COMMON FORMATIVE ASSESSMENTS DEVELOPED THROUGH PROFESSIONAL LEARNING COMMUNITIES (PLCs): A CASE STUDY TO ANALYZE THE ALIGNMENT OF CURRICULUM, ASSESSMENT, AND INSTRUCTION IN A MATH PLC AT A TITLE I MIDDLE SCHOOL IN THE SOUTHERN UNITED STATES

A Record of Study

by

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Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

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May 2013

Major Subject: Curriculum and Instruction

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ABSTRACT

The introduction of No Child Left Behind increased performance expectations for students across the United States and compelled teachers to focus on standardized assessments instead of frequent formative assessments to monitor instruction and promote student learning. Common formative assessments (CFAs) help teachers align curriculum, assessment, and instruction while building the collective knowledge of the professional learning communities (PLCs). This qualitative case study analyzed the collaborative processes used by five sixth grade math teachers and one instructional coach (IC) at a Title I middle in the Southern United States to align the rigor between learning objectives, PLC-developed CFAs and classroom instruction. Of the teachers selected for the case study, the most experienced teacher had 35 years of teaching experience while the least experienced had two years of experience.

This case study sought to answer the following overarching question: What collaborative processes are used to build CFAs in a PLC comprised of five sixth grade math teachers and one instructional coach at a Title I middle school in the Southern United States. The following sub-questions were also addressed:

1. What professional dialogue occurs when the sixth grade math PLC collaborates to develop CFAs that align with the rigor of TEKS and STAAR?
2. What resources does the sixth grade math PLC use to develop CFAs that align with the rigor of the TEKS and STAAR?

Data was collected during collaborative CFA development sessions, eJournal reflection notes, one focus group, and supplemental documents from participants. Qualitative data analysis techniques included combing through the data for codes and using constant comparative analysis to determine main and sub-themes. The findings discovered that the sixth grade math PLC was methodical in their protocols to build CFAs. The progression from beginning to end involved deconstructing the TEKS, sharing instructional strategies, identifying anticipated student misconceptions and posing reflective questions to the group. The results of the case study revealed that the processes involved in creating CFAs were strategically implemented in a way that promoted precise alignment between curriculum, assessment, and instruction.

DEDICATION

This research is dedicated with all my love to my grandmother, Ruby M. Hill. Your amazing ability to touch the lives of so many students inspired me to pursue education. Your encouragement kept me going, your prayers helped me reach my potential, and your words of wisdom grounded me in humility.

ACKNOWLEDGEMENTS

I would like to thank God for giving me the strength to complete this doctoral degree, an accomplishment I could have never achieved on my own.

My deepest gratitude goes to my wife and friend, Dr. Tunisha Q. Hill, for her enduring love, fervent prayers, and continual support throughout this experience. I could not have accomplished this without her immeasurable sacrifices and relentless patience. Thanks for walking this journey with me, listening when I needed to talk, and motivating me to press forward.

I would also like to thank my grandmother, mother, and family for their love and encouragement.

Thanks also to my committee co-chairs, Dr. Valerie Hill-Jackson and Dr. Lynne Walters, for their wisdom, patience and guidance during the course of this research. I would also like to thank my committee members, Dr. Jia Wang and Dr. Bugrahan Yalvac for their commitment, support and feedback.

I wish to extend my gratitude to Mandy Stutts who was very instrumental in helping me complete this project and Sharon Helmke for editing and critiquing my work. Finally, thanks to my administrative team, colleagues, faculty and friends who have supported me over the past four years.

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CHAPTER I

INTRODUCTION

Background

Educators are constantly faced with demands from state and federal legislatures to improve overall instruction and student performance. The introduction of No Child Left Behind (NCLB) (20 U.S.C. § 6319), Adequate Yearly Progress (AYP) (20 U.S.C. § 6319) and state accountability ratings have compelled many educators to *teach to the test* in order to reach annual goals. The concept of standardized testing contradicts what many educational scholars have considered effective teaching and learning (e.g., Dewey, 1938; Sarason, 2004; Pinar, 2004; and Kelly, 2009). Although some schools across the nation have achieved higher standardized test scores, this superficial increase has resulted from less of a focus on what Kelly (2009) referred to as "curriculum as process and development" (p. 89) and more of a focus on *teaching to the test*. Present day students are "forced to learn what the [standardized] test-makers declare to be important" (Pinar, 2004, p. 10) for the test, all at the expense of long-lasting conceptual understanding, academic gains and concept transferability.

