Assess their present knowledge of effective short-cycle formative assessment strategies • Identify the different types of formative assessments • Identify the core-constructs of short-cycle formative assessments.
Learning Target and Evidence of Learning	By the end of the short-cycle Formative Assessment PD Series #3, teachers will be able to • Assess their present knowledge of two of the short-cycle formative assessment core-constructs: learning target and evidence of learning • Identify and apply their knowledge of the two core-constructs in the classroom setting.
Instructional Adjustment and Observation of Student Affect	By the end of the short-cycle Formative Assessment PD Series #4, teachers will be able to • Recognize the role of student understanding in the short-cycle formative assessment process • Identify tools and strategies to use to determine student understanding and make instructional adjustments.
Question Quality, Nature of Questioning, and Self-Evaluation	By the end of the short-cycle Formative Assessment PD Series #5, teachers will be able to • Understand how to use effective questions to stimulate student thinking and self-evaluation during the short-cycle formative assessment process • Develop skills for using questioning strategies that encourage students to think.

Data to Analyze Participant Use of Formative Assessment Strategies

As shown in the timeline in Figure 1, in addition to collecting data about participant knowledge, participants were observed regarding their use of short-cycle formative assessment. Data from at least four classroom observations were collected to examine how the participants used short-cycle formative assessment strategies. Post-observations conferences were conducted to discuss the use of short-cycle formative assessment strategies using the AssessToday™ observation tool.

Classroom observations. All classroom observations were conducted by the researcher. The curriculum used by each of the teachers in the study was the same; therefore, the content the researcher observed in each of the classrooms was

consistent throughout the study. Each observation was conducted in line with the definition of short-cycle formative assessment, which in this case meant one observation during one class period of 45 minutes. The researcher observed Ms. Anderson five times in the study and Ms. Thomas four times using the AssessToday™ observation protocol. This was because the first teacher rated at the proficiency level of master on the core-constructs of short-cycle formative assessment in three classroom observations. An additional classroom observation was conducted to add to the validity of the results.

AssessToday™ observation protocol. The AssessToday™ observation protocol (Eddy & Harrell, 2014) was the observation framework used to conduct a deductive analysis of teacher's pre- and post- use of short-cycle formative assessment strategies. The AssessToday™ observation protocol was designed to measure short-cycle formative assessment strategies in the classroom (Heitz, 2013). AssessToday™ observation protocol was created as a 7x4 rubric that includes seven core-constructs of short-cycle formative assessment with four proficiency levels for each construct. The seven core-constructs were: (1) learning target, (2) questioning quality; (3) nature of questioning; (4) self-evaluation; (5) observation of student affect; (6) instructional adjustment; and, (7) evidence of learning. These research-based categories were designed to measure the effectiveness of short-cycle formative assessment strategies during one observation within one class period. This was the intention because it was designed for short-cycle formative assessment specifically. The constructs were directly aligned with Stiggins' (2005) assessment for learning. (These are described in more detail in a subsequent section.)

There were four proficiency levels created for each construct. Teachers received a rating for each observation on each the seven core-constructs of short-cycle formative assessment. The observation ratings were as follows: (1) novice, (2) apprentice, (3) practitioner, and (4) master. Each observation rating listed indicators to provide the participant and researcher with details of observed implementation required to obtain the rating, based on the indicators for each area. For example, the learning target core-construct included four indicators observable throughout the lesson: (1) teacher states objective, (2) teacher writes objectives for students to see, (3) students write objectives, and (4) teacher revisits objectives. To receive a level of novice as the rating for the learning target core-construct, the observer would not be able to collect any evidence to support any of these indicators during the lesson. To receive a level of master as the rating for the learning target core-construct, the observer would be able to provide evidence to support all four indicators during the lesson.

Each core-construct included a set of indicators for the observer to note and to determine the degree with which the teacher was implementing this indicator. The indicators for each core-construct informed the level of implementation that could be observed during one period of instruction. Though each of the core-constructs and indicators are listed separately, they were to be interpreted as interconnected and considered by the observer as informing each other. The indicators for each core-construct are provided below.

Learning target. To demonstrate the quality with which the teacher implements the core-construct of the learning target, the teacher must perform the following: the

teacher states the objectives, the teacher writes the objectives, the students write the objectives down, and the teacher revisits the objectives.

Question quality. To demonstrate the level of question quality, the teacher must exhibit: open-ended questions, a mix of Bloom's high and low questioning, and connections to prior knowledge.

Nature of questioning. The teacher must show consistent and appropriate use of follow-up questioning and wait time for this core-construct.

Self-evaluation. When teachers employ techniques to encourage student self-evaluation, the teacher is demonstrating techniques that are teacher initiated, are a clearly defined strategy (or strategy), and students must use the strategy (or strategies).

Observation of student affect. When the teacher focuses on noticing the impact that instruction is having on the affective aspect of student learning, the teacher is responding to both verbal and nonverbal actions. The observable indicators for this core-construct are: student behavior, teacher focus, and student interactions.

Instructional adjustment. Adjustments made to instructional strategies and timing, adapting the audience that needs assistance, and alterations in grouping strategies are all indicators of instructional adjustment.

Evidence of learning. The indicators for the evidence of learning core-construct include that there are responses from all students, individual responses are assessed, and artifacts of learning are collected.

The indicators for the seven core-constructs were designed to provide observable, measurable data points that could be collected to rate a teacher. These were to be incorporated into the report of an observation. When tested for reliability, the

constructs on the AssessToday™ observation protocol met the recommended measures for reliability (Heitz, 2013). The AssessToday™ observation protocol was tested on its reliability based on the inter-rater reliability of the trained raters who participated in the observations in the study that were used to validate the instrument. Heitz (2013) concluded in his dissertation discussion that all of the constructs of Assess Today© met the recommended reliability at some point in the study using three measures: the percentage of agreement between raters, Cohen's kappa, and Fleiss kappa. When tested for validity, the AssessToday™ observation protocol met the requirements of content validity because the instrument was tightly connected to the literature on effective short-cycle formative assessment tools as well as feedback from experts in the field. Additionally, to further validate the AssessToday™ observation protocol, the instrument was field tested in secondary mathematics and science classrooms by trained observers.

Post-observation conferences. As part of the AssessToday™ observation protocol, the observer held a post-observation conference after each classroom observation. Every conference was held within 48 hours of the observation, a practice that proved beneficial and informative for both observer and observed. The purpose was to debrief and discuss the corresponding rating of each core-construct from the AssessToday™ observation protocol. The researcher provided each participant with written feedback from the observation, subdivided by each core-construct.

Additionally, during the post-observation conference, the researcher used semi-structured interviewing strategies by asking clarifying, extending, and follow-up questions to develop better insight into each teacher's use of short-cycle formative

assessment. The written feedback and the discussions during the conference helped the teacher establish goals to improve future use of short-cycle formative assessment strategies.

Data Analysis

The data analysis process used by the researcher followed a single case study design (Stake, 1995). The single case study design helped the researcher gain insight into the nature of how participant knowledge of short-cycle formative assessment practices changed over the course of the study (Bryman, 2008). Additionally, the design of the case study enabled the researcher to develop specific descriptions of participant knowledge and use of effective short-cycle formative assessment practices (Mertler & Charles, 2011).

Analytical Technique: Time-Series Analysis

The researcher separated the data analysis technique for this case study into weekly descriptions of teachers' knowledge and use of short-cycle formative assessment strategies through the course of the study. The time-series analysis technique was used to explain how the timing of the targeted instructional support influenced the changes in teacher knowledge and use of short-cycle formative assessment practices. Yin (2008) described the time-series technique as a match between the observable phenomena and observable time-pattern trends during the study. The researcher analyzed each data source separately to develop the case study narrative for each participant.

Teacher interviews. The short-cycle formative assessment core-constructs on the AssessToday™ observation protocol aligned with the pre- and post-interview

questions used in this study (Appendix B and Appendix C). The results lie within the framework of the AssessToday™ observation protocol. The teacher participants' answers helped the researcher develop an understanding of where to focus the targeted instructional support and how each teacher's knowledge of short-cycle formative assessment strategies changed over the course of the study.

The first interview question, "How would you define the term formative assessment?" was a broad question to begin the interview with focusing on the topic of formative assessment and the participant's prior knowledge. This question was also aligned to the evidence of learning short-cycle formative assessment core-construct. The second interview question, "How do you communicate the intended learning of a lesson, activity, project, or unit to students?" was a question asked to determine the teacher participant's understanding of the learning target of short-cycle formative assessment. The third question, "When do students in your class receive feedback on their progress?" was asked to determine the participant's understanding of the role of feedback in student mastery of the learning target. The answer to this question aligned with the instructional adjustment core-construct of formative assessment because the feedback provided to students helped to alter the learning gap, as a result of teachers adjusting their instruction. The fourth pre-interview question, "What forms does feedback take in your classroom?" was a question that helped the researcher gather data on the teacher participant's understanding of the different types of feedback that that students can receive to help them progress towards mastery of the learning target. The answer to this question aligned with the core-constructs of question quality and nature of questioning because the use of questioning to scaffold instruction and

diagnose problems with learning are two types of feedback to improve instruction and student learning. The fifth question, “What do you expect student to do with feedback information?” was a question that helped the researcher determine if the participant understood how to help students regulate and improve their own learning through the implementation of the self-evaluation core-construct of short-cycle formative assessment in their classroom. Lastly, the sixth question, “How do the processes of tracking, reflecting on, and sharing learning work to “close the gap?” was asked of each teacher participant. This question was aligned to the student affect core-construct of short-cycle formative assessment.

Classroom observations. In a nine-week period, one sixth-grade teacher received five unannounced observations, and the other sixth-grade teacher received four unannounced observations. Within forty-eight hours after each observation, the researcher invited each teacher to participate in a post-observation conference, during which the participant was also provided written feedback. The researcher compared the observations from each teacher and notated changes in the use of short-cycle formative assessment strategies derived from ratings on the AssessToday™ observation protocol. The researcher included suggestions for instructional improvement related to the core-constructs of short-cycle formative assessment. The written feedback supported the conclusions made in the data analysis of this study.

Formative assessment professional development sessions. As a third aspect of the time-analysis technique, the researcher assessed and noted any changes in participant knowledge of short-cycle formative assessment during the professional development series. The researcher analyzed what learning occurred in each of these

sessions and its potential impact on the change in the knowledge of short-cycle formative assessment practices for each participant.

Trustworthiness

To ensure trustworthiness in a qualitative study, Lincoln and Guba (1985) proposed that researchers consider four criteria when collecting data and reporting their findings. The four criteria are: (1) credibility, (2) transferability, (3) dependability, and (4) confirmability. To increase the credibility of the findings of this study, the researcher triangulated the data by using multiple data sources, (e.g., classroom observations, post-observation feedback conferences, and interviews). Holloway (1997) suggested that qualitative researchers should include thick descriptions when reporting their findings to increase the study's transferability. For this study, the researcher provided the reader with detailed accounts of the teacher participants' experiences in context as it pertained to their pre- and post- knowledge and use of short-cycle formative assessment strategies.

Triangulation of Data Sources

As stated in Denzin and Lincoln (2011), "the use of multiple methods, or triangulation, reflects an attempt to secure an in-depth understanding of the phenomenon in question" (p. 5), and that this is "not a tool or a strategy of validation but an alternative to validation" (p. 5). Gay, Mills, and Airasian (2009) state that the process of triangulation involves "two or more methods… such as interviews with students may be used to contribute to our understanding of what we observed in a lesson" (p. 377).

In order to demonstrate the trustworthiness of the data reported in this study, a triangulation of four data sources was conducted. The researcher triangulated the four

data collection methods shown in Figure 2 to produce a more in-depth explanation of how each teacher's knowledge and use of short-cycle formative assessment strategies changed over time.

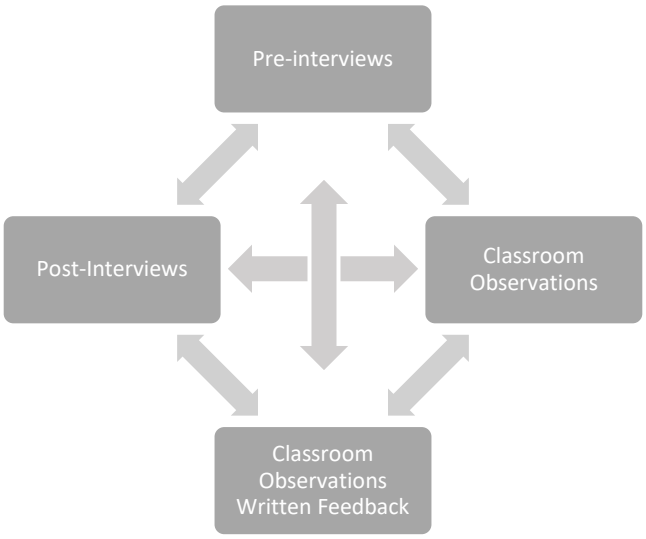

Figure 2. Triangulation of data sources.

For example, the researcher looked at data from the learning target core-construct because both Ms. Anderson and Ms. Thomas received targeted instructional support in these areas to help improve their implementation. This core-construct was also selected because Ms. Thomas scored at the master level on four of the other six core-constructs across all observations and, as a result, needed minimal targeted instructional support related to these constructs

Initially, a baseline of knowledge for short-cycle formative assessment was established using six pre-interview questions. Next, the prior knowledge was used to explore teacher knowledge gains after participation in a professional development session that provided strategies teachers could employ to specifically implement the learning target core-construct of short-cycle formative assessment.

Cross verification of data was facilitated using data from five teacher observations that employed the AssessToday™ observation protocol. For example, change was apparent in the following excerpts from the professional development session during week four which targeted the core-construct of learning target:

> Ms. Anderson: Okay. First state before we start, “today we are going to be covering this subject” and then I state the learning objective of the day as well as [have students] write the learning objective of the day and state it throughout the lesson.
>
> Ms. Thomas: Having students write their learning objectives for the day. I am going to start with my unit so that they can make a connection with the unit and the lesson objectives. Have the students say the lesson objectives, have the students do that throughout the lesson to make sure they understand what they are learning.

Their comments that were recorded during the professional development session indicates their reflection on the information provided during the session as it related to the indicators for the learning target.

Additionally, written feedback from the researcher was another way to cross verify data from two or more sources. The written feedback from the first observation showed evidence that students were not required to write down the learning target during the lesson. Excerpts of written feedback provided by the researcher regarding the learning target after the first observation are listed in Table 2 for Ms. Anderson and Table 3 for Ms. Thomas. For instance, during the first observation, the researcher did not notice students writing down the lesson objective in either class.

Table 2

Ms. Anderson's First Observation Written Feedback for the Learning Target Core-Construct

Core-Construct of Formative Assessment	Observation Evidence Based on Core-Construct	Observation Rating
Learning Target	Two of the four indicators are observed during the class period. • **Teacher states objectives** – After students completed the Do Now, the teacher shared with the students what they were going to learn that day. • **Teacher writes objectives for students to see** – Lesson objective was posted on the board. • ***Student writes objective down*** *– Not observed –By writing down the lesson objective (in their own words) students can begin to set their own learning goals and take ownership in their progress towards meeting those goals.* • **Teacher revisits objectives** – *Not observed – By restating the objective throughout the lesson, students can begin to make connections and monitor their progress towards mastery of the objective.*	Apprentice

Table 3

Ms. Thomas' First Observation Written Feedback for the Learning Target Core-Construct

Core-Construct of Formative Assessment	Observation Evidence Based on Core-Construct	Observation Rating
Learning Target	Three of the four indicators are observed during the class period. • **Teacher states objectives** – After students completed the Do Now, the teacher started the lesson by stating the objective. • **Teacher writes objectives for students to see** – Lesson objective was posted on the board. • **Student writes objective down** – Not observed – The teacher had students refer to their prior learning throughout the observation. By writing down the lesson objective (in their own words), students can begin to set their own learning goals and take ownership in their progress towards meeting those goals. • **Teacher revisits objectives** – The teacher restated what students were learning today through the use of the academic vocabulary as well as through connecting the lesson objective for today to previous learning.	Practitioner

Thus, the researcher suggested implementing this component in future lessons. During the third observation for Ms. Anderson and the second observation for Ms. Thomas, the researcher noted in the written feedback that students were writing down

the learning target during the lesson. As both teachers progressed from the pre-interview to the post-interview, there was data to suggest that the targeted instructional support the teachers received influenced the effective implementation of the learning target core-construct.

Table 4 is an excerpt from Ms. Anderson's written feedback regarding the learning target after the third observation when she reached Master level of implementation for the learning target core-construct. Table 5 is an excerpt from Ms. Thomas' written feedback regarding the learning target after the second observation when she reached Master level of implementation for the learning target core-construct.

Table 4

Ms. Anderson's Third Observation Written Feedback for the Learning Target Core-Construct

Core-Construct of Formative Assessment	Observation Evidence Based on Core-Construct	Observation Rating
Learning Target	Four of the four indicators are observed during the class period. • **Teacher states objectives** – After students completed the Do Now, the teacher shared with the students what they were going to learn that day. • **Teacher writes objectives for students to see** – Lesson objective was posted on the board. • ***Student writes objective down*** –The teacher had the students write down the lesson objective in their notes. • **Teacher revisits objectives** – The teacher revisited the objective by stating it after each rotation.	Master

Table 5

Ms. Thomas' Second Observation Written Feedback for the Learning Target Core-Construct

Core-Construct of Formative Assessment	Observation Evidence Based on Core-Construct	Observation Rating
Learning Target	Three of the four indicators are observed during the class period. • **Teacher states objectives** – After students completed the Do Now, the teacher started the lesson by stating the objective. • **Teacher writes objectives for students to see** – Lesson objective was posted on the board. • **Student writes objective down** – The teacher had students write down the lesson objective at the start of the lesson. • **Teacher revisits objectives** – The teacher restated what students were learning today through the use of the academic vocabulary as well as through connecting the lesson objective for today to previous learning.	Master

Finally, a post-interview was used to document changes in knowledge about short-cycle formative assessment at the end of the study. For examples, both teacher included in their post-interviews how they ensured that students were writing down the lesson objective or learning target. Requiring that students write down the learning target during each lesson was stated in the literature as a strategy of effective implementation of short-cycle formative assessment.

Summary

The purpose of this study was to examine how sixth-grade mathematics teachers' knowledge and use of short-cycle formative assessment strategies changed as a result of receiving targeted instructional support in the form of professional development and post-observation conferences with written feedback. Chapter 3 described the background of the methods and methodology of this study, which included a detailed description of the case study research design, data collection methods, data analysis, and examples of triangulation of the data. The qualitative data

collection from the various sources provided the information needed to study the phenomena of the changes in teachers' knowledge and use of short- cycle formative assessment strategies over time. Chapter 4 included a detailed description of the findings from the study. The researcher used the time-series case study analysis design to categorize the findings based on the research question and the data collection from each of the data sources.

CHAPTER 4

RESEARCH FINDINGS

This chapter presents the findings for the case study of two sixth-grade middle grades mathematics teachers, Ms. Anderson and Ms. Thomas, specifically their changes in the knowledge and use of short-cycle formative assessment strategies while receiving targeted instructional support. The research question informed the direction of this study. The researcher examined teacher knowledge of short-cycle formative assessment by using pre- and post-interviews to ascertain what the participants knew before the study began and what they knew at the end of the study. During the study, the researcher provided teachers with professional development sessions that narrowly focused on short-cycle formative assessment strategies and was tailored to the needs of the participants. The researcher examined teacher use of short-cycle formative assessment with classroom observations using the AssessToday™ observation protocol and post-observation feedback conferences. During the study, the researcher used the post-observation feedback conferences to provided targeted instructional support.

The data collection was a single case study involving participant use of short-cycle formative assessment strategies. To provide a description of how targeted instructional support such as professional development sessions and post-observation feedback conferences with written feedback can influence changes in knowledge and use of short-cycle formative assessment strategies, two participants were included in the study.

The narrative begins with a description of each individual teacher's changes in knowledge and use of short-cycle formative assessment strategies when provided with targeted instructional support in the form of professional development and post-observation feedback conferences with written feedback after each classroom observation. The narrative concludes with a combination of findings from both participants to help describe how the professional development and post-observation feedback conferences with written feedback played important roles in the changes in teachers' knowledge and use of short-cycle formative assessment strategies based on Assess Today© observation protocol core-constructs.

Findings by Participant

The first section for each teacher participant focused on the changes in knowledge of short-cycle formative assessment strategies. The data was analyzed and used to develop a narrative about each participant spoke to the research question. Pre-interviews were used to ascertain teacher's prior knowledge of short-cycle formative assessment. Teachers then participated in professional development sessions that focused on the short-cycle formative assessment strategies that were designed to meet their instructional needs. The post-interviews were analyzed to determine if there were any changes in teacher knowledge of short-cycle formative assessment due to their participation in this targeted instructional support.

The second section for each teacher participant focused on observable changes in use of short-cycle formative assessment strategies. The data from classroom observations, post-observation conferences, and written feedback using the

AssessToday™ observation protocol were analyzed and used to develop a narrative about each participant's use of short-cycle formative assessment strategies.

Ms. Anderson's Changes in Knowledge of Short-Cycle Formative Assessment

The findings for the changes in Ms. Anderson's knowledge of short-cycle formative assessment strategies were reported using weekly interactions. Ms. Anderson participated in the pre- and post-interviews, five post-observation conferences, and four professional development sessions. Ms. Anderson's prior knowledge of short-cycle formative assessment was captured in her answers to the six pre-interview questions. Using this information, she was provided with targeted instructional support in the form of professional development sessions focused on learning the short-cycle formative assessment strategies. In addition to these sessions, she received feedback during her post-observation conferences that provided more information regarding short-cycle formative assessment strategies. At the conclusion of the study, the changes in Ms. Anderson's knowledge of short-cycle formative assessment were analyzed using her answers to the post-interview questions.

Pre-interview. The pre-interview focused on eliciting participant initial knowledge of short-cycle formative assessment strategies. During the pre-interview, the researcher asked the participant six questions that align to the seven short-cycle formative assessment core-constructs on the AssessToday™ observation protocol. The answers to the questions revealed Ms. Anderson's and Ms. Thomas' beginning knowledge of short-cycle formative assessment strategies.

Ms. Anderson was a first-year teacher in sixth-grade mathematics, but she had extensive mathematics knowledge because her bachelor's degree was in mathematics.

At the time of data collection, she was midway through her first year of teaching. As it was her first year of teaching, she relied heavily on the other sixth- grade mathematics team members to help her understand how to teach mathematics to sixth graders. Despite her having extensive mathematics content knowledge, Ms. Anderson's lack of teaching experience and minimal teacher education background limited her knowledge of short-cycle formative assessment. She was unable to describe constructs of short-cycle formative assessment as described in the AssessToday™ observation protocol. The following are two excerpts from Ms. Anderson's pre-interview to describe how her knowledge of short-cycle formative assessment at the beginning of the study was superficial at best.

For example, when asked the second interview question, "How do you communicate the intended learning of a lesson, activity, project, or unit to student?" (which aligns to the learning target short-cycle formative assessment core-construct on the AssessToday™ observation protocol) Ms. Anderson responded: "When we start a lesson, the students have their objective for the day posted on the PowerPoint and [I] communicate it throughout the lesson." Ms. Anderson's description of communicating the lesson objective throughout the lesson demonstrated that she perceives it is the teacher's role to be constantly aware of the intended learning target and to remind students of what that is. As research has shown, by posting the lesson objective for the students to view helps the students refer back to the learning target, they can progress toward mastery as agents of their own learning.

Another example was during the pre-interview, when asked the third interview question regarding when students receive feedback on their progress, Ms. Anderson

provided a short answer that focused mainly on the student making changes based on the feedback the teacher provided. Ms. Anderson stated, “They [the students] are getting instant feedback as to how they are doing and what they could change.” From this answer, the researcher determined that Ms. Anderson’s understanding of feedback was minimal and would benefit from targeted professional development related to short-cycle formative assessment.

Using the pre-interview data, the researcher noted that Ms. Anderson lacked a clear understanding of short-cycle formative assessment and how to gather data from her students in various forms to make adjustments that would impact student learning in the moment. As a result, the researcher used the AssessToday™ observation protocol core-constructs to inform what professional development activities would help Ms. Anderson build her knowledge of short-cycle formative assessment. The section that follows depicts her changes in knowledge by drawing from the data in the pre-interview, professional development sessions, and post-interview; each section is organized using the core-constructs from the AssessToday™ observation protocol.

Ms. Anderson’s knowledge of evidence of learning. Ms. Anderson’s beginning knowledge of the evidence of learning core-construct was minimal. During the pre-interview, Ms. Anderson discussed gathering evidence of learning to assess student’s progress using a type of assessment that is typically used at the end of a lesson or unit. When talking about how she gathered student data as evidence of learning Ms. Anderson stated: “I will define the term formative assessment as a concrete tool used to assess progress of a student as in a quiz or test.” With this in mind, during the targeted professional development session that focused on the evidence of learning core-

construct. Ms. Anderson was asked to self-assess her knowledge about the evidence of learning core-construct. Ms. Anderson read Stiggins (2005b), “From Formative Assessment to Assessment for learning: A Path to Success in Standard’s Based Schools” (beginning at the Assessment for learning section, pages 327-328) and identified the student’s role in gathering evidence of learning during the lesson. Ms. Anderson reviewed and discussed the indicators for the evidence of learning core-construct with other participants in the professional development session. The review of evidence of learning included Ms. Anderson working in a collaborative group to develop a concrete example of an effective implementation regarding evidence of learning in the classroom. Based on Ms. Anderson’s self-assessment, she planned how she would use the indicators and examples from the professional development session to move herself to the next level on the evidence of learning core-construct.

Ms. Anderson’s knowledge of the evidence of learning core-construct by the end of the study included terminology such as the types of evidence of learning artifacts that are collected that suggested she understood that there are multiple ways to assess student understanding. Additionally, she indicated she understood that there are various ways to gather student evidence to determine mastery. During the post-interview, Ms. Anderson explained her understanding of gathering student evidence of learning in the following statement: "I would [define] formative assessment as different ways to assess student learning…. different measurable ways to assess student learning.”

Ms. Anderson’s knowledge of learning target. Ms. Anderson’s beginning knowledge of the learning target core-construct included an understanding of two of the aspects of the learning target core-construct: posting the lesson objective and

communicating the lesson objective throughout the lesson to students. In this regard, Ms. Anderson discussed the following in the pre-interview as it pertains to the learning target core-construct:

> When we start a lesson the students have their objective for the day and it is usually posted on a PowerPoint where we use different resources instead of how we say it students will be able to assess, I will be able to…. and the objective is displayed as well as communicated throughout the lesson.

During the professional development session that focused on the learning target core-construct dimension of short-cycle formative assessment, Ms. Anderson articulated her knowledge of the learning target core-construct. During the same professional development session for the core-construct, evidence of learning, the core-construct of the learning target was also addressed. When Ms. Anderson read Stiggins (2005b), “From Formative Assessment to Assessment for learning: A Path to Success in Standard’s Based Schools” (beginning at the Assessment for learning section, pages 327-328), she was also asked to identify the student’s role in “understanding the learning target” during the lesson. Ms. Anderson reviewed and discussed the indicators for the learning target core-construct with other participants in the professional development session. Similar to what she did for the evidence of learning core-construct, Ms. Anderson worked in a collaborative group to develop a concrete example of an effective implementation of the learning target in the classroom. Based on Ms. Anderson’s self-assessment, she planned how she would use the indicators and examples from the professional development session to move herself to the next level on the learning target core-construct.

Ms. Anderson's knowledge of the learning target core-construct by the end of the study did not change when she was asked the same question in the post-interview. However, her response highlighted what Ms. Anderson deemed as important when ensuring her students know the learning target for the day. She held to the belief that the teacher should state the lesson objective and revisit the objective throughout the lesson in her post-interview response:

> Firstly, I state before we start today, we are going to be covering the subject and then I state the learning objective of the day as well as write the learning objective of the day and it is also…. the learning objective is stated through the lesson.

Ms. Anderson's knowledge of question quality. Ms. Anderson's beginning knowledge of the question quality core-construct included a strategy that she used to provide students with feedback when they ask questions. She did not go into detail during the pre-interview about the types of questions that she asks or her selection of questions that she might pose throughout the lesson. In this regard, the response that she provided during the pre-interview when referencing the feedback that she provided to students indicated that she has some knowledge about the role that providing feedback to students plays on the improvement of learning, "They receive instant feedback through the ten with the pen, and they are getting instant feedback as to how they are doing and what they could change…. It will show their progress."

During the professional development session that focused on the core-construct, question quality, Ms. Anderson reflected on her prior knowledge that the teacher should encourage students to think before responding. She was then provided Brookhart's

(2009), “Asking Questions that Encourage Students to Think.” Using the information from the article, Ms. Anderson and the other participants reviewed and discussed the indicators for the question quality core-construct. During this discussion, Ms. Anderson stated that she would incorporate more “open-ended questions rather than questions of fact” in her lessons (Brookhart, 2009, p. 51).

By the end of the study, Ms. Anderson’s knowledge of the question quality core-construct was similar when she was asked the same question in the post-interview. The similarity in her responses indicated that she believed feedback should be provided to students in a timely manner. The role that feedback has in improving instruction is indicated in her post-interview response below, “Verbal, if it’s like ten with the pen with little check marks on the papers and when work is checked it is returned to the student in graded form.”

Ms. Anderson’s knowledge of nature of questioning. Ms. Anderson’s beginning knowledge of the nature of questioning core-construct lacked depth, as revealed during the pre-interview about the types of questions that she asks or her selection of questions that she might pose throughout the lesson. For example, as cited above in the question quality, she focused on their progress rather than how she might adapt instruction based on student responses.

During the professional development session that focused on question quality, the other construct that was addressed was the nature of questioning core-construct of short-cycle formative assessment. Revisiting Brookhart (2009) and their discussion related to question quality, the participants built on this and examined the indicators for the nature of questioning. Ms. Anderson contributed to the discussion by sharing her

idea for wait time. She shared that she provided less than two seconds of wait time to students after asking a question. However, she realized that when she provided longer wait time student responses to her questions were more complex.

In the post-interview, Ms. Anderson displayed a change in her knowledge of the nature of questioning core-construct:

> They receive feedback during the “do now” through “ten with the pen” …. throughout the do now process as well as we stop for checks for understanding and if it is individual work then I monitor the room, walk around and get feedback as they are working independently.

Her response included using questioning as a check for understanding, which can be linked to the follow-up questioning dimension of the nature of questioning core-construct.

Ms. Anderson’s knowledge of instructional adjustment. Ms. Anderson’s beginning knowledge of the instructional adjustment core-construct was minimal. During the pre-interview, Ms. Anderson explained the forms of feedback that she provides to students to determine if instructional adjustments would need to be made during the lesson, “Verbal feedbacks and grades.”

Based on Ms. Anderson’s limited knowledge of the instructional adjustment core-construct, the researcher selected materials for the professional development that would provide Ms. Anderson with concrete examples of activities that would lend itself to different types of instructional adjustments, such as how to determine the most effective grouping strategies to use during a particular lesson.

At the onset of the professional development session, Ms. Anderson reflected on her knowledge of the core-construct, instructional adjustment, using a self-assessment tool. She was then presented with different classroom scenarios to discuss how the teacher in each scenario collected data to affirm student understanding of the content and how the teacher adjusted the instruction because of the data that was collected. The following is one of the classroom scenarios that was presented to Ms. Anderson to determine how she would collect student data and determine what adjustments to the lesson would need to be made:

> Students are working in groups of 3-4 completing 3 station review activities. The teacher allots 5 minutes for students to complete each station activity. As the groups are working at each station, the teacher works with a small group of students (5) in the back of the classroom on a reteach activity.

Her response to this scenario was that she would set expectations for her groups to ensure that there was individual accountability. Additionally, as students in the small group worked on independent practice problems, she would monitor the work of the individual work of students in each group to determine if instructional adjustments would need to be made. (See Appendix E for the complete list of scenarios.)

In addition to collaborating on different classroom scenarios that would yield different types of instructional adjustments, Ms. Anderson reviewed and discussed the indicators for the core-construct, instructional adjustment, with other participants in the professional development session. Ms. Anderson stated that she recognized the need to collect data to be able to adjust instruction, for example, by implementing checks for understandings or multiple response strategies. She followed this by sharing some

ideas for how she planned to address the indicators and implement examples from the professional development session to move herself to the next level on the instructional adjustment core-construct. In particular, she highlighted obtaining data throughout the lesson to affirm student understanding to determine if an adjustment was needed.

Ms. Anderson's knowledge of the instructional adjustment core-construct by the end of the study changed significantly when she was asked the same question in the post-interview. Her answer included a distinct way in which she would gather student data. The gathering of student data would help her to make instructional adjustments during the class, "Verbal, if it's like ten with the pen with little check marks on the papers and when work is checked it is returned to the student in graded form."

Ms. Anderson's knowledge of self-evaluation. Ms. Anderson's beginning knowledge of the core-construct, self-evaluation, included minimal evidence that she required that her students use a self-evaluation strategy or tool during the lesson. In this regard, Ms. Anderson's response to the pre-interview question that aligned to the self-evaluation core-construct was as follows: "With the instant feedback with like "ten with the pen" I expect them to correct mistakes in their moment and then with grades either to taking back in changes what they need to work on and what they don't."

The professional development session that focused on the self-evaluation core-construct of short-cycle formative assessment began with each participant sharing their current knowledge of the self-evaluation core-construct. This was followed by the group reading Chappius (2005), "Helping Students Understand Assessment." They were then asked to reflect on the tools being used during instruction to help students self-assess their own progress towards mastery of the self-evaluation core-construct. Ms. Anderson

reviewed and discussed the indicators for the self-evaluation core-construct with other participants in the professional development session. She discussed how she could use the Understand, Plan, Solve, Check (UPS Check) problem solving model's check portion to help students reflect on their thinking in addition to checking over their work.

In the post-interview, Ms. Anderson's response was similar to her pre-interview response, in that she still expected students to reflect on their mistakes and make corrections, but with an added depth of recognizing that the importance of students sharing when there is a need to be addressed so that she could assist through further instruction:

> I expect students to…. if it's verbal then on the spot change with… has to be changed or continue working at the same pace that they…. as to work if it is correct and with written feedback I expect them to see what changes need to be made or what problems need to be corrected and correct those problems for further instruction.

Her response during the post-interview revealed that her knowledge of the self-evaluation core-construct changed because her students were being held accountable for using strategies to improve their learning, not just rely on the teacher to know if the student does not understand a concept.

Ms. Anderson's knowledge of observation of student affect core-construct. Ms. Anderson's beginning knowledge of the observation of student affect core-construct was superficial. She lacked an understanding of what student affect was and how it could influence student performance. This is demonstrated through her description in the pre-interview when she shared her perception of how students respond:

> When I think about tracking I think about like the DOL [demonstration of learning] or by using that information I could see what needs to be re-taught so I know how to perceive rest of the lesson.

This was followed by how she reacted to this as well as how she allowed students to interact with their peers:

> Well when they are working on a question they could share with their partner, they work on a question for two minutes spend two minutes with your partner, discuss what you have asked me and if you all did the same what they did with their partners…let's figure out which one is the right way or if their partner can help them.

In her statement, her perspective of student affect showed that Ms. Anderson valued student interactions and was willing to adjust instruction based on the data from those interactions.

During the professional development session, she was provided an excerpt from Chappius (2005), "Helping Students Understand Assessment" (p. 39), and they were asked to reflect on personal experiences with helping students understand assessment. This article was selected because it provided teachers with an idea for why it is important for students to feel like they are capable of learning and what impact that has on student success in the classroom. After reading the article, Ms. Anderson reviewed and discussed the indicators for the observation of student affect core-construct with other teacher participants in the professional development session. In the discussion, participants reflected on ideas to implement in their classrooms. Ms. Anderson

suggested she would work to observe what students were doing with the feedback that she provided.

Ms. Anderson's post-interview response indicated that there were a few changes in her knowledge of the observation of student affect core-construct. For example, Ms. Anderson still indicated that she understood the importance of providing students with opportunities to interact with their peers and learn from them. This displayed a form of academic risk taking. Additionally, she described the idea of sharing their answers with their peers, which is another form of academic risk taking:

> With sharing learning I think of students working and sharing their answers together, so it helps students…. if they don't understand something they can get something from their peers and also students may have a way of helping other students that you can't, they understand…. sometimes they understand each other better than they understand you. So, sharing their work and sharing out their answers helps to close the gap in their instruction learning.

Her summarizing statement revealed that her perspective shifted and that she better understood how student affect impacts their learning, thus how significant it is for a teacher to observe both verbal and non-verbal cues.

Summary of Ms. Anderson's knowledge of short-cycle formative assessment. The analysis of Ms. Anderson's responses to the pre-interview questions when compared to the post-interview questions revealed that Ms. Anderson demonstrated changes in her knowledge for all of the core-constructs. She included language during the post-interview that contained vocabulary from the core-constructs, such as the use

of the term reflection when describing how she ensures her students are self-evaluating their progress towards mastery.

Another example of how Ms. Andersons's answers to the post-interview questions changed after participating in the professional development sessions was found in her discussion of the instructional adjustment core-construct. Ms. Anderson's statement specifically referred to the teacher's role in the feedback process:

> Throughout [the lesson] we stop and check for understanding and if it is [independent] work time then I monitor the room, walk around and get feedback. I expect students to see what changes need to be made and correct those problems for future instruction.

Although Ms. Anderson's description of how she used feedback information to make instructional adjustments still focused mostly on the student, the inclusion of checks for understanding provided the teacher with additional evidence to make instructional adjustments in future lessons. Classroom observations—which will be provided in the next section—showed that checking for understanding to make instructional adjustments was lacking in Ms. Anderson's implementation of formative assessment at the beginning of the study. Thus, her pre- and post- answers provided evidence of how her knowledge of short-cycle formative assessment strategies changed over the course of the study after receiving targeted instructional support in the form of professional development. Moreover, her understanding of each core-construct was enhanced by her participation in the professional development sessions that focused on each core-construct.

Ms. Anderson's Changes in Use of Short-Cycle Formative Assessment

In conjunction with the professional development sessions, the researcher used the Assess Today™ to observe the participants. After each classroom observation, Ms. Anderson participated in a post-observation feedback conference with the researcher. During the post-observation feedback conference, the researcher provided written feedback on the following: (a) observation ratings; (b) evidence of each indicator in the lesson; and, (c) instructional suggestions on how to move to the next observation rating if the indicators did not align with the level of master.

Ms. Anderson was observed five times, participated in five post-observation feedback conferences, and received written feedback during each conference. The findings for the changes in Ms. Anderson's use of short-cycle formative assessment strategies are reported by providing an analysis of the classroom observations and the post-observation feedback that was provided to Ms. Anderson after each observation.

Classroom Observation 1 and post-observation feedback. Classroom observations began in Week 1. Classroom Observation 1 for Ms. Anderson occurred on January 14, 2016. The observation lasted 40 minutes. There were 22 students in the classroom (12 girls and 10 boys). There were four African-American students and eighteen Hispanic students. The lesson objective was posted on the board, and it read: "Students will be able to solve multiplication and division one-step inequalities and graph solutions."

The teacher engaged with students in the lesson by providing opportunities for students to interact with their peers. The role of the teacher for more than half of the lesson was as a facilitator. The activities included an independent activity to review

previously taught concepts at the beginning of the lesson. The teacher then led the review as a whole group discussion with the teacher doing most of the talking. After she reviewed the independent activity on previously taught concepts with the entire class, she followed up by asking open-ended questions and modeling the correct strategy to solve the problems on the independent practice activity. Then she transitioned to the concept focus for the day, starting with stating the lesson objective, followed by the directions that students would be practicing the strategies that they learned previously to complete practice problems in collaborative groups. The dynamics of the classroom were such that the teacher allowed students to work in small collaborative groups to practice solving problems related to the lesson objective.

While she was teaching, the researcher observed the teacher circulating around the room monitoring student work and student conversations in the groups. The teacher was a facilitator of the learning, as students did most of the talking, and she did most of the questioning. Additionally, the researcher observed some students working independently rather than collaboratively in their groups.

During the first post-observation conference, the researcher discussed the lesson that was taught with Ms. Anderson. Though there was written feedback provided to Ms. Anderson for all of the core-constructs, the feedback from this specific lesson included focusing on the learning target and question quality. For the learning target, only two of the four indicators were observed. Together, the conversation focused on addressing the other two. By requiring students to write down the lesson objective in their own words, it allows them to set their own learning goals and take ownership of their progress toward meeting those goals. Then the discussion shifted to the indicators for

question quality. As Ms. Anderson reflected on her teaching, she recognized that she should explicitly ask questions that connect student's prior and present knowledge so students could think critically about the content. Table 6 is a classroom observation summary table, which is a detailed description of the observation ratings and the corresponding evidence gathered from each observation based on the core-constructs of short-cycle formative assessment.

Table 6

Classroom Observation 1 Summary Table: Ms. Anderson

Core-constructs of Formative Assessment	Observation Evidence based on Core-Constructs	Observation Ratings
Learning Target	*Two of the four indicators are observed during the class period.* • **Teacher states lesson objective**: After students completed the Do Now, the teacher shared with students what they were going to be learning that day. • **Teacher writes objectives for students to see**: The lesson objective was posted on the board. • **Students write down the lesson objective in their own words**: Not observed. • **Teacher revisits objectives**: Not observed.	Apprentice
Question Quality	*Teacher rarely uses questions effectively to scaffold instruction.* • **Open-ended questions**: Ms. Anderson asked a few open-ended questions. "How could I figure it out?" Most questions were "1" answer questions and procedural questions. • **Bloom's high and low mix**: Mostly low level questions (knowledge and comprehension). "What is our total? How many does she have remaining?" • "How can I figure out how much each side is if I know one side?" • **Connects to prior knowledge**: Not observed.	Apprentice

(table continues)

Table 6 *(continued).*

Nature of Questioning	*Teacher generally uses questioning effectively to diagnose problems with learning and improve instruction.* • **Follow-up questioning**: There was follow-up questioning done whole group after choral response. Ms. Anderson asked students clarifying and extension questions. Students were working in small groups. When she circulated around the room to check on the progress of each group, she would pose a question. If a student had an incorrect answer, she would help the student arrive at the right answer. However, it was noted that she did not follow back up with the group after clearing up the misconception. • **Wait time:** There was a lot of emphasis placed on choral responses. The teacher intentionally waited for all students to answer the question and followed up with asking the question again until she heard the correct answer in unison.	Apprentice
Self-Evaluation	*Generic self-evaluation strategy(s) or tool(s) is employed but the strategy is not explicitly tied to the regulation and improvement of student's self-learning.* • **Teacher initiated:** The teacher explicitly stated and modeled the use of the UPS Check problem solving strategy to help students begin the process of self-evaluating their progress toward mastery. • **Clearly defined strategy:** UPS Check • **Student use strategies**: It was unclear if the students were required to use the UPS Check every time they used this strategy to solve the problems.	Apprentice
Observation of Student Affect	*Teacher is sensitive to the affect of most students and shows general evidence of balancing teaching content with affect. Academic risk taking behavior is evidenced, but occurs in infrequent, episodic intervals.* • **Student behavior:** Students were standing with their groups and some students were slouched on the wall with their papers in hand. • **Teacher behavior:** The teacher makes an effort to be sensitive to more than half of students' feelings, body language, facial expressions, and/ or response to class work. • **Teacher focus:** Ms. Anderson posed questions and less than five students raise their hands to volunteer to answer the question. • **Student interactions:** It was unclear if all students were authentically engaged in the lesson based on observation of body language and facial expressions.	Practitioner

(table continues)

Table 6 *(continued).*

Instructional Adjustment	*Teacher uses minimal adjustments during instruction.* • **Instructional strategies:** There was one observed adjustment of instruction. • **Instructional timing:** The teacher used opportunities during small group interactions to address concerns immediately. • **Instructional audience:** Ms. Anderson circulated around the room and asked different groups clarifying questions. • **Grouping strategies:** Students worked in groups of two-four. There were no clearly defined group roles for students. Strategies for grouping students was not evident during the observation. Individual students worked on the problems in the groups rather than together.	Apprentice
Evidence of Learning	*There is evidence of learning for 50-74% of the students according to the suggested indicators.* • **All student responses:** White board response was used to gather evidence of learning. • **Individual responses**: Individual students volunteered to answer questions. • **Artifacts of learning:** Teacher collected group work to provide feedback to the students.	Practitioner

Classroom Observation 2 and post-observation feedback. Classroom Observation 2 for Ms. Anderson occurred on January 25, 2016. The observation lasted 40 minutes. There were twenty-two students in the classroom (12 girls and 10 boys). There were four African-American students and eighteen Hispanic students. The lesson objective was posted on the board, and it read, “Students will be able to solve one-step addition and subtraction inequalities using numbers.”

The teacher engaged with students in the lesson by providing opportunities for students to interact with their peers. The teacher led as facilitator for more than half of the lesson. Class began with an independent review of previously taught concepts, followed by a whole-class discussion of the problems. Following this, she asked the class open-ended questions and modeled the correct strategy to solve the problems. Then she transitioned to the concept focus for the day, starting with stating the lesson objective, followed by the directions that students would be practicing the strategies that

they learned previously to complete practice problems in a collaborative group. The dynamics of the classroom were such that the teacher allowed students to work in small collaborative groups to practice solving problems related to the lesson objective.

While she was teaching, the researcher observed that students were using the strategy incorrectly while working in their small collaborative groups. The teacher circulated around the room and made the same observation. She immediately called students back to whole group and remodeled the correct strategy to solve the problem through a re-teach. She asked clarifying questions after remodeling the strategy and required that all students respond to her questions using a multiple response strategy.

The researcher noted an improvement of Ms. Anderson's use of short-cycle formative assessment strategies for five of the core-constructs. However, her rating of self-evaluation remained at the rating of apprentice and observation of student affect dropped back to apprentice.

Table 7 provides a summary of her ratings and written feedback provided during her post-observation conference. Ms. Anderson described what improvements she made. Then the researcher and Ms. Anderson discussed further improvements for her instructional practices. One idea, as related to instructional adjustment, was to strategically structure student groups in sets of three or four, as well as establish roles for each group member so that all students are accountable in the group setting. Secondly, to enhance question quality, the researcher prompted the teacher to consider how allowing more wait time would allow students an opportunity to formulate a response and respond. On quite a few occasions, the researcher had observed her answering her own questions without providing students an opportunity to answer.