Across the state of Texas, schools are expected to meet accountability expectations that continue to rise with the introduction of the State of Texas Assessment of Academic Readiness (STAAR) and End of Course (EOC) exams. Although these assessments are aligned with state objectives, they do not provide precise and timely data for immediate instructional decision-making in the classroom. Reeves (2000)

referred to state assessments, such as STAAR and EOC, as autopsies that provide useful information after the patient's health has failed, while teacher developed assessments serve as physical exams that promote a healthier life style. Unfortunately, profound credence has been placed on standardized summative assessments instead of promoting the use of ongoing formative assessments to guide student learning and to foster timely instructional adjustments. The current era of standardized testing reflects the disconnect that exists between accountability and improved student achievement in the classroom (Stiggins, 2005). In order to promote increased student learning, teachers must become more strategic in their use of formative assessments. The precision by which assessments are used to immediately examine understanding is the catalyst for improved student mastery and better results on summative assessments such as STAAR and EOC.

Scriven (1967) and Bloom, Hastings, and Madaus (1971) established a conceptual framework for using formative and summative assessments to enhance student learning. Formative assessments are used to inform teachers and students about progress toward achieving the learning goals, while summative assessments are administered to determine mastery at the completion of a unit of study or course (Bloom, Hastings, & Madaus, 1971). Common assessments are either formative or summative instruments (a) created by two or more teachers, (b) scored collaboratively and (c) used to provide immediate feedback to educators (Reeves, 2004). The way in which teachers use common assessment data determines whether the instrument is formative or summative. The definitions and strategies presented by these assessment researchers

apply to contemporary classrooms but are often disregarded due to the absence of formal teacher training in effective assessment practices.

Other researchers argue that one of the most strategic ways to improve overall student performance is through the use of on-going, high-quality assessments created by PLCs (Fullan, 2001; Hargreaves, 2002; Stiggins, 2005; Wiliam & Thompson, 2007). PLCs are educators "committed to working collaboratively in ongoing processes of collective inquiry and action research to achieve better results for the students they serve" (DuFour, Dufour, & Eaker, 2008, p. 14). PLCs allow teachers to combine pedagogical content knowledge for instructional planning, assessment development, diagnosis of student learning deficiencies, and action planning for re-teaching (Hughes & Kritsonis, 2006; DuFour, DuFour & Eaker, 2008). Although policy makers promoted the use of standardized summative assessments for school accountability, many researchers (Reeves, 2000; Stiggins, 2002; Guskey, 2003; Hyde, Clayton, & Booth, 2004) suggested that PLCs collaboratively develop and administer formative assessments as a catalyst to advance student learning.

Young and Kim (2010) reported that the efficient use of data to guide instruction rests on the formative assessment practices of teachers, the usefulness of formative data, and the collective content and pedagogical knowledge of teachers—all of which are strengthened through collaboration in PLCs. It is the combination of these critical elements that provide teachers with the skills to plan meaningful lessons and make instructional adjustments based on assessment data. Black and Wiliam (1998a) found that student gains that resulted from formative assessment practices were "among the

largest ever reported for educational interventions" (p. 61). Despite external pressure to perform on standardized summative tests, PLCs must maintain a clear focus on the use of effective formative assessment approaches to monitor and promote student mastery of the curriculum.

Purpose of the Study

This field-based case study analyzed the collaborative processes used by five sixth grade math teachers and one instructional coach to align PLC-developed CFAs to the rigor level of the Texas Essential Knowledge and Skills (TEKS). The term *collaborative processes* refers to the way teachers think, dialogue, and interact with one another as a PLC. These covert characteristics evolve as a result of the synergy created when teachers openly reflect on their work, grapple with new ideas, question their peers, deconstruct the learning objectives, create assessments, and share best practices. According to Schmoker (2005) the capacity of a PLC to transform instructional practice rests on its collective ability to engage in "clear, frequent talk about concrete details" (p. 143) related to curriculum, assessment, and instruction. DuFour et al., (2006) argued that these interactions allow teacher to question their current reality, experience cognitive dissonance, build shared knowledge, and develop new capabilities. *Alignment* refers to the extent to which curriculum standards, assessments and instruction are designed at a level of cognitive demand that allows students to meet learning targets (Webb, 2007). *Rigor* includes the learning experiences that allow students to become cognitively engaged in activities that align to the learning objectives (Blackburn, 2008).

The end product of this field-based study includes a summary of practical protocols to guide teachers and educational leaders in the development and implementation of collaboratively designed CFAs that align with the state curriculum and classroom instruction. Protocols include formal and informal assessment development procedures, resources for assessment questions, blueprints for aligning CFA questions and instructional planning documents. Literature regarding the use of CFAs to align curriculum, assessments and instruction will also be presented. The audience, which consists of educators interested in gaining a greater understanding of PLC-developed CFAs, will benefit from a compilation of resources and reflections on the processes associated with CFA development prior to instruction and understand how collaborative processes aid in the alignment of curriculum, assessment, and instruction.

A qualitative case study research approach was used to gain insight into the current realities of how five sixth grade math teachers and one instructional coach at a Title I middle in the Southern United States (pseudonym to protect participant identity) used PLC-developed CFAs created prior to instruction to guide the alignment between curriculum, assessment, and instruction. Multiple data sources were used to compile information regarding the collaborative processes involved in building PLC-developed CFAs. The research incorporated (a) audio recordings of the PLC during the CFA development process, (b) a focus group interview with the team of teachers and instructional coach, (c) eJournal lesson reflections from each teacher in the PLC, and (d) additional documents shared by the PLC.

Statement of the Problem

Despite NCLB requirements, many researchers argued that standardized summative testing had little impact on improving student learning (Arter, 2003; Linn, 2000; Sacks, 1999). Instead, these researchers proposed that educators make use of frequent CFAs to drive instructional decisions and measure incremental learning gains. During the current era of education reform, minimal research has been conducted on the role of CFAs created by PLCs as a tool to promote alignment between curriculum, assessment, and instruction. Although many researchers have explored the use of teacher made assessments to guide instruction (e.g., Plake, Impara, & Fager, 1993; DuFour, DuFour, Eaker, & Many, 2006; Black & Wiliam, 1998a), the use of PLC-developed CFAs to promote a deeper understanding of the curriculum by teachers prior to instruction was worthy of greater review.

While prior research provides theory regarding the implementation and benefits of common assessments and PLCs, this case study merges these two concepts in an attempt to make collaboratively developed CFAs more practical for PLCs. An overarching problem that has not been adequately addressed in earlier research is the method by which teachers collaboratively develop CFAs prior to lesson design as a means to enhance teacher understanding of the curriculum thereby promoting precisely aligned, rigorous classroom assessments and instruction. Blackburn (2008) defined rigor as learning experiences that are aligned to objectives and allow students to think and learn at high levels. Rigor alignment is the interconnection between the curriculum—*what* is taught; assessment—*how* it is measured; and instruction—*how* it is taught.

Figure 1.1 provides a visual of the alignment interdependence that exits between the rigor of curriculum, assessment, and instruction.

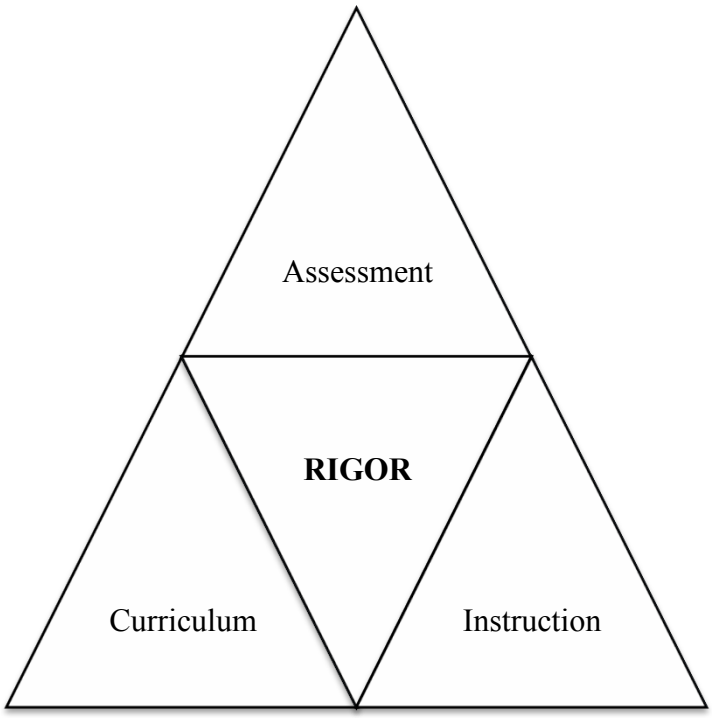


Figure 1.1: Rigor Alignment between Curriculum, Assessment, and Instruction.