Table 7

Classroom Observation 2 Summary Table: Ms. Anderson

Core-constructs of Formative Assessment	Observation Evidence based on Core-Constructs	Observation Ratings
Learning Target	*Three of the four indicators are observed during the class period.* • **Teacher states lesson objective**: After students completed the Do Now, the teacher shared with students what they were going to be learning that day. • **Teacher writes objectives for students to see:** The lesson objective was posted on the board. • **Students write down the lesson objective in their own words**: Not observed. • **Teacher revisits objectives**: Ms. Anderson restated the lesson objective by stating it after each rotation.	Practitioner
Question Quality	*Teacher generally uses questions effectively to scaffold instruction.* • **Open-ended questions**: Examples of questions asked during the lesson are as follows: "How did you get an inequality?" and "Why is 16 not right here?" • **Bloom's high and low mix**: Mostly low level questions (knowledge and comprehension). "What operation do you see?" and "Is that an equal sign?" • **Connects to prior knowledge**: Ms. Anderson asked students, "what did we learn yesterday to help us understand today's lesson objective?"	Practitioner
Nature of Questioning	*Teacher generally uses questioning effectively to diagnose problems with learning and improve instruction.* • **Follow-up questioning**: As the teacher circulated around the room, she noticed that students were not using the correct strategy to solve the problems. She asked the questions, "Do you think that makes sense?" "How do you know?" The teacher then remodeled how to solve the problem using the correct strategy with the students. This was evidence of the teacher diagnosing problems to improve instruction. • **Wait time**: The teacher paused for a few seconds after students raised their hands to provide time for all students to formulate their response.	Practitioner

(table continues)

Table 7 *(continued).*

Self-Evaluation	*Generic self-evaluation strategy(s) or tool(s) is employed but the strategy is not explicitly tied to the regulation and improvement of student's self-learning*. • **Teacher initiated**: Ms. Anderson asked all students with black shoes on to stand. These students were required to answer the question. She then used a modified whip around response strategy to have students sit down when they heard a similar answer stated before they had their chance to respond. • **Student initiated**: A student who thought he heard his answer stated sat down. After another student shared their response he replied to the teacher, "so I had it right the first time?" This was an indication that he was self-evaluating his own thinking and understanding of his mastery of the content. • **Clearly defined strategy**: Not observed	Apprentice
Observation of Student Affect	*Teacher is sensitive to the affect of most students and shows general evidence of balancing teaching content with affect. Academic risk taking behavior is evidenced, but occurs in infrequent, episodic intervals.* • **Teacher behavior**: Ms. Anderson asked questions and engaged the class through whole group instruction and student volunteer responses. • **Student behavior**: There was little evidence of academic risk taking as some students did not volunteer during the lesson to answer teacher posed questions or to participate in the discussion and were not encouraged to do so by the teacher.	Apprentice
Instructional Adjustment	*Teacher predominantly and effectively uses adjustments during instruction.* • **Instructional strategies:** There was one observed adjustment of instruction. • **Instructional timing:** After observing student work in the groups, Ms. Anderson realized that some students were not using the correct strategy to answer the questions and she adjusted instruction by remodeling the correct strategy to use. • **Instructional audience:** Ms. Anderson circulated around the room and asked different groups clarifying questions. • **Grouping strategies:** Students were working in groups of four to five.	Practitioner
Evidence of Learning	*There is evidence of learning for 50-74% of the students according to the suggested indicators.* • **All student responses:** Teacher incorporated thumbs-up, thumbs-down and partner share as response strategies to gather evidence of learning. • **Individual responses**: She circulated around the room and provided individual feedback. • **Artifacts of learning:** Teacher collected group work to provide feedback to the students.	Practitioner

Classroom Observation 3 and post-observation feedback. Classroom Observation 3 for Ms. Anderson occurred on February 8, 2016. The observation lasted 40 minutes. There were twenty-one students in the classroom (10 girls and 11 boys). There were four African-American students and eighteen Hispanic students. The lesson objective was posted on the board, and it read: “Students will be able to determine if three lengths form a triangle when given a problem.” The teacher engaged with students in the lesson by using different questioning strategies during the direct instruction and guided practice portions of the lesson. The role of the teacher for most of the lesson was a lecturer with the lesson being an introductory concept for students. The activities included an independent activity to review previously taught concepts at the beginning of the lesson. The teacher then reviewed the independent activity whole group with the teacher doing most of the talking, ending this section by asking the class open-ended questions and modeling the correct strategy to solve the problems on the independent practice activity. Then she transitioned to the concept focus for the day, starting with stating the lesson objective. She asked students to recall what they had learned in the previous lesson and then she stated that students would be learning a new concept today. She modeled a content-specific strategy to use to solve the problems and allowed students to practice with a peer and also independently during guided practice. The dynamics of the classroom were such that the teacher allowed students to work both independently and collaboratively to practice the concept. Additionally, the teacher asked questions throughout the lesson as she taught the concept and required that all students respond using a multiple response strategy.

While she was teaching, the researcher observed that students followed the directions of the teacher and practiced solving the problems using the strategy that the teacher modeled. The concept did not seem difficult for the students to grasp as there were not many clarifying questions asked or errors made when students worked with their peer or independently. During this lesson, the researcher noted that there was implementation from some of the ideas in the previous post-observation conferences. For example, when a student was struggling with answering a question, Ms. Anderson provided ample wait time; furthermore, she asked another student to answer the question if the student was still unable to answer then followed up with first student to restate the correct response.

These improvements were reflected in her ratings that were discussed during her post-observation feedback conference. She rated at the practitioner level of implementation on three of the seven core-constructs, question quality, observation of student affect, and instructional adjustment. She rated at the master level on three core-constructs, learning target, nature of questioning, and evidence of learning. On self-evaluation, she remained in the rating category of apprentice. Table 8 is a classroom observation summary table, which is a detailed description of the observation ratings, and the corresponding evidence gathered from each observation based on the core-constructs of short-cycle formative assessment.

Table 8

Classroom Observation 3 Summary Table: Ms. Anderson

Core-constructs of Formative Assessment	Observation Evidence based on Core-Constructs	Observation Ratings
Learning Target	*All four indicators are observed during the class period.* • **Learning target posted**: The lesson objective was posted on the board. • **Teacher states objective:** Observed. **Students write objectives down**: Students wrote a summary of the lesson objective down in their journals. • **Teacher revisits objectives**: She revisited the lesson objective during the lesson.	Master
Question Quality	*Teacher generally uses questions effectively to scaffold instruction.* • **Open ended questions and Bloom's high and low mix**: Ms. Anderson asked a few open-ended questions. There were a few times during the lesson when Ms. Anderson asked leading questions that required a one-word or phrase answer. Examples of questions asked during the lesson are as follows: "How can I check my answer?" "If I divided to get my answer, how can I check my answer?" and "How many students…?" • **Connects to prior knowledge**: Not observed.	Practitioner
Nature of Questioning	*Teacher generally uses questioning effectively to diagnose problems with learning and improve instruction.* • **Follow-up questioning**: Ms. Anderson followed up with students who did have the answer to the question after asking another student the question and receiving a correct response. • **Wait time**: When a student was struggling with answering a question she provided thirty seconds of wait time and she asked another student the question if the student still was unable to answer. She circulated around the room, checked student work, and provided individual student feedback.	Master
Self-Evaluation	*Generic self-evaluation strategy(s) or tool(s) is employed but the strategy is not explicitly tied to the regulation and improvement of student's self-learning*. • **Teacher initiated and Clearly defined strategy:** Ms. Anderson models how to use "check" in UPS Check. When she circulated around the room during independent practice, she did not emphasize the use of the "check" step of the strategy. • **Student use strategies**: Not observed. Several students were still not checking their work using this strategy.	Apprentice

(table continues)

Table 8 *(continued).*

Observation of Student Affect	*Teacher is sensitive to the affect of most students and shows general evidence of balancing teaching content with affect. Academic risk taking behavior is evidenced, but occurs in infrequent, episodic intervals.* • **Teacher behavior**: Ms. Anderson provided students with an opportunity to share their learning using response strategies and adjusted the lesson based on student responses. • **Student behavior**: When students respond using the white board she immediately adjusted her instruction. • **Teacher focus**: The teacher called on volunteers and non-volunteers. The non-volunteers still refuse to participate in the lesson when called on.	Practitioner
Instructional Adjustment	*Teacher predominantly and effectively uses adjustments during instruction*. • **Instructional timing**: Ms. Anderson provided time limits for the activities that included sharing and discussing questions posed by the teacher with their peers. • **Instructional strategies**: Ms. Anderson provided students with an opportunity to share their learning using response strategies and adjusted the lesson based on student responses.	Practitioner
Evidence of Learning	*There is evidence of learning for 75 – 100% of the students according to the suggested indicators. The use of the following examples indicates high evidence of learning: traffic lights, white boards, thumbs, individual responses, and authentic artifacts of learning.* • **Individual responses**: Ms. Anderson incorporated white boards to elicit a response from all students. • **All student responses**: She followed the white board response strategy with a turn and talk (pair share activity). • **Artifacts of Learning**: All students completed a demonstration of learning activity at the conclusion of the lesson and the teacher gathered this particular evidence of learning.	Master

During the post-observation conference, the researcher asked Ms. Anderson to reflect on her improvements in all areas of the observation and reaching master level on almost half of the core-constructs. Ms. Anderson shared her connections among prior observation ratings, post-observation conferences, and professional development sessions. For example, she used to feel uncomfortable when there was silence after she asked a question; however, she since realized that students need silence to be able to think and formulate their response. Now she implemented a 30-second wait time strategy in her classroom after asking a challenging question. Additionally, she shared

with students why she was providing this wait time because she required that all students think and formulate their own responses before sharing out with the whole class.

Following this time of reflection, the researcher engaged in ideas about improving student's use of self-evaluation. One strategy that arose in the conversation was to utilize of the check portion in the UPS Check (Understand, Plan, Solve, and Check the answer) problem solving method for students to check the validity of the strategy they used. Additionally, to improve observation of student affect, the incorporation of non-verbal cues would encourage students to take risks and participate. In the pre-interview, Ms. Anderson had struggled with understanding what the researcher meant by the question, "How does the process of reflecting on your learning help to close learning gaps?" The researcher had noted that, so during the post-observation conference the researcher revised the question to include an example of what reflecting on one's own learning looks like in the classroom. Ms. Anderson responded: "Well I think that this is what we do prior to working [independently], so when students…. they answer the question on the white board and they hold it up and then I can see where they are." By drawing from a specific strategy that Ms. Anderson had used during her lesson, the researcher was able to facilitate her making the connection between what she was doing and how it was categorized on the Assess Today©. By having that conversation, Ms. Anderson built upon her current knowledge and fostered her awareness of adapting instruction in the moment, recognizing that it will have a positive impact on student learning.

Classroom Observation 4 and post-observation feedback. Classroom Observation 4 for Ms. Anderson occurred on February 22, 2016. The observation lasted 40 minutes. There were twenty-one students in the classroom (10 girls and 11 boys). There were four African-American students and seventeen Hispanic students. The lesson objective was posted on the board, and it read: “Students will be able to use a formula to find the area of a rectangle, parallelogram, and trapezoid.”

The teacher engaged with students in the lesson by using different questioning strategies during the direct instruction and guided practice portions of the lesson. The role of the teacher for most of the lesson was a lecturer with the lesson being an introductory concept for students. Class started with students independently reviewing the previous day’s concept, followed by a whole-class discussion led by the teacher. Open-ended questions and modeling the correct strategy to solve the problems were included during the review. Then she transitioned by stating the lesson objective for that day. She asked students to recall prior knowledge then moved to modeling a content-specific strategy to use to solve the problems for that day. She allowed students to collaborate during guided practice. Additionally, the teacher asked questions throughout the lesson as she taught the concept and required that all students respond using a multiple response strategy.

While Ms. Anderson was teaching, the researcher noticed that the atmosphere of the classroom had shifted. When a student did not know an answer, she would ask another student the question, but then return to that student by asking, “What did you hear him/her say?” By engaging in this practice, Ms. Anderson was working to improve not only how she questioned, but also how to encourage students to listen to each

other. Overall, Ms. Anderson scored at the practitioner level of implementation on three core-constructs and master level on the remaining four during Classroom Observation 4. By the fourth classroom observation, Ms. Anderson's students were taking academic risks. (See Table 9 for the summary and evidence gathered.)

Table 9

Classroom Observation 4 Summary Table: Ms. Anderson

Core-constructs of Formative Assessment	Observation Evidence based on Core-Constructs	Observation Ratings
Learning Target	*All four indicators are observed during the class period.* • **Learning target posted**: The lesson objective was posted on the board. • **Teacher states objective**: Observed • **Students write objectives down**: Ms. Anderson stated the lesson objective and had students write a summary of the lesson objective down in their journals. • **Teacher revisits objectives**: She revisited the lesson objective during the lesson.	Master
Question Quality	*Teacher generally uses questions effectively to scaffold instruction*. • **Open ended questions:** Ms. Anderson asked a few open-ended questions. • **Bloom's high and low mix**: She required that students answer chorally when there was a lack of participation. Examples of questions asked during the lesson are as follows: 1.) What is my height? 2.) What formula do we use to find the area of rectangle? Parallelogram? Trapezoid? 3.) How is the formula for finding the area of a trapezoid different from the area formula for a rectangle? How are they similar? • **Connects to prior knowledge** – Not observed	Practitioner
Nature of Questioning	*Teacher consistently and appropriately uses questioning effectively to diagnose problems with learning and improve instruction.* • **Follow-up questioning**: Ms. Anderson incorporated a response card strategy to elicit answers from all students to determine student understanding. She asked, 'what formula would I use to solve this problem?" "How do you know?" • **Wait-time**: Ms. Anderson always pauses after posing a question to allow all students the opportunity to think. When she calls on a student who does not have the answer she waits first then follow-up with the student after receiving a correct answer from another student in the class. She ask the follow up question: "what did you hear …say?"	Master

(table continues)

Table 9 *(continued).*

Self-Evaluation	*Evidence of one self-evaluation strategy(s) or tool(s) is used in an effort to regulate and improve the student's self-learning*. • **Teacher initiated and Clearly-defined strategy** - Ms. Anderson models how to use the UPS Problem Solving strategy to self-check. She asked, "what strategy do we use to solve word problems?" • **Students use strategies** - Half of the students in the class responded.	Practitioner
Observation of Student Affect	*Teacher is sensitive to the affect of most students and shows general evidence of balancing teaching content with affect. Academic risk taking behavior is evidenced, but occurs in infrequent, episodic intervals.* • **Teacher behavior**: Ms. Anderson provided students with an opportunity to share their learning using response strategies and adjusted the lesson based on student responses. • **Student behavior**: Students are still not volunteering to answer questions and when called on did not know the answer to the question. • **Teacher focus**: Ms. Anderson then required that all students respond chorally to her questions. All students did respond chorally this is evidence that academic risk-taking in a whole group setting occurs in infrequent, episodic intervals.	Practitioner
Instructional Adjustment	*Teacher predominantly and effectively uses adjustments during instruction.* • **Instructional timing**: Ms. Anderson checked for student misconceptions when she circulated around the room and asked individual students questions. • **Grouping strategies and Instructional strategies**: She incorporated think pair share and turn as a grouping strategy to have students communicate their understanding verbally.	Master
Evidence of Learning	*There is evidence of learning for 75 – 100% of the students according to the suggested indicators. The use of the following examples indicates high evidence of learning: traffic lights, white boards, thumbs, individual responses, and authentic artifacts of learning.* • **Individual responses** - The teacher incorporated response cards to check for individual understanding. • **All student responses** - She followed the response card strategy with a whole class choral response to a question to gather all student response data. • **Artifacts of Learning** – She gave students a demonstration of learning activity to collect data on mastery at the end of the lesson.	Master

During the post-observation conference, the researcher invited Ms. Anderson to share what improvements she had demonstrated. Then together, Ms. Anderson and the researcher discussed students not checking their work and thus not demonstrating the

ability to self-evaluate their progress towards mastery. Also discussed was encouraging all students to participate in multiple response strategies implemented in the classroom. The researcher had observed that some students were not participating. Furthermore, students appeared apprehensive to take academic risks, as indicated in her responses in the pre-interview and based on classroom observation data.

In the subsequent observation, Ms. Anderson started implementing non-verbal response strategies to help support students who are not as vocal as other students are during the class, such as looping back to a student who answered incorrectly after the correct answer is stated. When Ms. Anderson looped back to the struggling student, she provided the student with a prompt, such as, “What did you hear …say?” This prompt further supported and encouraged students who are not as vocal as other students to take academic risks.

Classroom Observation 5 and post-observation feedback. Classroom Observation 5 for Ms. Anderson occurred on February 29, 2016. The observation lasted 40 minutes. There were twenty-students in the classroom (10 girls and 10 boys). There were four African-American students and sixteen Hispanic students. The lesson objective was posted on the board and it read: “Students will be able to use a problem-solving model to find the area of a rectangle, parallelogram, and trapezoid.”

The role of the teacher for most of the lesson was a lecturer with the lesson being an introductory concept for students. The teacher engaged with students in the lesson by using different questioning strategies during the direct instruction and guided practice portions of the lesson. The activities included an independent activity to review previously taught concepts at the beginning of the lesson. The teacher then reviewed

the independent practice activity whole group with students. After she reviewed the independent activity whole group by asking the class open-ended questions and modeling the correct strategy to solve the problems on the independent practice activity, the teacher stated the lesson objective and had students write down the lesson objective in their journals in their own words. She then asked students to recall what they had learned in the previous lesson. She then stated that students would be learning a new concept today that required that they use UPS Check to help them build the skills they need to solve the challenging word problems they would see. She modeled using a think aloud how to solve example problems using UPS Check and showed students how to use their mathematics reference chart to find the correct formula to use. During guided practice, students solved example similar to one that the teacher modeled and were allowed to practice with a peer. The dynamics of the classroom were such that the teacher allowed students to work both independently and collaboratively to practice the concept. Additionally, the teacher asked questions throughout the lesson as she taught the concept and required that all students respond using a multiple response strategy.

During the lesson, the researcher observed that students were required to use two different strategies to self-evaluate their work. In previous observations, students only used the UPS Check “check” portion to regulate and improve their learning. During this observation students used multiple strategies in the check portion to self-evaluate their work. Ms. Anderson scored at the master level of implementation on each of the seven core-constructs during classroom observation #5. Table 10 is a classroom observation summary table, which is a detailed description of the observation ratings,

and the corresponding evidence gathered from each observation based on the core-constructs of short-cycle formative assessment.

Table 10

Classroom Observation #5 Summary Table: Ms. Anderson

Core-constructs of Formative Assessment	Observation Evidence based on Core-Constructs	Observation Ratings
Learning Target	• *All four indicators are observed during the class period.* • **Learning target posted:** The lesson objective was posted on the board. • **Teacher states objective** and **Students write objectives down**: Ms. Anderson stated the lesson objective and had students write a summary of the lesson objective down in their journals. • **Teacher revisits objectives**: She revisited the lesson objective during the lesson.	Master
Question Quality	*Teacher generally uses questions effectively to scaffold instruction.* • **Open-ended questions:** Ms. Anderson asked open-ended questions. • **Bloom's high and low mix**: She required that students answer chorally when there was a lack of participation. Examples of questions asked during the lesson are as follows: 1.) What problem solving model do we use to solve math problems? 2.) What strategy do we use to solve area problems? 3.) What is the formula for find the area of a rectangle? Trapezoid? Parallelogram? 4.) How do the formulas compare? 5.) What happens when we used the wrong formula to solve a problem? • **Connects to prior knowledge**: Ms. Anderson asked students to recall what they learned in the previous lessons about perimeter. Students were asked how perimeter and area differ.	Master
Nature of Questioning	*Teacher consistently and appropriately uses questioning effectively to diagnose problems with learning and improve instruction.* • **Follow-up questioning** - Ms. Anderson incorporated the white board response during her introduction of the lesson and throughout the lesson to elicit individual responses from all students. One student responded incorrectly when solving a problem and showing his final answer on the white board. • **Wait-time** – Ms. Anderson reviewed the student's work and provided individual feedback. This was done as the other students who answered correctly moved on to another problem.	Master

(table continues)

Table 10 *(continued).*

Self-Evaluation	*Teacher uses a variety (two or more) of strategies or tools to encourage students to self-evaluate in an effort to regulate and improve their own learning. These could include techniques such as the use of traffic lights, a self-assessment inventory, journaling and/or reflection statements.* • **Teacher initiated and Clearly defined strategy**: Ms. Anderson models how to use UPS Check strategy to self-check. • **Student use strategies (more than one)**: She required that all students check their work using a different strategy. Most students worked backwards to show that they had arrived at the correct answer.	Master
Observation of Student Affect	*Teacher is sensitive to the affect of most students and shows general evidence of balancing teaching content with affect. Academic risk taking behavior is evidenced, but occurs in infrequent, episodic intervals.* • **Teacher behavior** and **Teacher Focus**: Ms. Anderson incorporated choral response to ensure that all students were participating in the lesson. • **Student behavior**: All students by the end of the lesson volunteered to answer a question. This demonstrates that students were more willing to take academic risks by volunteering to answer questions posed throughout the lesson.	Master
Instructional Adjustment	*Teacher consistently and effectively uses adjustments during instruction.* • **Instructional strategies**: Ms. Anderson checked for student understanding throughout the lesson by using multiple strategies. She used the white board response and choral response to determine if adjustments needed to be made to the lesson. • **Instructional timing**: There was a time when not all students responded to a question posed by the teacher. It was during this time that the teacher asked a follow up question to random students in the class using cold calling to determine student understanding. During this particular instance, the students that were called on randomly answered the question correctly. • **Grouping strategy**: Ms. Anderson also incorporated a pair-share when she did not get 100% of the students to respond chorally to her questions.	Master
Evidence of Learning:	*There is evidence of learning for 75 – 100% of the students according to the suggested indicators. The use of the following examples indicates high evidence of learning: traffic lights, white boards, thumbs, individual responses, and authentic artifacts of learning.* • **Individual responses**: The teacher incorporated white board response to check for individual understanding. • **All student responses**: She followed the white board response strategy with a whole class choral response to a question to gather all student response data. • **Artifacts of Learning:** She gave students a demonstration of learning activity to collect data on mastery at the end of the lesson.	Master

During the post-observation conference, the researcher asked Ms. Anderson to reflect on her improvements. The researcher focused on the two core-constructs where she had previously scored at the practitioner level. For the self-evaluation core-construct, all students used the self-evaluation strategies modeled by the teacher on their written work. For the observation of student affect core-construct, the teacher used a response strategy to ensure that she engaged all students in the lesson activity. The desks were numbered, and she randomly called on students using those numbers. This promoted student academic risk taking because all students knew that they would eventually have to answer a question. Students showed excitement about being called on with the random number generator application the teacher used.

Summary of Ms. Anderson's use of short-cycle formative assessment. Ms. Anderson used the feedback provided during the post-observation conferences and as a result, demonstrated in the classroom observations that she could receive master level ratings in implementation of the seven core-constructs of short-cycle formative assessment using the Assess Today™ observation protocol. Table 11 is the summary of the teacher observation ratings that demonstrates the changes in use of the core-constructs of short-cycle formative assessment.

Table 11

Summary of Teacher Observation Ratings for Ms. Anderson

	Observation 1	Observation 2	Observation 3	Observation 4	Observation 5
Learning Target	Apprentice	Practitioner	Master	Master	Master
Question Quality	Apprentice	Practitioner	Practitioner	Practitioner	Master
Nature of Questioning	Apprentice	Practitioner	Master	Master	Master
Self-evaluation	Apprentice	Apprentice	Apprentice	Practitioner	Master
Observation of Student Affect	Practitioner	Apprentice	Practitioner	Practitioner	Master
Instructional Adjustment	Apprentice	Practitioner	Practitioner	Master	Master
Evidence of Learning	Practitioner	Practitioner	Master	Master	Master

Ms. Anderson's Knowledge and Use of Short-Cycle Formative Assessment

In the findings above, the data showed that Ms. Anderson shifted in her knowledge and implementation of short-cycle formative assessment. She was led through targeted instructional support that directed her toward a deeper understanding and more instructional strategies. The AssessToday™ observation protocol was used to both act as a framework for the professional development sessions and as an observation tool with post-observation conferences to focus on particular aspects of short-cycle formative assessment. Below is a summary of the changes of Ms. Anderson with respect to each core-construct. As stated in the introduction of the AssessToday™ observation protocol, these constructs are not mutually exclusive; rather, they are taken together to paint a richer description of the many facets of short-cycle formative assessment.

Summary of Ms. Anderson's knowledge and use of the learning target core-construct. In the pre-interview Ms. Anderson displayed some knowledge about learning

targets. She discussed two of the aspects of the learning target core-construct: posting the lesson objective and communicating the lesson objective throughout the lesson to students. Then during the five observations that spanned a period of six weeks Ms. Anderson implemented the two aspects of the learning target core-construct as well as also incorporate the other two indicators for the learning target core-construct: revisiting the lesson objective and having students write the lesson objective down in their own words as a result of the professional development about learning targets.

During the professional development session that focused on the learning target core-construct, Ms. Anderson reviewed and discussed the learning target core-construct, and she was able to plan how she would use the indicators and examples gathered during the professional development session to move herself to the next level. Finally, the post-interview supported growth in Ms. Anderson's knowledge about learning targets in that it highlighted the importance of the teacher restating the lesson objective and revisiting the lesson objective throughout the lesson. Therefore, as a result of the targeted instructional support, Ms. Anderson moved from the rating of apprentice to master, suggesting strong improvement in knowledge and use of learning targets which are associated with research-based formative assessment practices.

Summary of Ms. Anderson's knowledge and use of the question quality core-construct. Ms. Anderson began this study with some knowledge about the question quality core-construct. During the pre-interview, she discussed the strategy she used to provide students with feedback when they ask questions. During the five observations that spanned a period of six weeks, Ms. Anderson more readily implemented the core-construct, question quality, by asking open-ended questions as well as asking questions

that connect student's prior knowledge, which was a result of the professional development session on question quality. During that session, Ms. Anderson reviewed research-based ways to use questioning to encourage students to think, and she planned how to use the indicators and examples gathered during the professional development session to move herself to the next level.