Several researchers noted that many schools across the nation have implemented CFAs (Guskey, 2003; Martin, 2006; Ainsworth & Viegut, 2006); however, little research exists on the practical processes involved in the development of collaboratively designed CFAs aligned to the state objectives. This paradigm presupposes that assessment is central, not peripheral, to instruction (Wiggins, 1998) and must be developed *prior* to building instructional plans. This field-based case study explored the collaborative

methods involved in creating CFAs prior to instruction and how these instruments were used to guide lesson design.

Research Questions

This case study answered the following overarching question: What collaborative processes are used to build CFAs in a PLC comprised of five sixth grade math teachers and one instructional coach (IC) at a Title I middle school in the Southern United States? Sub-questions included:

1. What professional dialogue occurs when the sixth grade math PLC collaborates to develop CFAs that align with the rigor of TEKS and STAAR?
2. What resources does the sixth grade math PLC use to develop CFAs that align with the rigor of the TEKS and STAAR?

Significance of the Study

The current emphasis on high-stakes standardized summative testing has its roots in the widely known text *A Nation at Risk: Imperatives of Education Reform* (National Commission on Excellence in Education, 1983). This manuscript, published in 1983, criticized the American public school system and called for the administering of standardized summative tests to measure the success of schools. It also argued that most students across the country were behind other nations and had regressed relative to national performance in years prior (National Commission on Excellence in Education, 1983). In response to this report, the federal government passed the No Child Left

Behind (NCLB) Act of 2001 (20 U.S.C. § 6319). As a result of this legislation the existing emphasis on accountability, school ratings, Adequate Yearly Progress (AYP) and standardized summative testing evolved. NCLB requires schools across the nation to (a) assess all third through eighth grade students annually in reading and math, (b) meet annual AYP goals and (c) ensure that all students meet minimum standards on reading and math state assessments by 2014. In addition, NCLB included an update to Title I, Part A which allocated funds to target high poverty schools or students who were at risk of not meeting NCLB standards (20 U.S.C. § 6319). The current standards of accountability under NCLB make it imperative that teachers implement an effective system of standards-based CFAs and rigorous instruction in order to help students continuously meet learning targets and accountability expectations.

Definitions of Terms

For the purpose of this case study, the following definitions and acronyms will be used.

1. Alignment: Alignment refers to the extent to which curriculum standards, assessments, and instruction are designed at a level of cognitive demand that allows students to meet learning targets (Webb, 2007).
2. Assessment: Assessment refers to the process of using multiple methods or tools to collect information about student mastery of the curriculum (Gareis & Grant, 2008).

3. Assessment Literacy: Assessment literacy refers to a teacher's ability to incorporate multiple modes of assessments as a means of measuring student growth and teacher success.
4. Collaborative Process: Collaborative processes refers to the way teachers think, dialogue, and interact with one another as a PLC. These covert characteristics evolve as a result of the synergy created when teachers openly reflect on their work, grapple with new ideas, question their peers, deconstruct the learning objectives, create assessments, and share best practices.
5. Common Formative Assessment (CFA): Common formative assessments (CFAs) are instruments (a) created by two or more teachers, (b) scored collaboratively and (c) used to provide immediate feedback to PLCs (Reeves, 2004).
6. Curriculum: Curriculum is the set of intentionally defined outcomes for learning that is usually prescribed by the state education agency (Johnson, 2004).
7. Formative Assessment: Formative assessments are used during instruction to inform teachers and students about progress toward achieving the intended learning goals for the course (Bloom, Hastings, & Madaus, 1971).
8. Instruction: Instruction is the "planned and unplanned experiences provided by a teacher and are intended to result in the acquisition of a set of intending learning outcomes for students (Gareis & Grant, 2008, p. 3).
9. Professional Learning Community (PLC): PLCs are educators "committed to working collaboratively in ongoing processes of collective inquiry and action

research to achieve better results for the students they serve" (DuFour, Dufour, & Eaker, 2008, p. 14).

10. Rigor: Rigor refers to learning experiences that are aligned to objectives and allow students to use collaboration, application, creativity, and critical thinking to demonstrate mastery of learning targets.
11. State of Texas Assessment of Academic Readiness (STAAR): STAAR is a standardized summative assessment that measures student knowledge of the Texas Essential Knowledge and Skills (TEKS), or state objectives, considered to be necessary for the current grade level and those that are essential to prepare students for the next grade level (Texas Education Agency, 2010).
12. Standardized Summative Assessment: Standardized summative assessments are tests developed with high levels of validity and reliability, require strict methods for administration and security and are scored based on a specified criterion (McAfee & Leong, 2007).
13. Summative Assessment: Summative assessments are administered to determine mastery of the intended learning goals at the completion of a unit of study or course (Bloom, Hastings, & Madaus, 1971).
14. Texas Assessment of Knowledge and Skills (TAKS): Texas standardize assessment that measures student knowledge of the TEKS in grades 3 through 11 in multiple content areas including reading, writing, math, social studies and science (Texas Education Agency, 2010). This assessment is scheduled to end during the 2012-2013 school year.

15. Texas Essential Knowledge and Skills (TEKS): TEKS are the Texas mandated curriculum and student expectations for all subjects.
16. Title I: Title I is a program designed to provide financial assistance to schools for the purpose of promoting academic achievement of low socioeconomic students. Title I originated in the Elementary and Secondary Education Act (ESEA) of 1965 but was updated most recently in the No Child Left Behind (NCLB) Act of 2001.

CHAPTER II

LITERATURE REVIEW

This chapter will present relevant literature to support the need for this qualitative case study. No one theory served as a basis this study; however, several interrelated ideas formed a conceptual framework to better understand common formative assessments (CFAs) that are created collaboratively by professional learning communities (PLCs). These broad concepts are (a) assessment literacy, (b) curriculum, assessment, and instructional alignment, and (c) professional learning communities in Title I schools. To further explore this framework, the literature review will (a) reveal research regarding teacher assessment literacy within the K-12 educational setting, (b) explore research regarding alignment models, and (c) examine the role of PLCs in the alignment of curriculum, assessment, and instruction in Title I schools.

Assessment Literacy

What is Assessment Literacy?

Assessment literacy refers to a teacher's ability to incorporate multiple modes of assessment as a means of measuring student growth and teacher success. Airasian (1994) defined assessment as the "process of collecting, synthesizing, and interpreting information to aid in [instructional] decision making" (p. 5). Erkens (2009) claimed that teachers who are assessment literate:

1. Create a formative culture and balanced assessment system conducive to learning;
2. Identify the comprehensive and specific targets of rigorous and relevant learning experiences;
3. Design accurate assessments to generate evidence that will sufficiently reflect the expectations;
4. Employ in-the-moment, strategic prompts and questions to elicit reasoning and knowledge construction responses from learners;
5. Deliver assessments in a safe and engaging environment;
6. Analyze results from assessments;
7. Respond accordingly to results from assessments with corrective feedback and responsive instruction;
8. Reassess to verify learning from responsive instruction;
9. Engage students as instructional decision makers in meaningful ways throughout the entire teaching and learning process (p. 14).

According to Popham (2009), assessment literacy is seen as a "sine qua non" (p. 4) or essential for today's educator. Gareis and Grant (2008) contend that assessment literacy "must be viewed as a professional competency that every teacher should be compelled to develop and demonstrate for purposes of licensure" (p. 16). Unfortunately, most undergraduate and graduate programs lack detailed courses that delve deep into the assessment development process. Many researchers argue that most educators have not been adequately trained on: (a) how to recognize or write items to measure specific

skills, or (b) how to employ balanced assessment strategies that ensure greater student success in the current era of high stakes testing (Stiggins & Conklin, 1992; Black & Wiliam, 1998b; Brookhard, 2004). According to Stiggins (2002), "assessment training is virtually non existent in teacher and administrator programs" (p. 762). As a result, teachers rely heavily on assessments from textbooks or haphazardly construct their own instruments (Guskey, 2003). According to Rieck (2006), most teacher-made tests lack critical thinking and a connection to learning goals. Thus, classroom assessments often lack the rigor necessary to challenge students at the depth and complexity outlined in state standards.

PLCs must work collaboratively to design high quality assessments in order to address individual teacher assessment literacy deficiencies. Pophom (2009a) argued:

> Assessment-literate teachers will typically make better decisions…their classroom assessments will be better because those teachers will know not only what it is that constitutes a defensible versus an indefensible assessment [and] and what represents an accurate versus an inaccurate interpretation of assessment-elicited data (p. 6-7).

To become more assessment literate, teachers must reframe their approach in a way that uses collaborative assessment development as the core of the planning process (Stiggins, Chappuis, Chappuis, & Arter, 2007). Stiggins (1998) claimed, "if classroom assessments are of high quality then sound [instructional] decisions can result and students can prosper" (p. 7).