In the post-interview, Ms. Anderson demonstrated growth in her knowledge of the question quality core-construct when she highlighted the belief about providing students with timely feedback through questioning. Thus, as a result of the targeted instructional support, Ms. Anderson moved from the rating of apprentice to master, suggesting strong improvement in knowledge and use of the core-construct, question quality, which are associated with research-based formative assessment practices.

Summary of Ms. Anderson's knowledge and use of the nature of questioning core-construct. At the beginning of the study, Ms. Anderson's knowledge regarding the nature of questioning core-construct lacked much depth. During the pre-interview, she discussed the responses that she received from students, not on how she would adapt instruction based on student responses. Then during her five observations, Ms. Anderson focused more on the responses that she received from students and employed follow-up questioning and wait time to students, as a result of the professional development about nature of questioning. During the professional development that focused on the nature of questioning core-construct, Ms. Anderson reviewed research-based ways to use questioning to improve instruction, and she was able to reflect on how she would use the indicators and examples gathered during the professional development session to move herself to the next level.

At the conclusion of the study, her post-interview answer to nature of questioning core-construct highlighted how she used questioning to check for understanding and make adjustments based on student responses. Therefore, as a result of the targeted instructional support, Ms. Anderson moved from apprentice level to master level suggesting strong improvement in knowledge and use of the core-construct, nature of questioning, which are associated with research-based formative assessment practices.

Summary of Ms. Anderson's knowledge and use of the instructional adjustment core-construct. During the pre-interview, as Ms. Anderson discussed the forms of feedback she provided to students to determine if instructional adjustments would need to be made, she showed minimal knowledge about the instructional adjustment core-construct. Then during her observations, Ms. Anderson circulated around the room during the lesson and clarify misunderstandings for students, and she also gathered evidence as she circulated around the room to determine what immediate adjustments would need to be made to the instruction, all as a result of the targeted instructional support, both in the professional development session and the post-observation conference, about instructional adjustments.

During the professional development that focused on the instructional adjustment core-construct, Ms. Anderson reviewed different ways that teachers collect data to affirm student understanding, and was able to plan how she would use the indicators and examples gathered during the professional development session to move herself to the next level. Finally, the post-interview supported significant growth in Ms. Anderson's knowledge about the instructional adjustment core-construct in that it highlighted a distinct way that Ms. Anderson planned to gather student data to make instructional

adjustments. Therefore, as a result of the targeted instructional support, Ms. Anderson moved from apprentice level to master level suggesting strong improvement in knowledge and use of the core-construct, instructional adjustment, which are associated with research-based formative assessment practices.

Summary of Ms. Anderson's knowledge and use of the self-evaluation core-construct. During the pre-interview, Ms. Anderson showed minimal knowledge about the self-evaluation core-construct. She discussed her expectation for students to correct their mistakes on graded assignments. Then during the five observations that spanned a period of six weeks, Ms. Anderson began implementing the UPS Check problem solving model as a generic self-evaluation tool, and across time she required students use UPS Check as a strategy to help regulate and improve student's self-learning which was a result of the professional development about self-evaluation.

During the professional development that focused on the self-evaluation core-construct, Ms. Anderson discussed how she could use the "check" portion of UPS Check to enable students to reflect on their thinking in addition to checking over their work, and she planned how to more effectively implement strategies to encourage student self-evaluation. Finally, the post-interview supported growth in Ms. Anderson's knowledge about the self-evaluation core-construct in that it highlighted Ms. Anderson's recognition that students need to be held accountable for using strategies to improve their learning. Consequently, as a result of the targeted instructional support, Ms. Anderson moved from apprentice to master rating on her observations, suggesting strong improvement in knowledge and use of the core-construct, self-evaluation, a part of research-based formative assessment practices.

Summary of Ms. Anderson's knowledge and use of the student affect core-construct. Ms. Anderson's knowledge about student affect core-construct appeared superficial at the beginning of the study. During the pre-interview, she lacked knowledge of how student affect can influence student performance. Then during the five observations that spanned a period of six weeks, some students in Ms. Anderson's class were observed taking academic risks, which is evidence of indicators from the observation of student affect core-construct, despite Ms. Anderson not being able to articulate her understanding of this construct during the pre-interview. During the professional development that focused on the observation of student affect core-construct, Ms. Anderson demonstrated an understanding of how it is important to observe what students were doing with the feedback she provided and was able to plan how she would use the indicators and examples gathered during the professional development session to move herself to the next level.

Finally, the post-interview supported growth in Ms. Anderson's knowledge about the observation of student affect core-construct in that it highlighted Ms. Anderson's understanding of the importance of teachers observing both verbal and non-verbal cues to impact student learning. As a result of the targeted instructional support, Ms. Anderson moved from a rating of practitioner to master, suggesting strong improvement in knowledge and use of the core-construct, observation of student affect, which are associated with research-based formative assessment practices.

Summary of Ms. Anderson's knowledge and use of the evidence of learning core-construct. Ms. Anderson showed minimal knowledge about the core-construct of evidence of learning during the pre-interview. She discussed how she gathered artifacts

of learning such as quiz and test data as evidence of learning. More about the notion of using evidence of learning became a focus in the professional development sessions.

Then during the five observations that spanned a period of six weeks, Ms. Anderson demonstrated changes in her practice, including gathering artifacts of learning such as exit slips at the end of the lesson; Ms. Anderson also used white board response and individual responses as evidence of learning throughout the lesson. During the professional development that focused on the evidence of learning core-construct, Ms. Anderson reviewed and discussed the evidence of learning core-construct, and she was able to plan how she would use the indicators and examples gathered during the professional development session to move herself to the next level.

Lastly, the post-interview supported growth in Ms. Anderson's knowledge about the core-construct, evidence of learning, in that it highlighted the importance of implementing multiple ways to assess student understanding. Hence, as a result of the targeted instructional support, Ms. Anderson moved from practitioner level to master level suggesting strong improvement in knowledge and use of the evidence of learning core-construct which are associated with research-based formative assessment practices.

Ms. Thomas' Changes in Knowledge of Short-Cycle Formative Assessment

The findings for the changes in Ms. Thomas' knowledge of short-cycle formative assessment strategies are reported by weekly interactions. Ms. Thomas participated in the pre- and post-interviews, four post-observation conferences, and four professional development sessions. Ms. Thomas' prior knowledge of short-cycle formative assessment was analyzed from her answers to the pre-interview questions. Using this

information, she was provided with targeted instructional support in the form of professional development sessions focused on learning the short-cycle formative assessment core-constructs. Additionally, she received feedback during her post-observation conferences that provided more information regarding short-cycle formative assessment strategies. After participating in the targeted instructional support, the changes in Ms. Thomas' knowledge of short-cycle formative assessment were examined from her answers to the post-interview questions.

Pre-Interview. Ms. Thomas was a third-year teacher in sixth-grade mathematics, but she had extensive mathematics content and pedagogical knowledge because her bachelor's degree was in mathematics education. Ms. Thomas was on a team of teachers who had less teaching experience in sixth-grade mathematics. As a result, Ms. Thomas was oftentimes the leader during the grade level planning meetings. The other two mathematics teachers would meet in Ms. Thomas' room every day during planning, whether there was a planned meeting or not. This leadership role on her grade level team was a result of Ms. Thomas' experience teaching sixth-grade mathematics as well as her willingness to share her knowledge with other teachers. At the beginning of the study, Ms. Thomas demonstrated general knowledge of short-cycle formative assessment. She had not used the term, "short-cycle formative assessment," but her descriptions of how she gathered student data during the class period and used that data to make instructional adjustments throughout the lesson were indicative of her knowledge of short-cycle formative assessment as described in the AssessToday™ observation protocol. The following are examples of how Ms. Thomas started the study with knowledge of short-cycle formative assessment.

Ms. Thomas demonstrated an understanding of the role of student's metacognition in the short-cycle formative assessment process in her statement in the pre-interview, "It's important for them to reflect on their work, so that they can understand what they don't understand."

The researcher asked Ms. Thomas to describe how teachers communicate the intended learning of a lesson to their students. She stated: "Normally before I start teaching I go through what we are learning today, I have students read our learning objectives, what they are learning today, [and] while we are going over it, I try to make connections." Ms. Thomas' answer to this question demonstrated that she had some basic knowledge of the importance of students being able to recognize what is the intended learning target so that they could potentially understand what they need to do to progress towards mastery level.

In addition, during the pre-interview, Ms. Thomas provided a more detailed description of feedback, stating the following:

> If I know that my students didn't do well on something that I taught the day before, the next day I will let them know 'Hey we didn't do so well on so and so, so we are [going to go] back [over] it again,' or 'Hey we did [an] awesome job yesterday'…we have about 70% of you [who] did well and [the] other 30% of you need to move up. Normally I send letters home [to parents] of students that I notice are struggling.

From this answer, the researcher determined through her example that Ms. Thomas recognized that feedback is an integral part of effective instruction.

After analyzing the pre-interview data, the researcher noted that the present knowledge of the role of feedback in the short-cycle formative assessment process was proficient for Ms. Thomas. As a result, the researcher provided Ms. Thomas with the same professional development activities as Ms. Anderson, but Ms. Thomas was utilized as a leader during the collaborative activities in the sessions. The section that follows is a description of the professional development sessions in which Ms. Thomas participated as related to the seven core-constructs of Assess Today© observation protocol

Ms. Thomas' knowledge of the evidence of learning core-construct. Ms. Thomas' beginning knowledge of the evidence of learning core-construct demonstrated her understanding that students learn in different ways. During the pre-interview, when Ms. Thomas discussed a question aligned to the evidence of learning core-construct she explained:

> When I think about formative assessment, I think of students demonstrating what they have learned. Not only using a form of a test, maybe using some kind of hands-on activity and using their assignment what they did for today to give you basics of what they know or maybe what you need to do to get over, what misconceptions that they have with the learning objective.

With this in mind, during the professional development session that focused on the evidence of learning core-construct, Ms. Thomas was asked to self-assess her knowledge of the evidence of learning core-construct. Ms. Thomas read Stiggins (2005b), "From Formative Assessment to Assessment for learning: A Path to Success in Standard's Based Schools" (beginning at the Assessment for learning section, pages

327-328) and identified the student's role in gathering evidence of learning during the lesson. Ms. Thomas and the other participants in the professional development session reviewed and discussed the indicators for the evidence of learning core-construct. This included Ms. Thomas leading a collaborative group to develop a concrete example of an effective implementation of the evidence of learning in the classroom. During the group conversation, Ms. Thomas discussed how she uses multiple response strategies such as white board and thumbs up, but that she would incorporate other response strategies such as traffic lights to provide students with additional multiple response options.

Ms. Thomas' post-interview response, which aligned to the evidence of learning core-construct, included terminology that indicated that Ms. Thomas' knowledge of gathering evidence of learning had improved. During the post-interview, Ms. Thomas explained the concept of formative assessment, "Formative assessment is you observing, students learning, providing feedback long term or short term."

Ms. Thomas' knowledge of the learning target core-construct. Ms. Thomas' beginning knowledge of the learning target core-construct demonstrated an understanding of two of the indicators for the learning target core-construct: stating the lesson objective and revisiting it throughout the lesson. In this regard, Ms. Thomas answered the pre-interview question aligned to the learning target core-construct as follows: "Normally before I start teaching I go through what we are learning today. I have the students to read our learning objectives, what they are learning today while we are going over it I try to make connections."

During the professional development session that focused on the learning target core-construct dimension of short-cycle formative assessment, Ms. Thomas articulated

her knowledge of the learning target core-construct. (This was during the same professional development session as the evidence of learning.) When Ms. Thomas read Stiggins (2005b), “From Formative Assessment to Assessment for learning: A Path to Success in Standard’s Based Schools” (beginning at the Assessment for learning section, pages 327-328), she was also asked to identify the student’s role in “understanding the learning target” during the lesson. Ms. Thomas reviewed and discussed the indicators for the learning target core-construct with other participants in the professional development session. Her self-assessment indicated that she provided students with an opportunity to write the lesson objective down. She planned to include this dimension in her future lessons to move herself to the next level on the learning target core-construct.

Ms. Thomas’ post-interview question related to the learning target core-construct indicated that she understood the importance of students being involved in the formative assessment process from the very beginning and throughout the lesson. Ms. Thomas realized that this could be accomplished through effective implementation of the learning target core-construct. Ms. Thomas discussed the following during the post-interview, which indicates her growth in knowledge of the learning target indicator:

> Having students write their learning objectives for the day. I am going to start with my unit so that they can make a connection with the units and the learning objectives and how together, having the students say learning objectives, having the students do that throughout the lesson and to make sure they understand what they are to learn.

Ms. Thomas' knowledge of the question quality core-construct. Ms. Thomas' beginning knowledge of the question quality core-construct was based on how students' prior knowledge could impact their understandings. In this regard, during the pre-interview, Ms. Thomas demonstrated that she had some knowledge of the indicator of prior knowledge related to question quality:

> I normally go…. if I know that my students didn't do well on something that I taught the day before, the next day I will let them know 'hey we didn't do so well on so and so, so we are back on it and we are going to do it again.'

During the professional development session that focused on the question quality core-construct of short-cycle formative assessment, Ms. Anderson reflected on her prior knowledge of the question quality core-construct related to questioning strategies that encourage students to think before responding. Participants were then provided Brookhart's (2009), "Asking Questions that Encourage Students to Think." Using the information from the article, Ms. Anderson and the other participants reviewed and discussed the indicators for the question quality core-construct. During this discussion, Ms. Thomas shared that she wanted to be more intentional with her questioning to assess student prior knowledge.

Ms. Thomas' knowledge of the question quality core-construct by the end of the study did not show significant change when she was asked the same question in the post-interview. The emphasis that she placed on providing students with immediate feedback so that they are able to make corrections and changes as they moved towards mastery of the lesson objective remained the same. Ms. Thomas explained during the post-interview, "Students received feedback immediately". During the lesson students

receive feedback, when they get their assignments back, they receive feedback from test or DOLs if the student asks you questions before, during or after the quiz they get feedback also."

Ms. Thomas' knowledge of the nature of questioning core-construct. In Ms. Thomas' pre-interview, she shared:

> I get feedback when I am walking around the room while they are working, wonderful feedback. If I state, 'hey you are doing an awesome job, good strategy, that's great' this is the time for them to explain to me why it's great.

From this response, the researcher noted that she had some knowledge of the nature of questioning core-construct which included asking students follow-up questions to improve instruction. When Ms. Thomas stated, "Explain to me why it's great," she received immediate data to diagnose problems with learning to help improve instruction.

During the professional development session that focused on question quality, the other construct that was addressed was the nature of questioning core-construct of short-cycle formative assessment. Revisiting Brookhart (2009) and their discussion related to question quality, the participants built on this knowledge and examined the indicators for the nature of questioning. Ms. Thomas contributed to the discussion by sharing her idea for wait time. She shared with the other participants that she used multiple response strategies, such as think-pair-share, to ensure that all students are provided with the opportunity to formulate their thoughts when asked a challenging question.

Ms. Thomas' knowledge of the nature of questioning core-construct by the end of the study showed change in her inclusion of the wait time dimension of this particular

core-construct when she was asked the same question in the post-interview. Her understanding of the importance of wait time was revealed in her response, “I use multiple response strategies to gather feedback from my students. I use all types of multiple response strategies.” From this response, the researcher noted that she added knowledge of the nature of questioning core-construct which included providing students with wait time after asking a question. One type of multiple response strategy that Ms. Thomas used in her classroom was the think-pair-share response strategy, which is a strategy that provides students wait time before formulating their response to the question.

Ms. Thomas’ knowledge of the instructional adjustment core-construct. Ms. Thomas’ beginning knowledge of the instructional adjustment core-construct was limited. She was not able to explain in detail how she adjusts instruction based on student data. During the pre-interview she explained how she provided feedback to students during the lesson and what she would like for students to do with the feedback, “Verbal feedback in a form of their grade from their assignment is feedback of what they did understand, letter about their…. you know feedback so that they can improve.”

Based on Ms. Thomas’ limited knowledge of the instructional adjustment core-construct, the researcher did not provide targeted instructional support that was different from that of Ms. Anderson during the professional development session. At the onset of the professional development session, Ms. Thomas reflected on her prior knowledge of the instructional adjustment core-construct using a self-assessment tool. From the self-assessment, Ms. Thomas was able to develop knowledge about the terminology and applications of the instructional adjustment core-construct. For example, she was

presented with different classroom scenarios to discuss how the teacher in each scenario collected data to affirm student understanding of the content and how the teacher adjusted the instruction because of the data that was collected. The following is one of the classroom scenarios that was presented to Ms. Thomas to determine how she would collect student data and determine what adjustments to the lesson would need to be made: “Students are working on an independent practice activity for 20 minutes. The teacher circulates around the room and monitors student work. About 80% of the students are demonstrating at least 70% mastery of the content on the activity.” Her response to this scenario was that she would notate as she circulated around the room which students did not demonstrate mastery of the content. The students who did not demonstrate mastery of the content would participate in a small group intervention. When planning the reteach activity, she would use a different strategy than what was used during the first instruction to teach students the concept.

In addition to collaborating on different classroom scenarios that would yield different types of instructional adjustments, Ms. Thomas reviewed and discussed the indicators for the instructional adjustment core-construct with other participants in the professional development session. Ms. Thomas emphasized the importance of collecting data to be able to adjust instruction, such as implementing checks for understandings and multiple response strategies. Based on Ms. Thomas’ self-assessment, she planned to obtain data throughout the lesson to affirm student understanding to determine if an adjustment such as implementing a small group re-teach during independent practice would need to occur.

Ms. Thomas' knowledge of the instructional adjustment core-construct changed to include more emphasis on the various types of data that can be obtained from students to determine if adjustments to the instruction need to be made. For example, she discussed using an instructional strategy that teaches students how to pinpoint their misunderstandings:

> I give them verbal feedback especially after noticing them not using the strategies on their work. I give them feedback like if I notice my students making mistakes while we are practicing or whatever or facial expressions, if I notice like 'Oh you….do you really….. what part of this do you not understand and they will be able to tell me what they don't understand. You have to teach them that too because they don't understand they would just say "I don't get it' well what you don't get about what part?"

Ms. Thomas' knowledge of the self-evaluation core-construct. Responses from the pre-interview showed that Ms. Thomas' beginning knowledge of the self-evaluation core-construct was minimal. She shared her expectation for students to check over their work. However, she did not provide a specific strategy to use for self-evaluation. This approach was highlighted by her response as follows, "I expect that if students are doing poorly in something I ask them to come tutoring, I tell them to take home the assignment, use their notes and resources to fix whatever they might have gotten wrong."

During the professional development session that focused on the self-evaluation core-construct, Ms. Thomas self-assessed her prior knowledge of the self-evaluation core-construct. Then Ms. Thomas read Chappius (2005), "Helping Students Understand

Assessment" and was asked to reflect on how the tools she presently used in her classroom helped students self-assess their own progress towards mastery of the self-evaluation core-construct. Ms. Thomas reviewed and discussed the indicators for the self-evaluation core-construct with other participants in the professional development session. She agreed with Ms. Anderson's response of using the "check" portion of UPS Check to help students reflect on their thinking as a self-evaluation strategy, and she articulated that she would also implement the same strategy.

In her post-interview, Ms. Thomas provided minimal evidence of how her knowledge changed with respect to self-evaluation. The response was very brief and once again provided evidence that Ms. Thomas encouraged her students to self-assess; however, the response lacked the "how." Ms. Thomas stated that she wants students to, "Make corrections, clear misconceptions."

Ms. Thomas' knowledge of the observation of student affect core-construct. Ms. Thomas' beginning knowledge of the student affect core-construct was limited and did not exhibit a depth for understanding student affect and how it could influence student performance. In her pre-interview, Ms. Thomas focused on teacher behaviors without much regard for student behaviors:

> When I am tracking the learning I can go back and say well this is percentage of the students that understand; this is something I need to re-teach, this is something I need to give as homework…. A lot of the time students will get…. they won't get it from you, but if their peer is explaining they seem to get it and so something about that…. something about working together helps them to understand a lot the things that they are learning.

In her statement, her perspective of student affect showed that Ms. Thomas valued student interactions and the knowledge that students were able to provide to one another when provided with the opportunity to interact during class.

During the professional development session, participants were provided an excerpt from Chappius (2005), “Helping Students Understand Assessment” (p. 39), and they were asked to reflect on personal experiences with helping students understand assessment. After reading the article, Ms. Thomas reviewed and discussed the indicators for the observation of student affect core-construct with other participants in the professional development session. In the discussion, participants reflected on ideas to implement in their classrooms. Ms. Thomas decided that she would observe student facial expressions during her whole class response activities to see if she could gather evidence of student mastery in addition to verbal and written responses.

Ms. Thomas’ post-interview response to the same question asked during the pre-interview that aligned to the observation of student affect core-construct indicated that there were a few changes in her knowledge. She still included responses that demonstrated her understanding of the student affect core-construct through two indicators. The first focused on student behavior:

> When tracking your learning, the students are able to see what they are not understanding and say I have an issue by either current tutoring, asking me during class how to do this or taking the opportunity to study on their own. It’s important for them to understand that they need to work on.

The second focused on student interactions:

> It's really close…. Some kinds of student don't get it the first time from the teachers or educators and with their peers I don't know what it is, but if they just tell them just do this… it helps, it clicks so that's the big thing.

Her summarizing statement revealed that her perspective was similar to what was provided in the targeted instructional support and that she understood the importance of allowing students the opportunity to interact with their peers.

Summary of Ms. Thomas' knowledge of short-cycle formative assessment. After participating in the professional development sessions that included targeted instructional support regarding each of the core-constructs of short-cycle formative assessment, the analysis of Ms. Thomas' answers to the post-interview questions revealed similar responses to her pre-interview responses. This indicated that there were a few changes to Ms. Thomas knowledge after participating in the professional development sessions. The differences noted were that Ms. Thomas used more of the language from the AssessToday™ observation protocol when she answered the questions compared to how she answered the pre-interview questions. For example, Ms. Thomas' response to the questions regarding feedback during the post-interview captured how her knowledge of instructional adjustments surpassed collecting only written and verbal feedback data from students to also include observations of non-verbal cues.

Ms. Thomas' Changes in Use of Short-Cycle Formative Assessment

The findings for the changes in Ms. Thomas' use of short-cycle formative assessment strategies are reported by providing an analysis of the classroom observations and the post-observation feedback that was provided to Ms. Thomas after

each observation. During the post-observation feedback conference, the researcher provided written feedback on the following: (a) observation ratings; (b) evidence of each indicator in the lesson; and, (c) instructional suggestions on how to move to the next observation rating if the indicators did not align with the level of master. She was observed four times, participated in four post-observation feedback conferences, and received written feedback during each conference, while also participating in five professional development sessions. The findings for the changes in Ms. Thomas' use of short-cycle formative assessment strategies are reported by providing an analysis of the classroom observations and the post-observation feedback that was provided to Ms. Thomas after each observation.

Classroom Observation 1 and post-observation feedback. Classroom Observation 1 for Ms. Thomas occurred on January 14, 2016. The observation lasted 40 minutes. There were twenty-five students in the classroom (17 girls and 8 boys). All students were Hispanic. The lesson objective was posted on the board: "Students will be able to solve multiplication and division one-step inequalities and graph solutions."

The teacher engaged with students in the lesson by using different questioning strategies during the direct instruction and guided practice portions of the lesson, with Ms. Thomas shifting between lecturer and facilitator. The activities included an independent activity to review previously taught concepts at the beginning of the lesson. She provided the students with several minutes to complete one word problem in their math journals. The researcher observed students drawing a four-part graphic organizer and using the UPS Check problem solving model strategies to solve the problem. The teacher then reviewed the independent activity whole group. As she reviewed it she

asked questions that were aligned to the skills taught in UPS Check. For example, the first question she asked students was, “What is the important information in this problem?”

She required that students respond chorally to answer the questions during this part of the lesson, asking the class open-ended questions as well as modeling the correct strategy to solve the problems on the independent practice activity. Following this, she stated the lesson objective for the day. She then asked students to recall what they had learned in the previous lesson. She modeled a content-specific strategy to solve the problems and allowed students to practice with a peer as well as independently during guided practice. The dynamics of the classroom were such that the teacher allowed students to work both independently and collaboratively to practice the concept. Additionally, the teacher asked questions throughout the lesson as she taught the concept and required that all students respond using a multiple response strategy.