Types of Assessments

The following section will provide explanations of four types of assessments: formative, summative, common formative and standardized summative assessments.

This portion of the chapter will also present a detailed history of standardized summative assessments in Texas.

Formative versus Summative Assessments

Formative and summative assessments impact instruction in distinctive ways and thus are important at different stages of the learning process. According to Brookhart (2001), the terms formative and summative refer to the *function* of the assessment, not a specific assessment instrument. Common assessments, however, can be used as either formative or summative instruments.

Heritage, Kim, Vendlinski and Herman (2009) defined formative assessments as "a systematic process to continuously gather evidence and provide feedback about learning while instruction is underway" (p. 24). Formative assessments are (a) designed *for* learning, (b) curriculum-based and (c) provide feedback to teachers and students on their progress toward achieving the intended goals. Hattie and Timperley (2007) outline the following purpose of formative assessments:

> For students it means gaining information about how and what they understand and misunderstand, finding directions and strategies that they must take to improve, and seeking assistance to understand the goals of the learning. For teachers, it means devising activities and questions that provide feedback to them about the effectiveness of their teaching, particularly so they know what to do next (p. 102).

Formative assessment is a planned and deliberate process that does not happen accidentally (Popham, 2008). When used correctly, formative assessment data exposes what students know, reveals gaps in student understandings, and identifies objectives that need re-teaching.

Summative assessments are assessment *of* learning. These assessments are administered at the end of a unit or school term (Gareis & Grant, 2008). Teachers use summative tests to determine mastery of objectives covered over an extended period of time. Data from these instruments is used solely for the purpose of assigning grades, as the data is not timely enough to make instructional adjustments. Teachers who have not embraced the data driven instruction paradigm shift or those who are deficient in assessment literacy use *every* assessment as a summative instrument.

Table 2.1 from Gareis and Grant (2008) provided a succinct comparison of formative and summative assessments.

Key Questions	Formative	Summative
Why assess?	To make instructional decisions	To judge the degree and/or worth of student learning
What is the extent of an assessment's coverage?	Focused on discrete knowledge or a particular skill set	Comprehensive of some period of instruction and some set of knowledge and/or skills
What are the typical consequential outcomes of an assessment?	Low stakes: typically related to day-to-day decisions about teaching and learning	High stakes: can determine future placement, remediation, honors designations, and so forth
Who primarily uses the results of the assessment?	Teacher and students	Teacher, students, and third parties (such as parents, administrators, and guidance counselors)

Table 2.1: Comparison of Formative and Summative Assessments. Adapted from Gareis, C., & Grant, L. (2008). Teacher-made assessments: How to connect curriculum, instruction and student learning. Larchmont, NY: Eye on Education.

Common Formative Assessments (CFAs)

Common formative assessments (CFAs) are formative assessments created by two or more teachers, scored collaboratively and used to provide immediate feedback to

a team of teachers (Reeves, 2004). Effective CFAs are curriculum-based, resemble the state standardized summative test format and are developed *prior* to instruction (Frey & Fisher, 2009). DuFour, DuFour, and Eaker (2006) outlined the following criteria for common assessments: (a) must connect to essential standards, (b) must be administered frequently to all students enrolled in a particular course, (c) must be administered at the same time, (d) must be created and analyzed by a PLC, and (e) must help students self-assess their learning. Four significant characteristics of CFAs noted by Ainsworth and Viegut (2006) are:

1. CFAs are periodic or interim assessments collaboratively designed by grade level PLCs;
2. CFAs are similar in design and format to district and state assessments;
3. CFAs are administered to all students in grade level or course several times during the quarter, semester, trimester or entire school year; and
4. CFA student results are analyzed in PLCs to guide instructional planning and delivery.

In essence, CFAs are collaboratively designed instruments used regularly during instruction to provide information to students and teachers regarding the effectiveness of the teaching and learning process.

Standardized Summative Assessments

Overview of Standardized Summative Assessments

Standardized summative assessments are tests developed with high levels of validity and reliability, require strict methods for administration and security and are

scored based on a specified criterion (McAfee & Leong, 2007). According to Stiggins et al. (2006), "standardized means that all students take the same test under the same conditions with the same instructions and scoring. Test administration and scoring are thereby 'standard' for all students" (p. 392). Individual states began implementing standardized summative assessments as educational reform measures in 1980s, but No Child Left Behind (NCLB) mandated annual standardized summative testing for students across the nation in grades three through eight in reading and math.

Standardized Summative Assessments in Texas

Statewide standardized summative testing in Texas can be traced as far back as 1979 with the introduction of the Texas Assessment of Basic Skills (TABS). This assessment was not curriculum-based and simply measured basic math, reading and writing skills in grades 3, 5 and 9 (Texas Education Agency (TEA), 2010). The Texas Educational Assessment of Minimum Skills (TEAMS) replaced TABS in 1985, and was intended to increase rigor by assessing *minimum skills* instead of basic skills in math, reading, and writing for grades 1, 3, 5, 7, 9, and 11 (TEA, 2010). In 1990, a new assessment, Texas Assessment of Academic Skills (TAAS), was mandated for math, reading and writing in grades 3, 5, 7, 9, and 11. Much like TEAMS, TAAS was developed to increase rigor and transition from an emphasis on minimum skills to an assessment of academic skills outlined in the newly adopted state curriculum. Over time, TAAS exams were developed to assess grades 3-8 in reading and math, and grades 4 and 8 in writing. By the mid-1990s, TAAS was not only a requirement for student

graduations, but also the primary instrument used to compare schools and districts across the state.

The Texas Assessment of Knowledge and Skills (TAKS) was introduced in 1999 but was not fully implemented until 2003. According to TEA (2010), the criterion referenced TAKS tests were designed to measure student knowledge of the TEKS at each grade level tested. This assessment was perceived as more rigorous than TAAS and aligned with the TEKS. TAKS was administered each year to students in grades 3 through 11 in multiple content areas including reading, writing, math, social studies and science (Texas Education Agency, 2012). Starting in the 2011-2012 school year, TAKS will be replaced by STAAR. According to the Texas Education Agency (2010) STAAR is a longer assessment than TAKS and will (a) assess students at higher levels of cognitive complexity, (b) assess readiness standards that are considered to be necessary for the current grade level and supporting standards which prepare students for the next grade and (c) assess multiple objectives or student expectations within one question (Texas Education Agency, 2010).

Curriculum, Assessment, and Instructional Alignment

Overview of Alignment

Curriculum is the set of intentionally defined outcomes for learning (Johnson, 2004). Assessment refers to the process of using multiple methods or tools to collect information about student mastery of the curriculum (Gareis & Grant, 2008). Gareis and Grant (2008) also assert that instruction is the "planned and unplanned experiences

provided by a teacher and are intended to result in the acquisition of a set of intended learning outcomes for students (p. 3). Marzano (2003) found that possessing a detailed understanding of alignment or the integrated nature of curriculum, assessment, and instruction is of the most important foundations of effective teaching.

Alignment refers to the extent to which curriculum standards, assessments and instruction are designed at a level of cognitive demand that allows students to meet learning targets (Webb, 2007). Tyler (1949) referred to alignment as the agreement between teacher objectives, activities, and assessment so they are mutually supportive. LeMarca, Redfield, Winter, and Despriet (2000) presented a more wide-ranging definition:

> Alignment is defined here as the degree to which assessments yield results that provide accurate information about student performance regarding academic content standards at the desired level of detail, to meet the purpose of the assessment system. To satisfy this definition, the assessment must adequately cover the content standards with the appropriate depth, reflect the emphasis of the content standards, provide scores that cover the range of performance standards, allow all students an opportunity to demonstrate proficiency and be reported in a manner that clearly conveys student proficiency as it relates to the content standards (p. 24).

The degree to which curriculum, assessment, and instruction align is the driving force to student academic success. Roach, Niebling, and Kurz (2008) strongly believe that when curriculum, assessment, and instruction are aligned, the majority of students in any school setting will be successful on assessment measures.

Alignment and Rigor

Although alignment theories date back to the 1940s, the current focus on alignment stems from the accountability measures outlined in NCLB. Blackburn (2013)

defined rigor as "creating an environment in which each student is expected to learn at high levels, each student is supported so he or she can learn at high levels, and each student demonstrates learning at high levels" (p. 10). However, for alignment purposes, rigor refers to a match between the depth and complexity outlined in the curriculum, assessments, and instruction.