While Ms. Thomas was teaching, the researcher noticed that the atmosphere of the classroom included a lot of choral responses and peer-to-peer interactions when the teacher asked a question. For example, she would pose a question and then say, “Turn-and-talk with your peer.” As students discussed the answer to the question with their peers, she circulated around the room and listen to the conversations. Table 12 is a classroom observation summary table, which is a detailed description of the observation ratings, and the corresponding evidence gathered from each observation based on the core-construct of short-cycle formative assessment.

Table 12

Classroom Observation 1 Summary Table: Ms. Thomas

Core-constructs of Formative Assessment	Observations based on Core-Constructs	Observation Ratings
Learning Target	*Three of the four indicators are observed during the class period*. • **Learning target posted**: The lesson objective was posted on the board. • **Teacher states objective**: Ms. Thomas stated the lesson objective. • **Teacher revisits objectives**: She revisited the lesson objective during the lesson. • **Students write objectives down**: Not observed.	Practitioner
Nature of Questioning	*Teacher consistently and appropriately uses questioning effectively to diagnose problems with learning and improve instruction*. • **Follow-up questioning**: Ms. Thomas incorporated the choral response, cold calling, and looped back to students who answered incorrectly throughout the lesson. • **Wait-time**: Students answer the questions when provided with wait time. Most students answered chorally which provided the opportunity for all students to be included in the questioning.	Practitioner
Self-Evaluation	*Teacher uses a variety (two or more) of strategies or tools to encourage students to self-evaluate in an effort to regulate and improve their own learning. These could include techniques such as the use of traffic lights, a self-assessment inventory, journaling and/or reflection statements.* • **Teacher initiated:** Ms. Thomas modeled for students how to use the UPS check problem solving model. • **Clearly defined strategy:** She asked students "is that correct?" and "Don't forget to check your solution with your thinking circles." These questions prompted students to use the problem solving model correctly. • **Student use strategies (one)**: Students check their work using the UPS check problem solving model and reflect on their answers in the check portion of the strategy.	Practitioner
Observation of Student Affect	*Teacher is sensitive to student affect of most students and shows general evidence of balancing teaching content with affect. Academic risk taking behavior is evidenced, but occurs in infrequent, episodic intervals*. • **Teacher behavior** and **Teacher Focus**: Ms. Thomas calls on students randomly. • **Student behavior**: She asks students to agree or disagree with their peers using thumbs up, thumbs down, which allows students to be able to explain their answer without making judgments or telling them immediately if they are right or wrong. Students seem comfortable taking academic risks based on their agreeing/disagreeing with each other and being comfortable sharing their answer when they know someone will agree/disagree.	Master

(table continues)

Table 12 *(continued).*

Instructional Adjustment	*Teacher consistently and effectively uses adjustments during instruction.* • **Instructional strategies**: Ms. Anderson checked for student understanding throughout the lesson by using multiple strategies. When students respond indifferently or choral response is not cohesive, Ms. Thomas rephrases the question and uses the white board response to elicit answers from all students. • **Instructional timing**: Ms. Thomas circulated around the room and monitored student work. Based on her observations, she determined which students would be in her small group instruction re-teach group. • **Grouping strategy**: Grouping strategies that she uses was turn and talk a partner share. She also allowed students to use white boards to respond to the questions posed during the lesson.	Master
Evidence of Learning	*There is evidence of learning for 75–100% of the students according to the suggested indicators. The use of the following examples indicates high evidence of learning: traffic lights, white boards, thumbs, individual responses, and authentic artifacts of learning.* • **Individual responses** - When students respond to the questions that the teacher asks throughout the lesson, some responses are one word/phrase. The teacher then adjusts her lesson to include additional strategies to gather evidence of student learning. • **All student responses** - White boards are used frequently during the lesson to elicit individual responses. • **Artifacts of Learning** – Students were provided with 10-minutes to complete two multiple-choice questions at the end of the lesson.	Master

During the post-observation conference, the researcher suggested that Ms. Thomas could improve in the area of learning target if she had students refer to their prior learning throughout the observation. The researcher observed that students did not write down the lesson objective, so Ms. Thomas was encouraged that when students write down the lesson objective in their own words, they can begin to set their own learning goals and take ownership in their progress towards meeting those goals. To improve in the area of nature of questioning, Ms. Thomas and the researcher discussed ways to incorporate follow-up questioning with students who may have

answered incorrectly previously. By revisiting their understandings, she could ensure that their misconceptions were cleared up or address them if they still existed.

Based on the level of implementation of short-cycle formative assessment in Ms. Thomas' class, the researcher noted that Ms. Thomas adjusted the level of instructional support from the original research plan. The researcher hypothesized that Ms. Thomas may not need five observations to reach master level on all seven core-constructs. This adjustment was made after Classroom Observation 4.

Classroom Observation 2 and post-observation feedback. Classroom Observation 2 for Ms. Thomas occurred on January 25, 2016. The observation lasted 40 minutes. There were twenty-five students in the classroom (17 girls and 8 boys). All students were Hispanic. The lesson objective was posted on the board and it read: "Students will be able to locate and graph ordered pairs on a coordinate plane."

The teacher followed a similar format as previously observed, such as a mixture of independent and collaborative work, and she also acted as facilitator and lecturer as needed. She stated the lesson objective like before and asked questions throughout the lesson as she taught the concept and required that all students respond using a multiple response strategy.

While Ms. Thomas was teaching, the researcher noticed that the atmosphere of the classroom was a bit different from the previous observation during direct teach. After the teacher modeled how to use the content-specific strategy to solve the problem, she simply stated, "Are there any questions?" Students responded with silence, she then stated, "Moving on." The wait time that Ms. Thomas typically provided to students to formulate their understanding of the concept throughout the lesson in the previous

observation was not provided during the direct teach portion of the lesson. The researcher did notate, however, that at the end of the lesson during the demonstration of learning activity, 23 out of 25 of the students demonstrated mastery of the concept based on the word problem that was provided to them to solve. The researcher also acknowledged that the concept was introductory in the sense that it was new material for the school year, but not a new concept. Students had experience locating and graphing coordinates from the previous grade level.

Ms. Thomas scored at the practitioner level on four of the core-constructs and at the master level of implementation on the other three core-constructs. Table 13 is a classroom observation summary table, which is a detailed description of the observation ratings, and the corresponding evidence gathered from each observation based on the core-construct of short-cycle formative assessment.

Table 13

Classroom Observation #2 Summary Table: Ms. Thomas

Core-constructs of Formative Assessment	Observation Evidence based on Core-Constructs	Observation Ratings
Learning Target	*Three of the four indicators are observed during the class period*. • **Learning target posted**: The lesson objective was posted on the board. • **Teacher states objective**: Ms. Thomas stated the lesson objective. • **Teacher revisits objectives**: She revisited the lesson objective during the lesson. • **Students write objectives down**: Not observed.	Practitioner

(table continues)

Table 13 *(continued).*

Question Quality	*Teacher generally uses questions effectively to scaffold instruction*. • **Open-ended questions:** Ms. Thomas asked some open-ended questions**.** • **Bloom's high and low mix**: Ms. Thomas asked a mix of low and high questions with most of the questions being open-ended. Examples of questions asked during the lesson: 1.) What is a ratio? 2.) What other strategies can we use to solve this problem? 3.) Is that true? 4.) How many ways can we set up a ratio? 5.) Provide me with an example. • **Connects to prior knowledge**: Ms. Thomas asked students to recall what they learned in 5th grade about locating and graphing points.	Practitioner
Nature of Questioning	*Teacher consistently and appropriately uses questioning effectively to diagnose problems with learning and improve instruction.* • **Follow-up questioning**: She called on one student in particular to solve an example problem and then asked the class if they agree or disagree with the student's solution. • **Wait-time**: Students were provided with a very specific content strategy to solve the problem and model of how to use the strategy to solve the problem was provided by the teacher. The teacher circulated around the room to ensure that all students were following along during the note-taking portion of the lesson. After she models the strategy she asks, "are there any questions?" There are no questions. She then states, "moving on." She continues this process during the note-taking portion of the lesson. After students took notes, the teacher provided students with practice problems to complete with a peer.	Practitioner
Self-Evaluation	*Evidence of one self-evaluation strategy or tool is used during instruction in an effort to regulate and improve the student's self-learning.* • **Teacher initiated**: Ms. Thomas asked a specific student, "what can we do to check our work?" The student replied, "start at the origin with our pencil and count right four and up three. Then see if we land on the point." Ms. Thomas asked the class, "do you agree or disagree by showing thumbs up or down?" All students show a thumbs up. During the lesson, Ms. Thomas uses the phrase, "I'll wait." After requiring that all students respond chorally and not receiving 100% participation. • **Student use strategies:** She then goes on to have two more students share how they would check their work with the class with the other students agreeing with a thumbs up and disagreeing with a thumbs down. • **Clearly defined strategy**: Students check their work using the UPS check problem solving model and reflect on their answers in the check portion of the strategy.	Practitioner

(table continues)

Table 13 *(continued).*

Observation of Student Affect	*Teacher is sensitive to student affect, collects evidence through body language, facial expressions, and/or classwork, and adjusts instruction accordingly. Teacher demonstrates expertise and polish in balancing content with student affect. Academic risk-taking is actively encouraged and occurring frequently.* • **Teacher behavior and Teacher focus**: Ms. Thomas calls on volunteers and non-volunteers. She called on one students. • **Student behavior**: The student looked surprised that she was called on. She did not have a response readily available. Ms. Thomas encouraged the student to respond by saying, "you know the answer." "we will wait on you to reply." • **Student interactions**: The student replied with the correct answer and she had the rest of the class give her a round of applause.	Master
Instructional Adjustment	*Teacher consistently and effectively uses adjustments during instruction.* • **Instructional strategies**: Ms. Thomas used a specific content strategy to teach the lesson objective. • **Instructional audience**: She required that students respond chorally to gather evidence of participation. She also circulated around the room and made statements such as, "As I walk around the room I notice…" She noticed that some students were going up on the y-axis first to graph their points and she corrected this misconception individually and reminded the class as a whole not to make this mistake. • **Instructional Timing**: As the teacher wrapped up guided practice and transitioned into independent practice, the teacher checked off which students were still struggling. She determined from her check which students needed additional time to complete the activity with teacher support. • **Grouping Strategy**: Ms. Thomas pulled identified struggling students to the back table to conduct a small group re-teach.	Master
Evidence of Learning	*There is evidence of learning for 75-100% of the students according to the suggested indicators.* • **Individual responses**: Ms. Thomas incorporated thumbs-up, thumbs-down and partner share as response strategies to gather evidence of learning. She also circulated around the room and provided individual feedback. • **Artifacts of Learning**: Students were provided with 10-minutes to complete two multiple-choice questions at the end of the lesson.	Master

During the post-observation conference, the researcher provided Ms. Thomas with the following suggestions to help improve. In the previous observation, Ms. Thomas scored at the practitioner level for nature of questioning. The suggestions for improvement included incorporating follow-up questioning for individual students. This strategy was observed in the next lesson. However, it was observed that students were not provided with wait time after the summation of the lesson to reflect on their understandings of the concepts. For example, during the lesson the teacher paused and asked if the students had any questions, and then after a few moments, stated, “Moving on.” Students had very little time to formulate a question if they truly had one. To enhance this area, the researcher suggested that the teacher provide a summation of the new learning and require that at least two students pose a question to the class regarding the new learning.

Classroom Observation 3 and post-observation feedback. Classroom Observation 3 for Ms. Thomas occurred on February 8, 2016. The observation lasted 40 minutes. There were twenty-four students in the classroom (17 girls and 7 boys). All students were Hispanic. The lesson objective was posted on the board and it read: “Students will be able to use a formula to find the area of a triangle.”

The teacher engaged with students in the same manner and structure as previously observed. The atmosphere of the classroom was very consistent from observation to observation. Ms. Thomas utilized a very similar lesson cycle daily. There was very little variation in the lesson cycle other than the types of questions that she asked and the students that she selected to work with her during small group intervention.

Ms. Thomas scored at the master level of implementation on all the core-constructs during Classroom Observation 3. Table 14 is a classroom observation summary table, which is a detailed description of the observation ratings. Also included are the data of corresponding evidence gathered from each observation based on the core-construct of short-cycle formative assessment.

Table 14

Classroom Observation 3 Summary Table: Ms. Thomas

Core-constructs of Formative Assessment	Observation Evidence based on Core-Constructs	Observation Ratings
Learning Target	*All four indicators are observed during the class period.* • **Learning target posted**: observed. • **Teacher states objective**: observed. • **Teacher revisits objectives**: She revisited the lesson objective during the lesson. • **Students write objectives down**: Students rewrote the lesson objective in their math journals using their own words.	Master
Question Quality	*Teacher consistently and appropriately uses questions effectively to scaffold instruction.* • **Open-ended questions and Bloom's high and low mix**: Ms. Thomas asked a mix of low and high questions with most of the questions being open-ended. Examples of questions asked during the lesson are: 1.) How do I determine the dimensions of the shape? 2.) How does the area formula for rectangle compare to the area formula for triangles? 3.) How are rectangles and triangles different? How are they the same? Use the different attributes and characteristics when describing similarities and differences. • **Connects to prior knowledge**: Ms. Thomas asked students to recall what they learned in the previous lesson regarding area of a rectangle. How does the area of a rectangle formula differ from the area formula for a triangle?	Master
Nature of Questioning	*Teacher consistently and appropriately uses questioning effectively to diagnose problems with learning and improve instruction.* • **Follow-up questioning**: Ms. Thomas incorporated the choral response, cold calling, and looped back to students who answered incorrectly throughout the lesson. • **Wait-time**: Students answer the questions and were provided with wait time. Most students answered chorally which provided the opportunity for all students to be included in the questioning.	Master

(table continues)

Table 14 *(continued).*

Self-Evaluation	*Teacher uses a variety (two or more) of strategies or tools to encourage students to self-evaluate in an effort to regulate and improve their own learning. These could include techniques such as the use of traffic lights, a self-assessment inventory, journaling and/or reflection statements.* • **Teacher initiated and Clearly defined strategy**: Ms. Thomas uses the UPS check problem solving model. She places emphasis on the check portion of the strategy. • **Student use strategies**: Students check their work using the UPS check problem solving model and reflect on their answers in the check portion of the strategy. Ms. Thomas places emphasis on the check portion of the UPS Problem Solving model when encouraging students to show their work and evaluate their own thinking. She then requires that students thinking circles to develop a visual reflection of their understanding of the concept at the conclusion of the lesson.	Master
Observation of Student Affect	*Teacher is sensitive to student affect, collects evidence through body language, facial expressions, and/or classwork, and adjusts instruction accordingly. Teacher demonstrates expertise and polish in balancing content with student affect. Academic risk-taking is actively encouraged and occurring frequently.* • **Teacher behavior and Teacher focus**: Ms. Thomas calls on volunteers and non-volunteers. She called on one students. • **Student behavior**: The student looked surprised that she was called on. She did not have a response readily available. Ms. Thomas encouraged the student to respond by saying, “you know the answer.” “We will wait on you to reply.” • **Student interactions**: The student replied with the correct answer and she had the rest of the class give her a round of applause.	Master

(table continues)

Table 14 *(continued).*

Instructional Adjustment	*Teacher consistently and effectively uses adjustments during instruction.* • **Instructional strategies**: She modeled how to use the formula to solve the problems. She clearly stated the importance of each step in the strategy. Before moving on to another step in modeling the strategy, she incorporated a response strategy to check for understanding. Ms. Thomas checked all student work as she circulated around the room and provided individual feedback in the form of praise for correct answers and guiding questions to help struggling students. She encouraged students to participate in the lesson by putting the learning in their own words. The teacher incorporated a rap song in the lesson to help students remember important steps in the strategy she taught. • **Instructional audience and Instructional Timing**: She required that students respond chorally to gather evidence of participation. She also circulated around the room and checked to see which students would need to be placed in which group and she corrected misconceptions individually and reminded the class, as a whole, not to make this mistake. She also determined as she circulated around the room when students were ready for the next part of the lesson. • **Grouping Strategy**: Ms. Thomas had students seated in groups of four	Master
Evidence of Learning	*There is evidence of learning for 75-100% of the students according to the suggested indicators.* • **Individual responses and All responses** - Ms. Thomas incorporated white boards to elicit a response from all students. She followed the white board response strategy with a turn and talk (pair share activity). • **Artifacts of Learning** – Students were provided with 10-minutes demonstration of learning activity at end of the lesson.	Master

During the post-observation conference, the researcher discussed with Ms. Thomas specific examples of formative strategies she implemented with fidelity throughout the observation. For example, the researcher observed all four of the indicators from the learning target core-construct. Students stated the objective, it was written for students to see, students wrote the objective down in their own words, and the teacher restated the lesson objective throughout the lesson as well as used academic vocabulary to connect the lesson objective to prior learning.

A second dimension that was discussed was the ways in which Ms. Thomas addressed feedback from previous observations to enhance the nature of questioning by providing students with an opportunity to ask questions within the lesson and wait time for students to formulate both their questions and answers. Even more than Ms. Thomas implementing these, the researcher also observed that students were both posing questions to their peers and providing their peers with wait time to answer the questions.

Classroom Observation 4 and post-observation feedback. Classroom Observation 4 for Ms. Thomas occurred on February 22, 2016. The observation lasted 40 minutes. There were twenty-four students in the classroom (17 girls and 7 boys). All students were Hispanic. The lesson objective was posted on the board and it read: "Students will be able to use a formula to find the area of a rectangle, parallelogram, and trapezoid."

The teacher engaged with students using her established routine. While Ms. Anderson was teaching, the researcher noticed the same observations of the consistency in the lesson cycle that afforded Ms. Thomas the multiple opportunities to gather student evidence of learning and make instructional adjustments in the previous observations. Overall, Ms. Thomas had already achieved the level of master level for all of the core-constructs. This observation was used to determine if there was any more instructional support that Ms. Thomas would need to help maintain master level of implementation. She scored at the master level of implementation on all seven core-constructs again during Classroom Observation 4. Table 15 summarizes the observation ratings and lists the corresponding evidence gathered.

Table 15

Classroom Observation 4 Summary Table: Ms. Thomas

Core-constructs of Formative Assessment	Observation Evidence based on Core-Constructs	Observation Ratings
Learning Target	*All four indicators are observed during the class period.* • **Learning target posted**: Observed. • **Teacher states objective**: Observed. • **Teacher revisits objectives:** Observed. • **Students write objectives down**: Students rewrote the lesson objective in their math journals using their own words.	Master
Question Quality	*Teacher consistently and appropriately uses questions effectively to scaffold instruction*. • **Open-ended questions and Bloom's high and low mix**: Ms. Thomas asked a mix, with most of the questions being open-ended. Examples of questions asked: 1) How does the area formula for rectangles compare to the area formulas for parallelograms? 2) How are rectangles and parallelograms different? How are they the same? Use the different attributes and characteristics when describing similarities and differences. • **Connects to prior knowledge**: Ms. Thomas asked students to recall what they learned in the previous lesson regarding perimeter. How does the area of a rectangle formula differ from the perimeter formula?	Master
Nature of Questioning	*Teacher consistently and appropriately uses questioning effectively to diagnose problems with learning and improve instruction*. • **Follow-up questioning**: Ms. Thomas incorporated the choral response, cold calling, and looped back to students who answered incorrectly throughout the lesson. • **Wait-time**: Students answer the questions when provided with wait time. Most students answered chorally which provided the opportunity for all students to be included in the questioning. Ms. Thomas waited at least 30 seconds in between each question and followed up with students who provided incorrect answers the first time. This happened once during the lesson, and Ms. Thomas asked all students to provide the answer chorally then she went back to the student to ensure that she knew.	Master
Self-Evaluation	*Teacher uses a variety (two or more) of strategies or tools to encourage students to self-evaluate in an effort to regulate and improve their own learning. These included the use of traffic lights, a self-assessment inventory, journaling and/or reflection statements.* • **Teacher initiated and Clearly defined strategy**: Ms. Thomas uses UPS Check. She placed emphasis on the check portion of the strategy. • **Student use strategies (two)**: Students checked their work using the UPS check problem solving model and reflect on their answers in the check portion of the strategy. Ms. Thomas places emphasis on the check portion of UPS Check when encouraging students to show their work and evaluate their own thinking. She then required students thinking circles to develop a visual reflection of their understanding of the concept at the conclusion of the lesson.	Master

(table continues)

Table 15 (*continued*).

Observation of Student Affect	*Teacher is sensitive to student affect, collects evidence through body language, facial expressions, and/or classwork, and adjusts instruction accordingly. Teacher demonstrates expertise and polish in balancing content with student affect. Academic risk-taking is actively encouraged and occurring frequently.* • **Teacher behavior and Teacher focus**: Ms. Thomas calls on volunteers and non-volunteers. She called on one students. • **Student behavior**: The student looked surprised that she was called on. She did not have a response readily available. Ms. Thomas encouraged the student to respond by saying, "You know the answer." "We will wait on you to reply." • **Student interactions**: The student replied with the correct answer and she had the rest of the class give her a round of applause.	Master
Instructional Adjustment	*Teacher consistently and effectively uses adjustments during instruction*. • **Instructional strategies**: Ms. Thomas checked all student work as she circulated around the room and provided individual feedback in the form of praise for correct answers and guiding questions to help struggling students. • **Instructional audience and Instructional Timing**: Ms. Thomas used white board responses during this lesson to elicit student responses. Most students provided the correct answer during the lesson, thus she adjusted the lesson only when needing to provide additional wait time for students to formulate their response. • **Grouping Strategy**: Ms. Thomas monitored student progress during the whole group and independent part of the lesson. She used a pair-share-activity for students to communicate their understanding of the content. She had students share their responses with their peers.	Master
Evidence of Learning	*There is evidence of learning for 75-100% of the students according to the suggested indicators.* • **Individual responses and All responses**: Ms. Thomas incorporated white boards to elicit a response from all students. She followed the white board response strategy with a turn and talk (pair share activity). • **Artifacts of Learning**: She provided students with an exit slip activity with two word problems. She checked student answers as they exited the classroom. 100% of the students demonstrated mastery on the problems.	Master

During the post-observation conference, the researcher discussed with Ms. Thomas the evidence gathered as aligned to the indicators at the master level of implementation for each core-construct. The more specific feedback resulted from excellent examples for every indicator on all the core-constructs. The conference concluded with a focus on Ms. Thomas' role as a leader among her peers.

Summary of Ms. Thomas' use of short-cycle formative assessment. Nothing occurred for Ms. Thomas during Week 8. Because she demonstrated the level of master on all seven core-constructs in the prior two observations, Ms. Thomas did not receive a fifth classroom observation. Ms. Thomas used the feedback provided during the post-observation conferences and as a result, demonstrated in the classroom observations that she could receive ratings of master in her implementation of the seven core-constructs of short-cycle formative assessment using the AssessToday™ observation protocol. Table 16 is the summary of the teacher observation ratings that demonstrates the changes in use of the core-constructs of short-cycle formative assessment.

Table 16

Summary of Teacher Observation Ratings for Ms. Thomas

	Observation 1	**Observation 2**	**Observation 3**	**Observation 4**
Learning Target	Practitioner	Practitioner	Master	Master
Question Quality	Master	Practitioner	Master	Master
Nature of Questioning	Practitioner	Master	Master	Master
Self-evaluation	Practitioner	Practitioner	Master	Master
Observation of Student Affect	Master	Master	Master	Master
Instructional Adjustment	Master	Master	Master	Master
Evidence of Learning	Master	Master	Master	Master

Ms. Thomas' Knowledge and Use of Short-Cycle Formative Assessment

The data revealed changes in Ms. Thomas' knowledge and implementation of short-cycle formative assessment. The targeted instructional support provided to impacted her abilities to both articulate and more consistently implement short-cycle

formative assessment strategies. The AssessToday™ observation protocol was the outline used as topics for the professional development sessions, but the content of the sessions were developed to specifically address the instructional needs of Ms. Thomas. Additionally, the AssessToday™ observation protocol was utilized as an observation tool that was followed by post-observation conferences to focus on particular aspects of short-cycle formative assessment. The changes in knowledge and use of Ms. Thomas are provided below with respect to each core-construct.

Summary of Ms. Thomas' knowledge and use of learning target. Ms. Thomas revealed some knowledge about learning targets during the pre-interview. She knew about posting the lesson objective and communicating the lesson objective throughout the lesson to students; however, the other two indicators were not mentioned. During the four observations that spanned a period of five weeks, Ms. Thomas transitioned from implementing only two to all four indicators of the learning target core-construct, including revisiting the lesson objective and having students write the lesson objective down in their own words. This was a result of the targeted instructional support regarding learning target.

During the professional development session that focused on the learning target core-construct, Ms. Thomas reviewed and discussed the learning target core-construct, and she was able to plan how she would use the indicators and examples gathered during the professional development session to move herself to the next level. Finally, the post-interview supported growth in Ms. Thomas' knowledge about learning targets in that it highlighted the importance of students internalizing what the learning target means by ensuring that they state the lesson objective and revisit the objective

throughout the lesson. Therefore, as a result of the targeted instructional support, Ms. Thomas moved from practitioner level to master level suggesting strong improvement in knowledge and use of learning targets which are associated with research-based formative assessment practices.

Summary of Ms. Thomas' knowledge and use of question quality. Ms. Thomas' pre interview revealed that she had some prior knowledge about the question quality core-construct. She discussed how she uses questioning to determine student prior knowledge. Then during the four observations that spanned a period of five weeks, Ms. Thomas assessed student prior knowledge as well as used open-ended questions to scaffold instruction.

During the professional development session that focused on the question quality core-construct, Ms. Thomas reviewed research-based ways to use questioning to encourage student to think, and was able to plan how she would continue to use the indicators and examples gathered during the professional development session to remain at the master level. Finally, the post-interview supported consistency in Ms. Thomas' knowledge about the question quality core-construct, in that it highlighted how Ms. Thomas planned to be more intentional with her questioning to assess student prior knowledge. Hence, as a result of the targeted instructional support, Ms. Thomas remained at the rating of master, suggesting a strong understanding and knowledge of the question quality core-construct which are associated with research-based formative assessment practices.

Summary of Ms. Thomas' knowledge and use of nature of questioning. Ms. Thomas began the study with some knowledge about the nature of questioning core-

construct. During the pre-interview, she discussed how she asks students follow-up questions to improve instruction. Then during the four observations that spanned a period of five weeks, Ms. Thomas implemented follow-up questions as well as improved on her wait time after asking questions.

During the professional development that focused on the nature of questioning core-construct, Ms. Thomas reviewed and discussed the nature of questioning core-construct and was able to plan how she would use the indicators and examples gathered during the professional development session to move herself to the next level. Finally, the post-interview supported growth in Ms. Thomas' knowledge about nature of questioning in that it highlighted the importance of providing students with wait time and how the use of multiple response strategies such as think-pair-share assisted her in providing students with this opportunity. Therefore, as a result of the targeted instructional support, Ms. Thomas moved from practitioner level to master level suggesting strong improvement in knowledge and use of the core-construct, nature of questioning, which are associated with research-based formative assessment practices.

Summary of Ms. Thomas' knowledge and use of instructional adjustment. Initially, Ms. Thomas had limited knowledge about the instructional adjustment core-construct, as revealed in the pre-interview. She discussed how she provided feedback to students during the lesson. Then during the four observations that spanned a period of five weeks, Ms. Thomas implemented all three indicators of the instructional adjustment core-construct (instructional strategies, instructional timing, and grouping strategies) despite not being able to articulate her understanding of this construct during the pre-interview.

During the professional development session that focused on the instructional adjustment core-construct, Ms. Thomas developed terminology about the applications of the instructional adjustment core-construct, and she was able to plan how she would continue to use the indicators and examples gathered during the professional development session to remain at the master level. Finally, the post-interview supported consistency in Ms. Thomas' knowledge about the instructional adjustment core-construct, in that it highlighted how Ms. Thomas planned continue to collect data to be able to adjust instruction. Thus, as a result of the targeted instructional support, Ms. Thomas remained at the rating of master, suggesting a strong understanding and knowledge of the instructional adjustment core-construct which are associated with research-based formative assessment practices.

Summary of Ms. Thomas' knowledge and use of self-evaluation. During the pre-interview, Ms. Thomas showed minimal knowledge about the self-evaluation core-construct. She failed to discuss a specific strategy that to use with students to help them self-assess their own progress towards mastery, although she did express the importance of having students check over their work. Then during the four observations that spanned a period of five weeks, Ms. Thomas required that students check over their work as well as encouraging them to use more than one strategy to self-evaluate.

During the professional development session on the self-evaluation core-construct, Ms. Thomas reviewed and discussed the self-evaluation core-construct, and she was able to plan how she would use the indicators and examples gathered during the professional development session to move herself to the next level. Finally, the post interview provided minimal evidence in Ms. Thomas' growth in knowledge about the

self-evaluation core-construct because her answers to the question during the post-interview was brief. She did, however, indicate in the post-interview that she understood the importance of encouraging her students to self-assess. Therefore, as a result of the targeted instructional support, Ms. Thomas moved from practitioner level to master level suggesting strong improvement in knowledge and use of the core-construct, self-evaluation, which are associated with research-based formative assessment practices.

Summary of Ms. Thomas' knowledge and use of observation of student affect. Ms. Thomas' initial knowledge about the observation of student affect core-construct was minimal. During the pre-interview she discussed teacher behaviors without much regard for student behaviors. Then during the four observations that spanned a period of five weeks, she effectively implemented all three indicators of the observation of student affect core-construct (teacher behavior, student behavior, and teacher focus), despite not being able to articulate her understanding of this construct during the pre-interview.

During the professional development session that focused on the observation of student affect core-construct, Ms. Thomas acquired terminology about the applications of the observation of student affect core-construct, and was able to plan how she would continue to use the indicators and examples gathered during the professional development session to remain at the master level. Finally, the post-interview supported consistency in Ms. Thomas' knowledge about the observation of student affect core-construct, in that it highlighted how Ms. Thomas planned to find other ways to gather evidence of student mastery through observation of student facial expressions. Therefore, as a result of the targeted instructional support, Ms. Thomas remained at the

rating of master, suggesting a strong understanding and knowledge of the student affect core-construct which are associated with research-based formative assessment practices.

Summary of Ms. Thomas' knowledge and use of evidence of learning. In the pre interview, Ms. Thomas demonstrated knowledge of the evidence of learning core-construct. She shared that students learn in different ways and, as a result, need different opportunities to demonstrate their understanding of the concept. Then during the four observations that spanned a period of five weeks, Ms. Thomas provided different opportunities for students to respond so she could gather student learning data; Ms. Thomas also articulated the importance of consistent implementation of these strategies.

During the professional development session that focused on the evidence of learning core-construct, Ms. Thomas described what it meant to her, and in her response she included the indicators and provided examples for how to include them during instruction, to the benefit of those who were also participating in the session. Finally, the post interview supported consistency in Ms. Thomas' knowledge about the core-construct, evidence of learning, in that it highlighted how Ms. Thomas planned for multiple ways for students to respond and how specifically she creates the tasks that she gathers as artifacts of learning. Thus, as a result of the targeted instructional support, Ms. Thomas remained at the master level suggesting a strong understanding and knowledge of the evidence of learning core-construct which are associated with research-based formative assessment practices.

Data from the Case Study across Time

In this case study, data was collected for two participants' knowledge and use of short-cycle formative assessment. Ms. Anderson and Ms. Thomas entered the study needing different levels of support. The observation data showed where the teachers started on the AssessToday™ observation protocol based their progression towards rating of master for each core-construct as they received targeted instructional support. Table 17 compares the initial ratings Ms. Anderson and Ms. Thomas when observed using the AssessToday™ observation protocol before the targeted instructional support was initiated.

Table 17

Summary of Ms. Anderson and Ms. Thomas' Initial Use of Short-Cycle Formative Assessment Strategies

Short-Cycle Formative Assessment	Ms. Anderson's Observation #1 Scores	Ms. Thomas' Observation #1 Scores
Learning Target	Apprentice	Practitioner
Question Quality	Apprentice	Master
Nature of Questioning	Apprentice	Practitioner
Self-evaluation	Apprentice	Practitioner
Observation of Student Affect	Practitioner	Master
Instructional Adjustment	Apprentice	Master
Evidence of Learning	Practitioner	Master

As depicted in the table above, Ms. Anderson's initial observation resulted in ratings of apprentice or practitioner, while Ms. Thomas began with ratings of practitioner or master. After collecting this data, the information collected from the pre-interviews were combine with the ratings and data from the post-observation feedback

conferences to develop professional development sessions and future conferences that could more directly meet the needs of both the participants.

In the following section, the changes in the ratings for each participant over time were compiled to show that though the participants demonstrated different levels of implementation of short-cycle formative assessment strategies, after participating in the targeted instructional support, they were able to provide observable data that matched the indicators on the AssessToday™ observation protocol. The data were separated by the core-constructs. The comparisons emphasized the results of the single case study and how the phenomena changed over time as a result of the targeted instructional support.

The graphs provided in Figures 3-9 assigned the observation ratings of novice, apprentice, practitioner, and master to number values of *0* to *3*, respectively, on the vertical axis, and the iteration of the observation on the horizontal axis. By displaying the ratings for each core-construct across time with each participant's changes, the graphs showed that participants do not begin nor change at the same rate; therefore, it is essential to tailor the instructional support to meet each of their needs.

Comparison of Ratings for Learning Target

In Figure 3 the ratings received by Ms. Anderson and Ms. Thomas were traced to show their respective changes in the level of implementation for the learning target core-construct across observations. As stated previously, Ms. Anderson started at the apprentice level. During the post-observation feedback conference following the first classroom observation, the researcher noted that Ms. Anderson failed to revisit the lesson objective throughout the lesson as well as the requirement of students writing

down the learning target. In contrast, Ms. Thomas started at the practitioner level for her implementation of learning target. During the post-observation feedback conference following the first classroom observation, the researcher noted that though students read the lesson objective aloud as a class at the beginning of the lesson, Ms. Thomas did not require that students write down the lesson objective. She responded by stating that she planned to include this strategy during her instruction.

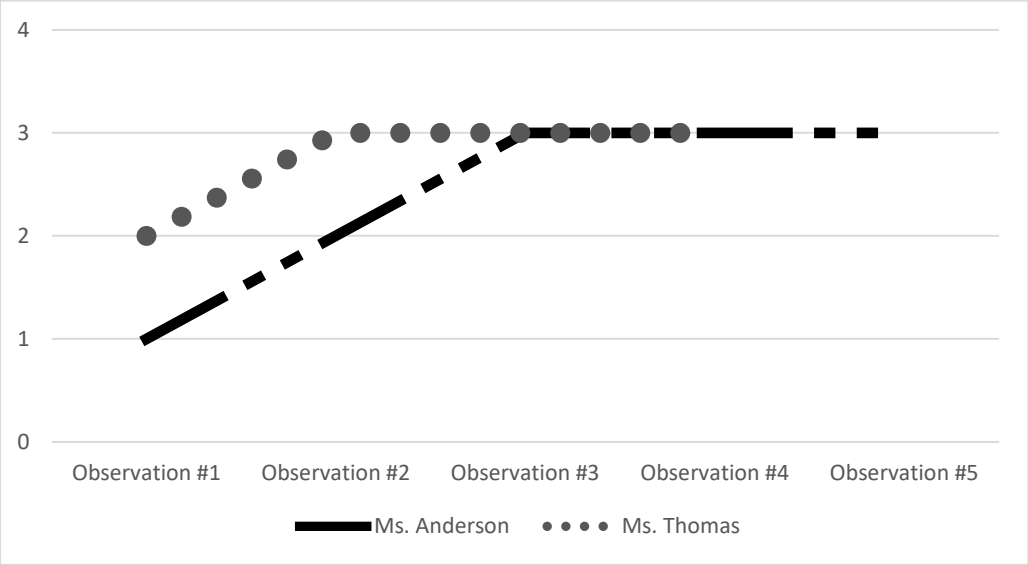

Figure 3. Summary of observation ratings-learning target.

During the second classroom observation, the researcher observed Ms. Anderson requiring her students to write the lesson objective after she stated it. In the third classroom observation, Ms. Anderson consistently revisiting the lesson objective throughout the lesson, in addition to displaying the other three indicators. She continued to demonstrate her proficiency in subsequent observations. Ms. Thomas demonstrated all indicators of learning target in all subsequent observations; thus, she was rated as master on this indicator during the second observation and continued to demonstrate mastery in subsequent observations.

Comparison of Ratings for Question Quality

As shown in Figure 4, Ms. Thomas started at the master level for her implementation of the question quality core-construct in her classroom. The researcher noted that Ms. Thomas consistently and appropriately used questions to effectively scaffold instruction by asking open-ended questions, with all levels of questions present, and by consistently connecting the present learning with the students' prior knowledge. In the second observation, however, she did not provide enough moments to demonstrate proficiency across all indicators of question quality. In the post-observation conference, this was discussed, and Ms. Thomas asserted her intention of improving this. In her third and fourth observation, the quality improved and was rated as master.

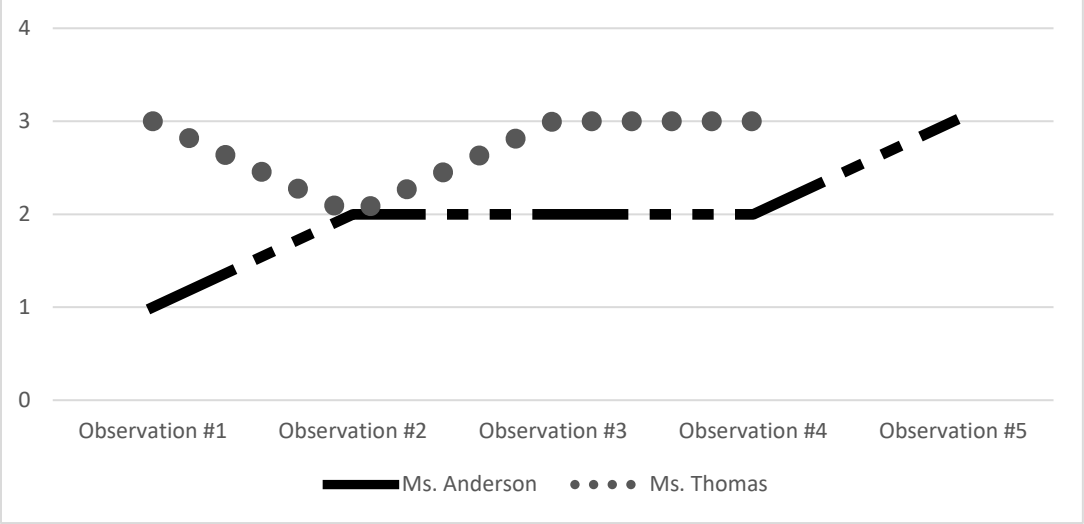

Figure 4. Summary of observation ratings-question quality.

By comparison, Ms. Anderson started at the rating of apprentice. During the first observation, Ms. Anderson asked a few open-ended questions during the lesson; however, most of the questions Ms. Anderson asked were procedural types of questions that require one-word or number answers. During her discussion of this in her post-observation conference, Ms. Anderson reflected on her need to increase the

asking of open-ended questions. In her second observation, she required students to explain and justify their answers, thus improving her rating to practitioner.

In the third classroom observation, the researcher observed Ms. Anderson using questioning strategies to scaffold instruction, except for ensuring that students connect new concepts to prior knowledge. During the third post-observation feedback conference, she received feedback about asking explicit questions that connect student's prior and present knowledge. Additionally, the professional development session on question quality and nature of questioning provided more information and opportunity to reflect on implementing question quality more effectively. By the fifth classroom observation, Ms. Anderson was rated as master. She improved her quality by asking more open-ended questions and intentionally asking questions that would allow students to connect the new content with prior knowledge.

Comparison of Ratings for Nature of Questioning

For the nature of questioning, the participants were the most similar in their growth as compared to the other core-constructs (see Figure 5). Initially, Ms. Anderson rated as apprentice while Ms. Thomas started as a rating of practitioner. The researcher noted that during the first classroom observation, Ms. Thomas' questioning strategies did not allow her to diagnose individual problems or misconceptions. Students responded chorally as a whole group to the questions. Similarly, Ms. Anderson's students responded chorally which left no wait time for students who struggled to answer. Thus, during the post-observation conference following this first observation, Ms. Anderson was provided this detail as well as the observation that she posed questions to a group but then moved to another group without following up with the first

group to ensure that they understood the content the teacher was trying to reinforce with the question. Ms. Thomas was provided feedback about her use of choral responses and consideration for including wait-time more effectively.

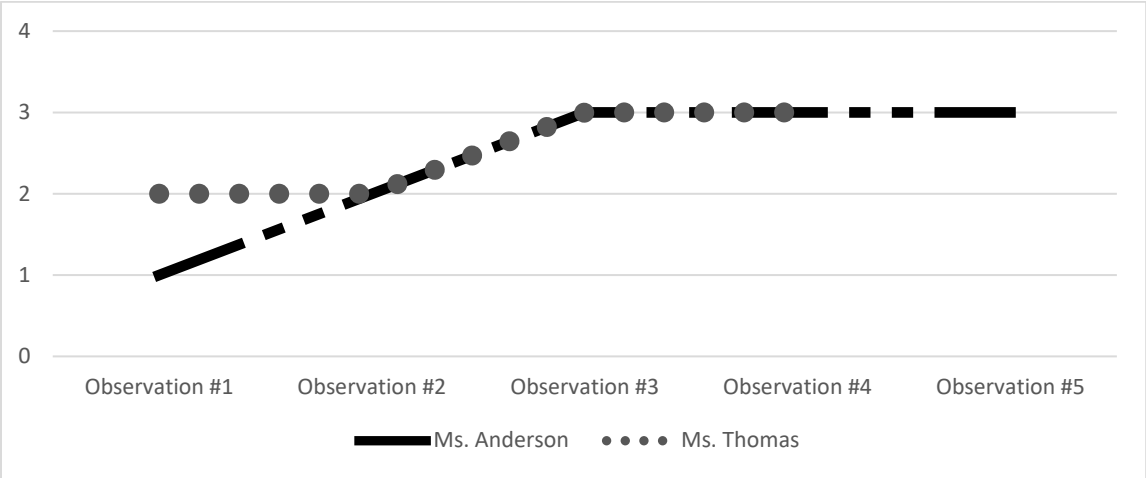

Figure 5. Summary of observation ratings-nature of questioning.

After the second observation, Ms. Thomas remained at the practitioner level. Though she intentionally followed up with individual students after asking questions in which students responded chorally as a whole group, her use of wait time was not effective. She would move on without asking a question and requiring a student response that provided opportunities for them to internalize the new information. In contrast, Ms. Anderson showed an increase in the use of follow-up questions to diagnose specific problems and to guide students towards mastery. But in the same way as Ms. Thomas, Ms. Anderson did not provide wait time after asking the questions; in fact, the researcher observed Ms. Anderson answering her own questions.

During the third classroom observation, Ms. Anderson started consistently incorporating follow-up questioning and wait time in her lesson. For example, when students struggled with answering a question, Ms. Anderson provided thirty seconds for

a student to answer the question before asking another student to respond. In the third classroom observation, Ms. Anderson rated as master as she demonstrated effective implementation related to the nature of questioning, which was also observed in the fourth and fifth observations. Ms. Thomas also showed improvement in the third classroom observation. She provided students adequate wait time to ask questions within the lesson and addressed individual students' understandings. As a summary for the new learning within the lesson, Ms. Anderson had one student pose a question to the class, and other students answered the question. She was also rated as master during her fourth observation.

The professional development session that included the nature of questioning was a time for the participants to share their strategies as related to follow-up questioning and wait-time. After the three post-observation conferences, the participants were able to articulate the indicators and describe well what they meant. When they read the article during the session, their knowledge was deepened even further as the indicators were supported by research literature. So when their observations that followed this session showed ratings of master for the nature of questioning, they could speak to what they did that demonstrated this.

Comparison of Ratings for Self-Evaluation

Strategies to encourage students to self-evaluate proved elusive for Ms. Anderson at the beginning of the study. While Ms. Thomas started with a rating of practitioner for self-evaluation, Ms. Anderson started as a rating of apprentice and remained there in Observations 2 and 3. During the first observation, Ms. Thomas explicitly stated and modeled the use of a self-evaluation strategy; however, it was

unclear if students used the self-evaluation strategy. Likewise, Ms. Anderson explicitly stated and modeled the use of a self-evaluation tool her students could use to monitor their own progress towards mastery; however, she did not place emphasis on students using the tool consistently throughout the lesson. In the second observation, neither participant demonstrated any changes as they did not implement any of the suggestions offered during the post-observation feedback conference following the first observation, nor during the third observation for Ms. Anderson. Figure 6 shows this static rating across the first three observations for Ms. Anderson and first two for Ms. Thomas.

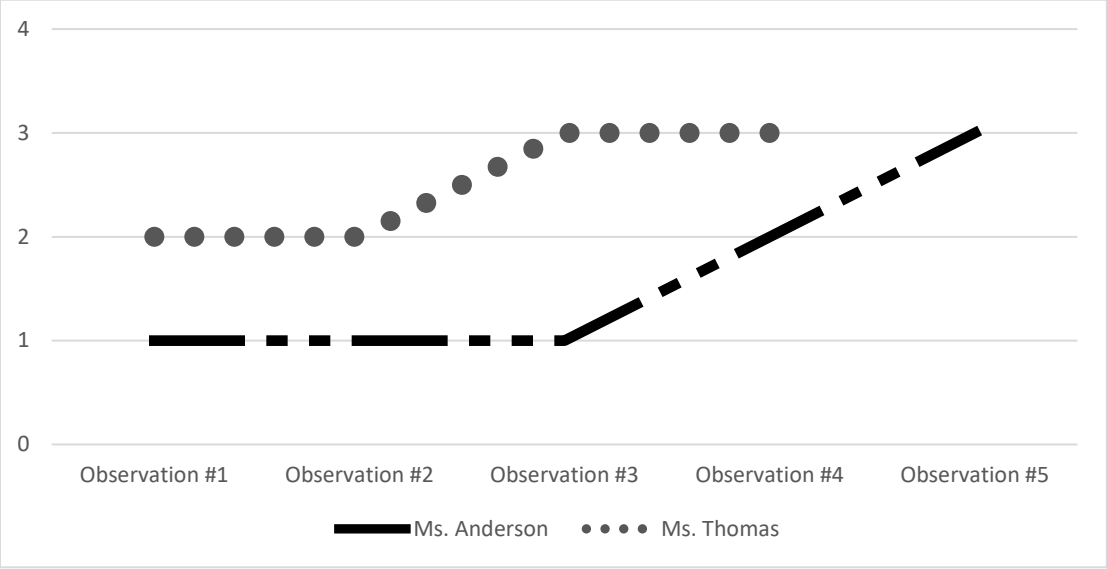

Figure 6. Summary of observation ratings-self-evaluation.

However, following the third observations, the focus of the professional development session included self-evaluation. The participants had the opportunity to reflect on ways to implement effective strategies. In the subsequent observation, Ms. Anderson and Ms. Thomas displayed effective strategies to encourage students' use of self-evaluation, and Ms. Anderson improved in the fifth observation to demonstrating a rating of master for self-evaluation.

Comparison of Ratings for Observation of Student Affect

From the outset, Ms. Thomas demonstrate proficiency for all indicators of the observation of student affect. For example, Ms. Thomas allowed students to explain their reasoning and understanding of the concepts without judgement. Volunteers and non-volunteers answered questions that focused on resolving misconceptions and development of conceptual understanding. Student-to-student interactions included students agreeing and disagreeing with one another in an effort to develop a better understanding of the concept as a class. Ms. Thomas was able to demonstrate this level throughout her observations.

Ms. Anderson's journey was a different story, and Figure 7 shows this dynamic. Though she started with a rating of practitioner on the first observation, she dropped in her second observation to the rating of apprentice. During her third observation, students who volunteered were engaged, but Ms. Anderson struggled to elicit responses from those who were not volunteering. The researcher rarely observed students taking any risks academically.

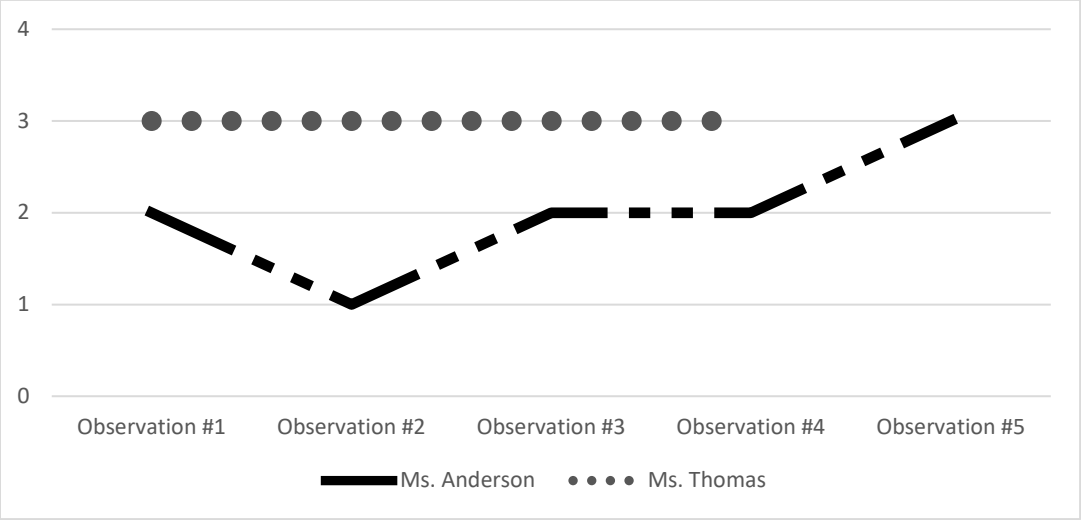

Figure 7. Summary of observation ratings-observation of student affect.

During the same week as the third observation, the professional development session highlighted how teachers could employ methods to observe student affect so as to adapt their instruction based on what the students are communicating, both verbally and non-verbally. Additionally, the researcher provided Ms. Anderson in the third post-observation conference with a non-verbal strategy that could elicit student participation during whole class discussions to encourage students to take risks and answer questions. Additionally, Ms. Anderson was encouraged to observe student body language and facial expressions to determine if students were engaged in the lesson and were comfortable taking academic risks during the lesson.

The fourth observation revealed students taking more risks during the lesson. Then in the fifth observation, Ms. Anderson was rated as master for this core-construct. All students were observed volunteering to answer questions, and Ms. Anderson worked to encourage all students to respond throughout the lesson.

Comparison of Ratings for Instructional Adjustment

With respect to instructional adjustment, the participants displayed different needs. The targeted instructional support was differentiated since Ms. Thomas was rated as master in her first and then the remaining observations but Ms. Anderson showed a need for more directed instruction.

Ms. Thomas consistently and effectively used instructional adjustments throughout her lessons. For example, the teacher circulated around the room, monitored student work, and gathered data regarding student misconceptions. She then posed a question to the class and incorporated a whiteboard response strategy to gather individual data regarding progress towards mastery. Additionally, she provided

students with an opportunity to turn and talk to a partner after she posed a question and after students responded to their partner, she called on students with exemplar answers to share out their responses with the class.

Juxtaposing Ms. Thomas' demonstration of effectiveness with the observation data of Ms. Anderson, the researcher concluded that the participants required different points of foci during their post-observation conferences and the professional development sessions. Figure 8 represents graphically this difference.

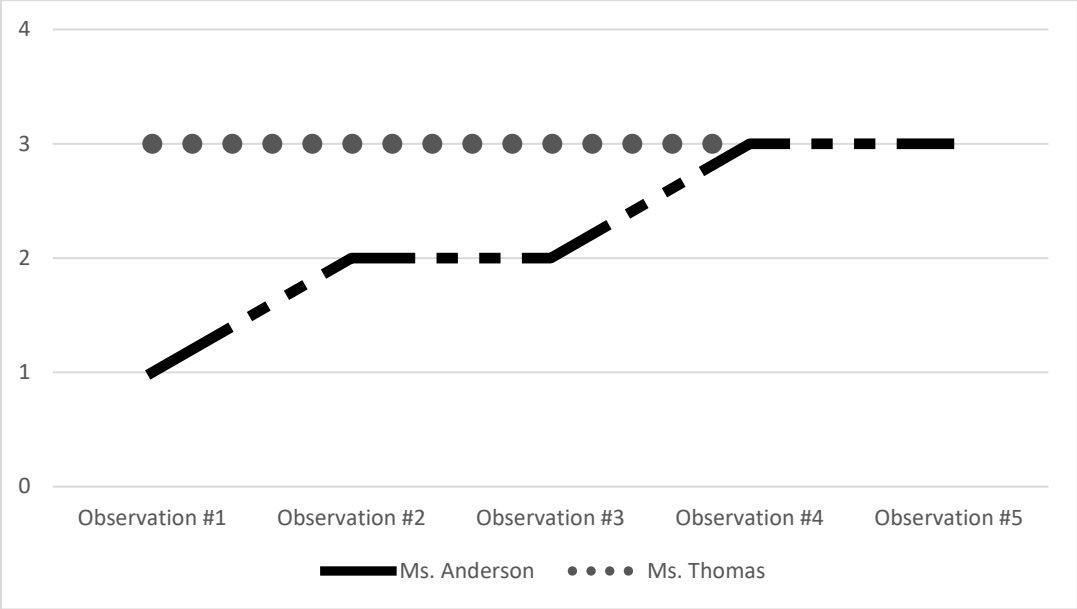

Figure 8. Summary of observation ratings-instructional adjustment.

Ms. Anderson began as demonstrating a rating of apprentice for instructional adjustment. During the first observation, minimal instructional adjustments occurred throughout the lesson. Students participated in collaborative groups during the lesson; however, the researcher failed to observe the teacher implementing strategies for holding individual students accountable for group work. The post-observation conference did not specifically focus on this core-construct, though Ms. Anderson did receive written feedback. When the second classroom observation revealed a need for

consideration of how to adapt instruction based on feedback, the researcher suggested, during the post-observation conference, that the teacher model the use of a content specific strategy before allowing students to work in collaborative groups. Additionally, the researcher suggested to Ms. Anderson that she consider using the grouping strategy of having between three and four students in each group. This was also reiterated during the professional development session that occurred that week.

In the fourth classroom observation, Ms. Anderson used different strategies to check for understanding and grouping strategies to gather evidence of student mastery throughout the lesson. Even more impressive was the ways in which Ms. Anderson adapted and altered her approach based on students' responses to questions. She also used think-pair-share as a strategy, and based on their conversations, the teacher made adjustments. This provided observable data for her to be rated as master level the fourth observation on this indicator and maintained it during her fifth observation. Ms. Thomas maintained the rating of master for her implementation of the instructional adjustment core-construct.

Comparison of Ratings for Evidence of Learning

Ms. Anderson demonstrated exemplary implementation of the evidence of learning core-construct throughout all four observations, maintaining the rating of master across all. The researcher consistently observed Ms. Thomas gathering individual student and class data during throughout the lesson using multiple response strategies and an assessment at the close of the lesson to determine if students mastered the evidence of learning core-construct.

In contrast, Ms. Anderson began at the rating of practitioner. During the first observation there was no observable moments when assessment tasks were used throughout the lesson to gather data of students' progression towards mastery. At the conclusion of the lesson, 50-74% of the students mastered the assessment task. After the second classroom observation, the researcher suggested that Ms. Anderson try incorporating multiple response strategies when posing high quality questions throughout the lesson to gather student data of progression towards mastery. During the third observation, Ms. Anderson increased observation ratings from practitioner to master. One specific example she used was a random number generated to garner participation from all students during the questioning portion of the lesson. Additionally, there was evidence that more than 80% of the students demonstrated mastery on the assessment task at the close of the lesson.

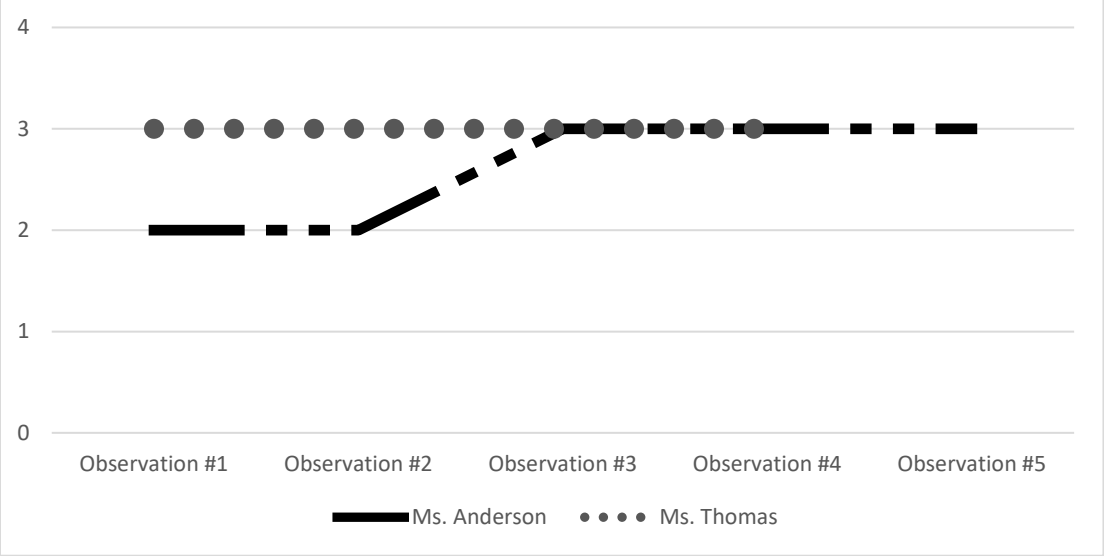

Figure 9. Summary of observation ratings-evidence of learning.

Figure 9 displays the comparison of their proficiencies. This core-construct was one that aligned with the indicators of other core-constructs such that it was selected to

be part of the focus of the second professional development session. Thus, the change that occurred for observation for Ms. Anderson can be attributed, at least in part, to the professional development. Because the evidence of learning core-construct proved to be a category for which both participants were proficient by observation three, the targeted instructional support could examine other core-constructs.

Summary

In this chapter, the researcher presented the findings of this single case study using a time-series case study analysis technique. The researcher based the findings on the pre-interviews, post-interviews, classroom observation data, and post-observation data. The researcher discussed the findings in three parts (1) each teacher's knowledge of short-cycle formative assessment strategies before receiving targeted instructional support; (2) the changes of use for each core-construct; and, (3) the trustworthiness of the data by analyzing changes regarding one specific core-construct across the study. The researcher found positive changes in participant knowledge and use of short-cycle formative assessment strategies, regardless of their level of knowledge at the beginning of the study, after the received targeted instructional support. In Chapter 5, the researcher provides general conclusions and recommendations for future research.

CHAPTER 5

DISCUSSION AND IMPLICATIONS

For this research study, the researcher relied on the theoretical proposition that targeted instructional support for sixth-grade mathematics teachers can positively influence teachers' implementation of short-cycle formative assessment practices in the classroom. The findings demonstrated how participants who engaged throughout the study were influenced related to both knowledge and use of formative assessment strategies. In this final chapter, a summary of what encompassed the targeted instructional support is provided. Next, the chapter shifts to how the post-observation feedback influenced the knowledge and use of formative assessment strategies. Finally, implications are provided related to professional development, observation and feedback, teacher instructional growth, teacher evaluation policy, and suggestions for future research.

Discussion of Targeted Instructional Support

As the findings demonstrated, targeted instructional support accompanied with professional development and post-observation conferences can positively influence teacher instructional growth in the implementation of short-cycle formative assessment strategies. Targeted instructional support was selected for this study because the researcher intended to impact the knowledge and use of short-cycle formative assessment for the participants and measure how that changed. By assessing prior knowledge and observing initial use of these practices, with the core-constructs of the AssessToday™ observation protocol as the framework, the researcher was able to intentionally design professional development sessions, focus on specific feedback

during post-observation conferences, and maintain a clear line of objectives for the participants to consider and to implement. In this way, the study was an iterative analysis where the researcher was formatively assessing their knowledge and use of formative assessment. When considering generalizability, Ms. Anderson is included in the discussion as a novice teacher and Ms. Thomas is included in the discussion as an experienced teacher. Using a blend of levels of experience allowed for the findings to highlight similarities and differences in the targeted instructional support offered. There was a weakness to the process that occurred during the study. As mentioned in chapter 1, the researcher was the supervisor for the participants and conducted evaluations for each study participant prior to the research study (using the school district observation form, not the one used in this study) and was responsible for providing feedback to help with the instructional growth of each teacher. However, this concern was mitigated through the triangulation of data. For example, when observing each teacher and providing an observation rating, the AssessToday™ observation protocol form offered the researcher a tool to become a more effective observer. The language from the AssessToday™ observation protocol was used in all conversations and as the focus of the professional development sessions. On the other hand, the researcher's role as supervisor caused an underlying bias because as the supervisor, the researcher was responsible for the professional growth of each participant.

Another weakness exposed after the study was that, though unintended, preconceived notions of the skills and knowledge of the participants might have influenced what the researcher heard and observed. This underlying bias could have influenced how the feedback was given and how the feedback was received by each

participant. Reflecting on the findings of this study, the researcher would argue that though trained with fidelity in using the AssessToday™ observation protocol, having two observers throughout the study would have limited this bias.

AssessToday™ Observation Protocol

The researcher relied on the AssessToday™ observation protocol to frame the conversations during the professional development sessions and the post-observation feedback conferences to illuminate how the participants could develop their knowledge and use of short-cycle formative assessment strategies. As mentioned earlier in chapter 3, the AssessToday™ observation protocol is a research-based tool designed to work with teachers to improve their understandings and implementation of short-cycle formative assessment strategies. This tool framed the instructional support that informed specific aspects of short-cycle formative assessment to impact teacher's knowledge and use of short-cycle formative assessment strategies. The seven core-constructs were the structures imposed in both the professional development sessions and post-observation conferences.

Furthermore, the AssessToday™ observation protocol's seven core-constructs of short-cycle formative assessment were used to frame the findings for this study. This is the first tool created to narrowly focus on short-cycle formative assessment, thus, this is a significant occurrence in this study. The focus on short-cycle formative assessment influenced the study's findings because the researcher and participants were able to pinpoint specific areas of growth in each of the different areas of short-cycle formative assessment.

Professional Development Sessions

The study revealed that participants had different beginning knowledge of how to implement formative assessment strategies in their classroom. Thus, similar to how educational leaders provide instructional support to teachers through professional development (Duffy et al., 2008; Linn, 2008; Hoppman, 2008), the researcher planned the professional development sessions to include targeted support based on the varied teacher needs. Novice teachers need support developing their basic knowledge of the profession along with developing their knowledge and use of formative assessment. Teachers with years of successful teaching experience in their classroom based on student performance on formative and summative assessments similarly need support enhancing the knowledge they already have.

Based on the findings, a novice teacher revealed a need for specific feedback on how to implement formative assessment strategies in their classroom. The observation data revealed that a first year teacher typically struggled with the following five core-constructs in understanding and using short-cycle formative assessment:

- Learning target
- Question quality
- Nature of questioning
- Self-evaluation
- Instructional adjustment

As a result, the professional development sessions that focused on these five core-constructs specifically included strategies to help the novice teacher develop their knowledge and understanding of formative assessment in their classroom.

Another component of the study that was revealed in the findings was the understanding and usage of the learning target in a novice teacher's classroom is typically a challenge because the novice teacher observed, based on classroom observation data, rarely revisited the learning target after stating it at the beginning of the lesson. The challenge that novice teachers have with understanding how to implement the learning target effectively in their classroom was similar to what was identified by Wiliam and Thompson (2007) who supported progression of learning for students in the form of frequent feedback provided to students to move their learning forward. This feedback would help students understand throughout the learning how to master the objectives. It was found in this study that due to the lack of restating the learning target throughout the lesson, the novice teacher failed to provide students with the feedback they need to help alter the learning gap.

Additionally, findings from this study included ways a novice teacher struggled with helping students connect new concepts to prior knowledge, specifically as seen through the types of questions that they ask. Strategies about how teachers can overcome this struggle were reported by Black and Wiliam (1998), including that students should have the opportunity to express their prior understandings of a topic so the teacher could use this information to scaffold instruction. During the professional development session that focused on question quality and nature of questioning, specific strategies that related to the indicators of each were included so the participants could consider how, in their teaching, they could use questioning to move student learning forward.

Relatedly, another finding uncovered was that the novice teacher who was observed struggled with gathering student learning evidence throughout the lesson due to the rare occurrence of checking for understanding of the concepts being taught throughout the lesson. The importance of gathering student learning evidence was revealed by Stiggins (2004) who argued that teachers should use assessment data daily to make immediate adjustments to the instruction and that formative assessment occurs while learning is in progress. During observations, the researcher noted minimal adjustments made by the novice teacher. Therefore, when planning the professional development session, the researcher brought forward the question for the participants to discuss strategies to gather student learning evidence in order to employ necessary instructional adjustments.

Based on the findings from this study, the more experienced teacher who was observed understood how to implement several aspects of effective short-cycle formative assessment strategies in the classroom. This was based on the pre-interview data and verified during classroom observations. Therefore, the researcher should provide the experienced teacher with highly focused feedback to enhance areas in which they already demonstrated proficiency. Moreover, the experienced teacher was encourage to co-facilitate the discussions during the professional development sessions.

Post-Observation Conferences

Data from the study showed that post-observation written feedback, in particular, provided teachers with increased knowledge and use of formative assessment. The feedback that teachers provided to students was one key strategy in effective

implementation of formative assessment (Black & Wiliam, 1998; Ramaprasad, 1983; Sadler, 1989; Stiggins, 2004; Stiggins & Chappius, 2008, Wiliam & Thompson, 2007). However, what was not included in the literature review was the importance of providing written feedback to teachers. The teacher participants were provided with written feedback during a post-observation feedback conference that outlined specifically what they should consider changing in their instruction to reach a rating of master for certain core-constructs. The teachers were allowed to keep this feedback as a reference when considering changes in practice. Similar to what is found in the literature review for students about how feedback influences future learning, feedback to teachers can influence future instruction (Ramaprasad, 1983; Sadler, 1989). Additionally, as cited in the literature review (Black & Wiliam, 1998), the dialogue between pupils and teachers is similar to the dialogue that occurred during the post-observation feedback conferences between the teacher and researcher. For example, at each conference, the teacher could refer back to their previous written feedback to determine how their knowledge and use of formative assessment had changed. This was a benefit of using the AssessToday™ observation protocol to conduct all the observations.

During the post-observation conferences, the findings showed that there was a difference in how the conversations transpired, depending on the ratings received by the teacher participant. While each participant was asked to reflect on their instruction, when the discussion turned to relating it back to the indicators, the depth of insights were not the same. Data showed that the novice teacher had to self-assess their understanding first for why it would be important for teachers to use information gleaned from questions asked to adjust instruction. Furthermore, it was noted that the novice

teacher struggled with helping students take academic risks and to reflect on their own learning with their peers. This was similar to research regarding the creating of effective classroom discussions to elicit evidence of student learning (Wiliam & Thompson, 2007). It can be inferred that in a first year teacher's classroom, students receive minimal formative assessment feedback because of the limited opportunities provided to students to share what they knew. This strategy described is one in which the teacher is the owner of the learning rather than the student, and there are fewer opportunities for students to function as learning resources for each other.

As shown in the data from the post-observation conferences, there were similarities from the findings. By the end of this study, the participants received the rating of master for observation of student affect because they were able to provide a variety of strategies to encourage students to self-evaluate and self-regulate their own learning. The literature review supported students self-assessing so they can understand the importance of the learning and thus can grasp a better understanding of the concepts (Black & Wiliam, 1998). The teachers in the research study received master level ratings in this area after participating in post-observation feedback conferences, for they were able to self-evaluate and self-regulate their own learning for how to impact students' self-evaluation and self-regulation. Based on the research findings, the distinction was made for how this would appear differently for various teachers. The novice teacher began at the apprentice level for this construct, while the experienced teacher began at the practitioner level. Moreover, the novice teacher did not have a self-reflection strategy that was modeled for students to use. In contrast, the

experienced teacher modeled strategies for students to self-reflect, though it was not initially observed that students' use of self-reflection strategies were monitored.

Post-observation feedback conferences are an integral component of the use of the AssessToday™ observation protocol. As a result of providing targeted support in the form of written feedback with a face-to-face conference, the teachers modeled self-reflection strategies for students to use throughout the lesson, and as observed later, students were using these strategies to build confidence in their own abilities to master the content.

Conclusion

One conclusion that can be reached as supported by the findings from the study is that professional development sessions should include assisting novice teachers in understanding the importance of feedback as a formative assessment strategy as it relates to revisiting the learning target. In one of the sessions in this study, the teachers read the article by Stiggins (2005b), "From Formative Assessment to Assessment for Learning: A Path to Success in Standards-Based Schools" and identified the student's role in understanding the learning target during the lesson. During the professional development session, the teachers identified the importance of revisiting the learning target throughout the lesson and how this strategy impacted student success. This revelation was directly linked to the idea posed by Stiggins, Arter, Chappius, and Chappius (2004) in that continuous learning requires that students know specifically where they are in relation to where they want to be. Experienced teachers develop and strengthen their knowledge as they become a leader in their professional learning community.

As demonstrated in this single case study, with the continuous need for teachers to feel supported in their efforts to instruct students effectively, findings provided insight into how targeted instructional support could assist in the growth and development of teachers. The participants in this study began with different understandings of formative assessment strategies and how to use them effectively in their classroom, as shown by their knowledge and use. The researcher assessed their prior knowledge in the pre-interviews then conducted a classroom observation to provide the researcher with additional information to determine each teacher's present knowledge and use for how they implement short-cycle formative assessment strategies. This information was used to differentiate the instructional support provided to each teacher during the professional development sessions as well as during the post-observation feedback conferences. Thus, the researcher concluded that an assessment of the present knowledge of each teacher's implementation of short-cycle formative assessment strategies through an interview and a classroom observation should occur before providing each teacher with targeted instructional support.

In summary, this study adds to the research of teacher knowledge and use of short-cycle formative assessment strategies. This study attempted to address a gap in the literature because of the limited research on how targeted instructional support accompanied with professional development can influence teacher instructional growth in the area of short-cycle formative assessment. Each participant showed progress in the implementation of formative assessment strategies in the classroom by the conclusion of the study. The insights provided from this research study are limited in

that it demonstrated how targeted teacher support systems and programs can enhance the professional development specifically for two sixth-grade mathematics teachers.

Implications

Both teachers and students face many challenges in teaching and learning mathematics. This study built on prior research in formative assessment and supports the effective implementation of short-cycle formative assessment strategies. This study is unique in that it examined closely the specificity needed to ensure that teachers experience positive support in their efforts to implement formative assessment strategies in their classrooms.

Implications for Professional Development

Results from this study provided a way for school leaders to implement targeted instructional support that could address the varied needs of teachers in a specific instructional area. This is similar to Ladner and Lips (2009) who reported on a program that school leaders in Florida implemented to address reading comprehension struggles of their students. The program included extensive professional development for teachers to address the needs of poor readers. In a similar way, the results of this study pinpoint two recommendations for professional development that school leaders can implement with their teachers to help them experience success in the classroom. First, school leaders should develop professional development sessions that target specific areas of teacher improvement. The instructional target area for this study was formative assessment strategies. Participants were provided with professional development that targeted the development of their knowledge and use of specific formative assessment strategies. The design of the professional development sessions, when targeting the

enhancement of a teacher's needs, should include careful consideration of the types of activities in which teachers would engage and how those activities would be immediately applicable in the classroom setting.

The second implication for professional development requires that school leaders differentiate instructional support to ensure each teacher receives the support needed to implement new practices. Similar to how teachers are instructed to develop lessons that focus on the individual needs of students, so should professional developers. In this study, the participants had different knowledge and levels of use of formative assessment strategies at the onset. Understanding each teacher's knowledge became important for the researcher to differentiate the targeted instructional support to meet their diverse needs related to the implementation of effective formative assessment strategies, in both professional development sessions and during post-observation conferences.

Implications for Teacher Instructional Growth

The study's findings indicated that implementation of the model relied heavily on campus leadership knowledge and the ability to coach teachers toward effective implementation of formative assessment practices. Teachers need time to collaborate with other teachers about the alignment of formative assessments strategies to the standards, the data garnered from the use of these strategies and effective next steps of instruction that may require knowledge about differentiation and other changes in instructional practices. School-wide implementation of formative assessment models represent a step in the right direction and demonstrate that it takes a team effort to make effective changes. However, it is important to note that, even with a school-wide

approach to implementing formative assessment, individual teachers must understand the purpose of formative assessment on student achievement. Additionally, understanding the purpose should include learning the terminology to be able to verbally articulate their knowledge of the skill.

The findings from this study are similar to Hollingsworth (2012), a case study in a Midwestern US high school the implementation of formative assessments based on changes in state curriculum across a transition of school-wide systematic practices for assessment. The focus of the research was to understand how campus leadership influenced the teacher's successful implementation of formative assessments. The campus leadership redesigned the school day to ensure that teachers had the time needed to collaborate and discuss instructional practices as related to implementation of formative assessment practices.

The data collection during this research study required that the researcher work closely with the teacher participants to help them develop a better understanding of effective formative assessment strategies. The post-interviews from Ms. Anderson and Ms. Thomas support the argument that changes in teacher knowledge and use of short-cycle formative assessment strategies occurred as they participated in the study. Furthermore, as Denzin and Lincoln (2011) articulated, qualitative researchers do not move to generalizability based on the data collected. The narrative story is the data, and it should be taken as such. In this study, provided targeted instructional support related to short-cycle formative assessment positively impacted participants' knowledge and use. Other researchers can interpret this as a story, one set of results, and consider how they may ask the same question with different participants and report on their own

findings. The research does not “guarantee” that this approach can be replicated with similar results. Such is the nature of qualitative research.

Suggestions for Future Research

During this study, the participants learned about and used formative assessment strategies that have implications for studying how students’ perceptions of the teaching process leads to improving student efficacy and achievement in the classroom. An increasingly common trend in recent research on formative assessment is the role of the student in the formative assessment process. Several researchers have studied the effect of formative assessment on student self-efficacy (Zimmerman, 1989; see also Schunk, 1989; Stiggins, 2004), yet they did not examine how providing teachers with targeted instructional support directly impacts student-self efficacy.

There exists a challenge for school leaders across all grade levels to address the impact that a teacher has on student-self efficacy, especially in an era of high-stakes testing and heightened accountability measures. Students must be encouraged not to quit. The building of a student’s confidence begins with the development of a system of assessment that provides students with credible success in the classroom. Implementation of effective formative assessment practices in the classroom in which learning is scaffolded can lead to student success. Stiggins and Chappius (2005) conducted a study about student self-efficacy that included how the formative assessment process shapes a student’s mentality, which ultimately influences their academic efficacy. The authors posited that students begin to develop conclusions about their potential for success based on the feedback they receive. Students develop their ideas about their potential for success early in their education (Stiggins, 2005a;

Stiggins & Chappius, 2005). Unfortunately for teachers in later grades, the psyche of students develops in earlier grades which creates a greater imperative for teachers in secondary classrooms to employ effective short-cycle formative assessment strategies.

As mentioned earlier in the limitations section of this study, the researcher subjectivity was a flaw that could be addressed in future research. This weakness can be addressed through the research design. Case study design tends to spark concern because traditionally the research lacks systematic procedures or methodological guidelines (Yin, 2009). The case study researcher is faced with the challenge of clarifying and developing their methodological techniques to construct validity. For this reason, it would be beneficial for future researchers to trace their methods of gathering data and select early on in the study if they are going to gather and analyze using inductive or deductive methods. To support the gathering of data, audio recording post-observation feedback conferences and professional development sessions would prove helpful. Additionally, to develop an enduring skill such as short-cycle formative assessment implementation, more time and more instances of targeted instructional support by the school leaders of at least 50-80 hours would further establish effective implementation over time (Banilour, 2002). As a result, school leaders should create a targeted instructional support plan for teachers that include at least twenty opportunities for teachers to practice implementation with continuous support to ensure growth (Joyce & Showers, 2002).

In all, this study found that targeted instructional support that focused on short-cycle formative assessment was effective when it was implemented through professional development sessions and post-observation conferences. The participants

increased in both knowledge and use of short-cycle formative assessment. They have become examples for other teachers on which they can draw as resources to consider their own practices of short-cycle formative assessment. Education leaders can also address how their own professional development becomes targeted instructional support and ways to consider how to differentiate instruction to meet the needs of all teachers engaged in their professional development.

APPENDIX A

TEACHER PRE-INTERVIEW QUESTIONS

1. How would you define the term formative assessment?

2. How do you communicate the intended learning of a lesson, activity, project, or unit to students?

3. When do students in your class receive feedback on their progress?

4. What forms does feedback take in your classroom?

5. What do you expect students to do with feedback information?

6. How do the processes of tracking, reflecting on, and sharing learning work to "close the gap?"

Questions Adapted From: Seven Strategies of Assessment for Learning, Jan Chappius (2009)

APPENDIX B

TEACHER POST-INTERVIEW QUESTIONS

1. How would you define the term formative assessment?

2. How do you communicate the intended learning of a lesson, activity, project, or unit to students?

3. When do students in your class receive feedback on their progress?

4. What forms does feedback take in your classroom?

5. What do you expect students to do with feedback information?

6. How do the processes of tracking, reflecting on, and sharing learning work to “close the gap?”

7. Has your definition of formative assessment changed from the beginning of the study until now?

Questions Adapted From: Seven Strategies of Assessment for Learning, Jan Chappius (2009)

APPENDIX C

SELF-ASSESSMENT ACTIVITY: LEARNING TARGET PROFESSIONAL DEVELOPMENT SESSION

"Check Yourself"
Self-Assessment Activity

Directions: Place a check in the box that best describes your present implementation of the following core constructs of formative assessment.

Core Constructs of Formative Assessment	Novice	Apprentice	Practitioner	Master
Learning Target	None or one of the indicators is observed during the class period.	Two of the four indicators are observed during the class period.	Three of the four indicators are observed during the class period.	All four indicators are observed during the class period.
Learning Target matches lesson - Teacher states objectives – Teacher writes objectives for students to see – Students write objectives down – Teacher revisits objectives				
Check one and provide an example or explanation of why you rated yourself in that particular area.				
Evidence of Learning[1]	There is minimal evidence that learning occurred. There is evidence of learning for 0-24% of the students according to suggested indicators.	There is episodic evidence that learning occurred. There is evidence of learning for 25-49% of the students according to suggested indicators.	There is evidence of learning for 50-74% of the students according to suggested indicators.	There is evidence of learning for 75-100% of the students according to suggested indicators: The use of the following examples indicates high evidence of learning: traffic lights, white boards, thumbs, individual responses, and authentic artifacts of learning.
All student responses – Individual responses – Artifacts of learning				
Check one and provide an example or explanation of why you rated yourself in that particular area.				

[1] McMillan (2010) suggests that evidence of learning should come from varied assessments.

APPENDIX D

INSTRUCTIONAL ADJUSTMENT PROFESSIONAL DEVELOPMENT SESSION:

CLASSROOM SCENARIOS ACTIVITY

1.) Students are working on an independent practice activity for 20 minutes. The teacher circulates around the room and monitors student work. Less than half of the students are demonstrating at least 70% mastery of the content on the activity.
2.) Students are working in groups of 3-4 completing 3 station review activities. The teacher allots 5 minutes for students to complete each station activity. As the groups are working at each station, the teacher works with a small group of students (5) in the back of the classroom on a reteach activity.
3.) Students are taking notes from the board in their math journals for 20 minutes. The teacher is emphasizing key vocabulary and modeling for students the content specific strategy they should use to understand the concept during the note taking.

APPENDIX E

POST-OBSERVATION CONFERENCE FEEDBACK EXAMPLES

Teacher: A Date of Observation: 1/14/2016 Date of Post-Observation Interview: 1/19/2016

Post Observation Interview
Feedback Template

Core Constructs of Formative Assessment	Rating	Evidence
Learning Target	Apprentice	Two of the four indicators are observed during the class period. • **Teacher states objectives** – After students completed the Do Now, the teacher shared with the students what they were going to learn that day. • **Teacher writes objectives for students to see** – Lesson objective was posted on the board. • *Student writes objective down – Not observed –By writing down the lesson objective (in their own words) students can begin to set their own learning goals and take ownership in their progress towards meeting those goals.* • **Teacher revisits objectives** – *Not observed – By restating the objective throughout the lesson, students can begin to make connections and monitor their progress towards mastery of the objective.*
Question Quality	Apprentice	Teacher rarely uses questions effectively to scaffold instruction. • *Open ended questions – The teacher asked some open ended questions. "How could I figure out?" Most questions were "1" answer questions and procedural questions. Asking students to justify their solutions when answering a question with one word or number will increase student's critical thinking skills.* • **Bloom's high and low mix** – Mostly low level questions (knowledge and comprehension) with a few high level questions. • **Connects to prior knowledge** – Not observed – explicitly asking questions that connect student's prior and present knowledge will help students begin to think critically about the content.
Nature of Questioning	Apprentice	Teacher generally uses questioning effectively to diagnose problems with learning and improve instruction. • *Follow-up questioning – There was follow-up questioning done whole group after choral response, but during the group activity, the teacher would ask a question and then not follow-up with the group to ensure that*

Teacher: A Date of Observation: 1/14/2016 Date of Post-Observation Interview: 1/19/2016

		they were working towards answering the question that was posed or understood the content that the teacher was trying to reinforce with the question. • *Wait time* – There was a lot of emphasis placed on choral response. The teacher intentionally waited for all students to answer the question, and followed up with asking the question again until she heard the correct answer in unison. *This is an effective strategy for repetition and retention of key information; it does however lend itself to potentially not being able to diagnose individual problems immediately.*
Self-Evaluation	Apprentice	Evidence of one self-evaluation strategy or tool is used during instruction in an effort to regulate and improve the student's self-learning. • **Teacher initiated** – The teacher explicitly stated and modeled the use of the UPS problem solving strategy to help students begin the process of self-evaluating their progress towards mastery. *The teacher did not place emphasis on the check portion of the UPS check.* • **Clearly defined strategy** – UPS check • **Student use strategies** –It was unclear if they were required to use the check portion of the UPS check every time they used this strategy to solve the problems.
Observation of Student Affect	Practitioner	Teacher is sensitive to the affect of most students and shows general evidence of balancing teaching content with affect. Academic risk taking behavior is evidenced, but occurs in infrequent, episodic intervals.
Instructional Adjustment	Apprentice	Teacher uses minimal adjustments during instruction.
Evidence of Learning	Practitioner	There is evidence of learning for 50-74% of students according to suggested indicators.

Teacher: B Date of Observation: 1/14/2016 Date of Post-Observation Interview: 1/15/2016

Post Observation Interview
Feedback Template

Core Constructs of Formative Assessment	Rating	Evidence
Learning Target	Practitioner	Three of the four indicators are observed during the class period. • **Teacher states objectives** – After students completed the Do Now, the teacher started the lesson by stating the objective. • **Teacher writes objectives for students to see** – Lesson objective was posted on the board. • *Student writes objective down – Not observed – The teacher had students refer to their prior learning throughout the observation. By writing down the lesson objective (in their own words) students can begin to set their own learning goals and take ownership in their progress towards meeting those goals.* • **Teacher revisits objectives** – The teacher restated what students were learning today through the use of the academic vocabulary as well as through connecting the lesson objective for today to previous learning.
Question Quality	Master	Teacher consistently and appropriately uses questions effectively to scaffold instruction. • **Open ended questions** – Mostly all of the questions asked were open ended questions where students had to reflect and elaborate on their thinking. • **Bloom's high and low mix** – All levels of questions were present in the lesson. • **Connects to prior knowledge** – Throughout the lesson, the teacher consistently connected the present learning to prior knowledge. She made those connections explicit by stating, "Remember yesterday we…"
Nature of Questioning	Practitioner	Teacher generally uses questioning effectively to diagnose problems with learning and improve instruction. • *Follow-up questioning – There was follow-up questioning done whole*

Teacher: B Date of Observation: 1/14/2016 Date of Post-Observation Interview: 1/15/2016

		group after choral response, but there can be some intention on following up with individual students. As the teacher circulates around the room, there could be some intentionality spent on explicitly diagnosing some individual misconceptions and the clearing up of those misconceptions through questioning. • *Wait time* – There was a lot of emphasis placed on choral response. The teacher intentionally waited for all students to answer the question, and followed up with asking the question again until she heard the correct answer in unison. *This is an effective strategy for repetition and retention of key information; it does however lend itself to potentially not being able to diagnose individual problems immediately.*
Self-Evaluation	Practitioner	Evidence of one self-evaluation strategy or tool is used during instruction in an effort to regulate and improve the student's self-learning. • **Teacher initiated** – The teacher explicitly stated and modeled the use of the UPS problem solving strategy to help students begin the process of self-evaluating their progress towards mastery. *The teacher did not place emphasis on the check portion of the UPS check.* • **Clearly defined strategy** – UPS check and thinking circles • **Student use strategies** – The students used the thinking circles. It was unclear if they were required to use the check portion of the UPS check every time they used this strategy to solve the problems.
Observation of Student Affect	Master	Teacher is sensitive to student affect, collects evidence through body language, facial expressions, and/or class work, and adjusts instruction accordingly. Teacher demonstrates expertise and polish in balancing content with student affect. Academic risk-taking is actively encouraged and occurring frequently. • Student behavior – Students participate in the lesson freely and clear about the expectations. Students are actively engaged in the lesson and provide the teacher with evidence of being engaged through participating in choral response and taking notes. • Teacher behavior – The teacher allows students to explain their reasoning, and understanding of the concepts without judgment. • Teacher focus – The calls on volunteers and non-volunteers to answer questions and focuses the instruction of perceived misconceptions. • Student interactions – Students are encouraged to agree and disagree with one another and share their understanding of the concepts with their peers.
Instructional Adjustment	Master	Teacher consistently and effectively uses adjustments during instruction.

APPENDIX F

EXAMPLES OF CLASSROOM OBSERVATION FIELD NOTES

Teacher B 11/14/16 12:25-1:05

AssessToday
A Short-Cycle Formative Assessment Observation Protocol

Core Constructs of Formative Assessment	Novice	Apprentice	Practitioner	Master
Learning Target	None or one of the indicators is observed during the class period.	Two of the four indicators are observed during the class period.	Three of the four indicators are observed during the class period. ✓	All four indicators are observed during the class period. Preferably in their own words = explicitly!
Learning Target matches lesson - Teacher states objectives – Teacher writes objectives for students to see – Students write objectives down – Teacher revisits objectives				
SWBAT solve x/t one step inequalities and graph solutions. The teacher stated the objective. The objective is posted. The teacher revisits the objective throughout the lesson				
Question Quality	Teacher does not use questions effectively during instruction.	Teacher rarely uses questions effectively to scaffold instruction.	Teacher generally uses questions effectively to scaffold instruction.	Teacher consistently and appropriately uses questions effectively to scaffold instruction. ✓
Do you agree or disagree? Did he make a profit, yes or no and why? What's very important? What do we need to know? What do we know about a profit? **Open ended questions – Bloom's high and low mix – Connects to prior knowledge** What is going to happen? The question is asking for an inequality... what inequality can we used? If he spent $50, did he make a profit... turn and talk to your partner. If you said multiply what would you multiply if you said divide what would you divide?				
Nature of Questioning[1]	Teacher does not use questioning effectively during instruction	Teacher rarely uses questioning effectively to diagnose problems with learning and improve instruction.	Teacher generally uses questioning effectively to diagnose problems with learning and improve instruction. ✓	Teacher consistently and appropriately uses questioning effectively to diagnose problems with learning and improve instruction.
Follow-up questioning – Wait time Students answer the question when provided with wait time... choral response questions are answered by most students. Involving all students in the questioning. Diagnosing is done whole group... Individual feedback/diagnosis through reflections.				
Self-evaluation[2]	Teacher does not use student self-evaluation strategy or tool during instruction.	Generic self-evaluation strategy(s) or tool(s) is employed but the strategy is not explicitly tied to the regulation and improvement of student's self-learning.	Evidence of one self-evaluation strategy or tool is used during instruction in an effort to regulate and improve the student's self-learning. ✓	Teacher uses a variety (two or more) of strategies or tools to encourage students to self-evaluate in an effort to regulate and improve their own learning. These could include techniques such as the use of traffic lights, a self-assessment inventory, journaling, and/or reflection statements.
Teacher initiated – Clearly defined strategy – Student use strategies The UPS check is used by the teacher. Is that correct? Students use UPS check when prompted by the teacher. Don't forget to check your solution with your thinking circles. UPS check I check over my work to make sure I did it right. Make that statement explicit...				

[1] Brophy and Good (1984) conclude good questioning helps maximize learning.
[2] Black and Wiliam (1998) discuss the importance of self-evaluation in the formative assessment context.

AssessToday
A Short-Cycle Formative Assessment Observation Protocol

Core Constructs of Formative Assessment	Novice	Apprentice	Practitioner	Master
Observation of Student Affect[3]	Teacher does not attend to how feedback is received by the student. There is no evidence of consideration of affect. Total emphasis is on teaching specific content. Risk-taking behavior is actively discouraged.	Teacher shows limited sensitivity to student affect and tailors feedback for only a few students. Most emphasis is on teaching specific content. Although academic risk-taking behavior may be present, it is not encouraged.	Teacher is sensitive to the affect of most students and shows general evidence of balancing teaching content with affect. Academic risk-taking behavior is evidenced, but occurs in infrequent, episodic intervals.	Teacher is sensitive to student affect, collects evidence through body language, facial expressions, and/or class work, and adjusts instruction accordingly. Teacher demonstrates expertise and polish in balancing content with student affect. Academic risk-taking is actively encouraged and occurring frequently.
Student behavior – Teacher behavior – Teacher focus – Student interactions				
The teacher calls on students randomly. She asks students to agree or disagree with their peers. She allows students to explain their answers without making judgments or telling them immediately if they are Right or wrong. Students interact positively with one another. They are comfortable agreeing/disagreeing with each other.				
Instructional Adjustment[4]	No adjustments to instruction are observed.	Teacher uses minimal adjustments during instruction.	Teacher predominately and effectively uses adjustments during instruction.	Teacher consistently and effectively uses adjustments during instruction. ✓
Instructional strategies – Instructional timing – Instructional audience – Grouping strategies				
When students respond indifferently or choral response is not cohesive, the teacher rephrases the information. Grouping strategies → Turn + Talk (partner share) Instructional Strategies) white boards				The teacher circulates around the room and monitors student work.
Evidence of Learning[5]	There is minimal evidence that learning occurred. There is evidence of learning for 0-24% of the students according to suggested indicators.	There is episodic evidence that learning occurred. There is evidence of learning for 25-49% of the students according to suggested indicators.	There is evidence of learning for 50-74% of the students according to suggested indicators.	There is evidence of learning for 75-100% of the students according to suggested indicators: The use of the following examples indicates high evidence of learning: traffic lights, white boards, thumbs, individual responses, and authentic artifacts of learning.
All student responses – Individual responses – Artifacts of learning				
Choral responses: Some responses are one word/phrase. Most questions/responses require individual students to justify their solution. DOL - 10 minutes to complete. "White boards" Don't forget to check your solution with your "thinking circle".				choral response individual response

The teacher allows students to share their answers with their peers and then had up their individual responses

Number of Students: 25 17 girls 8 boys

Demographics: All Hispanic

[3] Formative assessment will influence student affect in the classroom (Black & Wiliam, 1998; Stiggins 2010; Brookhart, Moss, & Long, 2008).
[4] Popham (2008) states that formative assessment use requires instructional adjustments.
[5] McMillan (2010) suggests that evidence of learning should come from varied assessments.

Teacher A 1/14/16 1:10pm-1:50pm

AssessToday
A Short-Cycle Formative Assessment Observation Protocol

Core Constructs of Formative Assessment	Novice	Apprentice	Practitioner	Master
Learning Target	None or one of the indicators is observed during the class period.	Two of the four indicators are observed during the class period. ✓	Three of the four indicators are observed during the class period.	All four indicators are observed during the class period.
Learning Target matches lesson - Teacher states objectives – Teacher writes objectives for students to see – Students write objectives down – Teacher revisits objectives				
Question Quality	Teacher does not use questions effectively during instruction.	Teacher rarely uses questions effectively to scaffold instruction.	Teacher generally uses questions effectively to scaffold instruction.	Teacher consistently and appropriately uses questions effectively to scaffold instruction.
Open ended questions – Bloom's high and low mix – Connects to prior knowledge				
Nature of Questioning[1]	Teacher does not use questioning effectively during instruction	Teacher rarely uses questioning effectively to diagnose problems with learning and improve instruction.	Teacher generally uses questioning effectively to diagnose problems with learning and improve instruction. ✓	Teacher consistently and appropriately uses questioning effectively to diagnose problems with learning and improve instruction.
Follow-up questioning – Wait time				
Self-evaluation[2]	Teacher does not use student self-evaluation strategy or tool during instruction.	Generic self-evaluation strategy(s) or tool(s) is employed but the strategy is not explicitly tied to the regulation and improvement of student's self-learning. ✓	Evidence of one self-evaluation strategy or tool is used during instruction in an effort to regulate and improve the student's self-learning.	Teacher uses a variety (two or more) of strategies or tools to encourage students to self-evaluate in an effort to regulate and improve their own learning. These could include techniques such as the use of traffic lights, a self-assessment inventory, journaling, and/or reflection statements.
Teacher initiated – Clearly defined strategy – Student use strategies				

What is our total?
How many does she have remaining?
The teacher poses question.
What did I do to my left side?

If I ...
How could I figure out?
What is my right side of the equation?

How can I figure out how much each side is if I know one side?

The teacher asked students clarifying and extension questions. Different groups. She failed to follow-up briefly ~~with~~ to the group that she asked the question to.

Teacher stated that students were using the WRS Check strategy which includes a self-evaluation/ Check
Students weren't required to self-evaluate ... "I check over my work to make sure I did it right."

[1] Brophy and Good (1984) conclude good questioning helps maximize learning.
[2] Black and Wiliam (1998) discuss the importance of self-evaluation in the formative assessment context.

AssessToday
A Short-Cycle Formative Assessment Observation Protocol

Core Constructs of Formative Assessment	Novice	Apprentice	Practitioner	Master
Observation of Student Affect[3]	Teacher does not attend to how feedback is received by the student. There is no evidence of consideration of affect. Total emphasis is on teaching specific content. Risk-taking behavior is actively discouraged.	Teacher shows limited sensitivity to student affect and tailors feedback for only a few students. Most emphasis is on teaching specific content. Although academic risk-taking behavior may be present, it is not encouraged.	Teacher is sensitive to the affect of most students and shows general evidence of balancing teaching content with affect. Academic risk-taking behavior is evidenced, but occurs in infrequent, episodic intervals.	Teacher is sensitive to student affect, collects evidence through body language, facial expressions, and/or class work, and adjusts instruction accordingly. Teacher demonstrates expertise and polish in balancing content with student affect. Academic risk-taking is actively encouraged and occurring frequently.
Student behavior – Teacher behavior – Teacher focus – Student interactions				
~~SWBAT solve multiplication and division one-step inequalities using numbers.~~ equations The teacher poses questions and less than 5 students raise their hands to volunteer the answer. It was unclear if all students were authentically involved. Most students in the group setting asked each other questions. Were willing to take risks.				
Instructional Adjustment[4]	No adjustments to instruction are observed.	Teacher uses minimal adjustments during instruction.	Teacher predominately and effectively uses adjustments during instruction.	Teacher consistently and effectively uses adjustments during instruction.
Instructional strategies – Instructional timing – Instructional audience – Grouping strategies				
Students worked in groups of 2-4. Group roles? Strategies for grouping was not evident. The teacher circulated around the room to the different groups asking clarifying questions				
Evidence of Learning[5]	There is minimal evidence that learning occurred. There is evidence of learning for 0-24% of the students according to suggested indicators.	There is episodic evidence that learning occurred. There is evidence of learning for 25-49% of the students according to suggested indicators.	There is evidence of learning for 50-74% of the students according to suggested indicators.	There is evidence of learning for 75-100% of the students according to suggested indicators: The use of the following examples indicates high evidence of learning: traffic lights, white boards, thumbs, individual responses, and authentic artifacts of learning.
All student responses – Individual responses – Artifacts of learning				
White board response was used. Individual student responses by volunteering.				

I see individuals working on the problems not groups working on the problems

Number of Students: 22 (10 boys, 12 girls)
Demographics: 4 AA, 18 Hispanic

[3] Formative assessment will influence student affect in the classroom (Black & Wiliam, 1998; Stiggins 2010; Brookhart, Moss, & Long, 2008).
[4] Popham (2008) states that formative assessment use requires instructional adjustments.
[5] McMillan (2010) suggests that evidence of learning should come from varied assessments.

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