In order to prepare students for state standardized summative assessments, teachers must ensure that classroom assessments (e.g., common formative assessments) and instructional practices align with the rigor outlined in the state curriculum. This involves allowing students to make real world connections, apply critical thinking skills, explore their creative thought processes, and create products that reflect their learning. Rigorous learning experiences also promote collaboration, application, and critical thinking, allowing students to demonstrate mastery of the learning targets. Snider (2009) outlined the following hallmarks of rigor: (a) standards and expectations are high and known to all students, (b) assessments are comprehensive and well aligned to standards, and (c) focus is on both content and critical thinking (p. 23). If teachers are teaching what they personally deem important, students could potentially do well on classroom assessments, and yet fail the standardized summative assessment (McGehee & Griffith, 2001). Thus, it is imperative that precise alignment of rigor exits between curriculum, assessment, and instruction.

For educators in Texas, the current standardized summative assessment is the STAAR. Throughout the evolution of standardized summative tests in Texas, the term *rigor* has been a universal exhortation used to describe each exam. According to the

Texas Education Agency (2010) the new STAAR standardized summative assessment is designed to be more rigorous than the prior TAKS standardized test in the following ways:

1. STAAR will increase in length at most grades and subjects.
2. STAAR will include more rigorous items that require students to apply multiple concepts within the same questions.
3. The rigor of STAAR items will be increased by assessing skills at a greater depth and level of cognitive complexity. In this way, the tests will be better able to measure the growth of higher-achieving students.
4. In science and mathematics, the number of open-ended (gridable) items on most STAAR tests will increase to allow students more opportunity to derive an answer independently.
5. Students will be required to respond to two STAAR writing tasks (including personal narrative, literary, expository, persuasive, and analytic) rather than one task.
6. STAAR performance standards will be reviewed at least once every three years and, if necessary, adjusted to ensure that the assessments maintain a high level of rigor.
7. STAAR performance standards will be set so that they require a higher level of student performance than is required on the current TAKS assessments.

Jenkins, Goldham and Webb (2012) claim that the essential elements of rigor that will prepare students for the STAAR exam are content acquisition, critical thinking,

relevance, integration, application of concepts, long term retention and student ownership of their learning. To engage students in aligned learning experiences characterized with intense rigor, careful consideration must be given to deconstructing the TEKS, designing objective based CFAs prior to instruction and designing lessons that allow students to engage in learning experiences at the depth and complexity as outlined in the TEKS.

Alignment Models

Alignment Models for Collaborative CFA Development

Rothman (2003) proposed that alignment processes must occur at the outset of instructional planning to ensure that curriculum, assessment, and instruction are aligned from the inception. A number or methods have been developed to analyze the alignment of curriculum, assessment, and instruction. The underlying purpose of alignment processes is to ensure a connection between all components of the educational program, thereby providing precise alignment that can facilitate teacher efforts to improve educational achievement (Raoch et al., 2008). Gareis and Grant (2008) described alignment processes in the following excerpt:

> If the intended curriculum is not aligned with the taught curriculum, students may be missing critical knowledge and skills that they need to acquire. If the intended curriculum is not aligned with the assessments of learning, teachers cannot have a clear picture of students' knowledge and skills in terms of the expectations held in the written curriculum. If instruction is not aligned with assessment, students have not had the opportunity to learn the material for which they are held accountable and, therefore, the assessment is inherently unfair (p. 55).

Several researchers (DuFour, Dufour, & Eaker, 2008; Goodwin, 2009, Ainsworth & Viegut, 2006) have developed practical models to help PLCs align curriculum, assessment, and instruction. These approaches involve deconstructing the learning objectives and matching the rigor of assessments and instruction to the objectives. Figures 2.1 and 2.2 provide protocols to assist PLCs align the rigor of CFAs to the learning objectives.

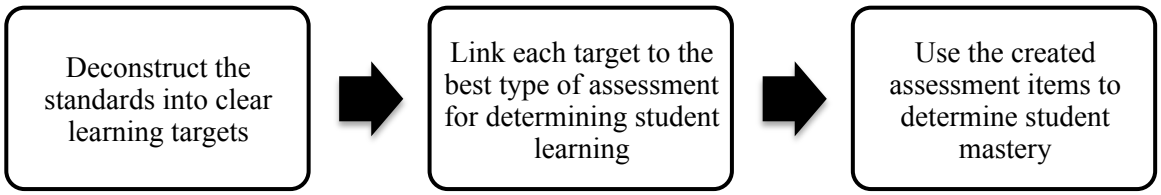


Figure 2.1: Alignment of Learning Target to Assessment. Adapted from Goodwin, M. (2009). Matchmaker, matchmaker, write me a test. In T. Guskey (Ed.), *The teacher as assessment leader* (pp. 89-109). Bloomington, IN: Solution Tree.

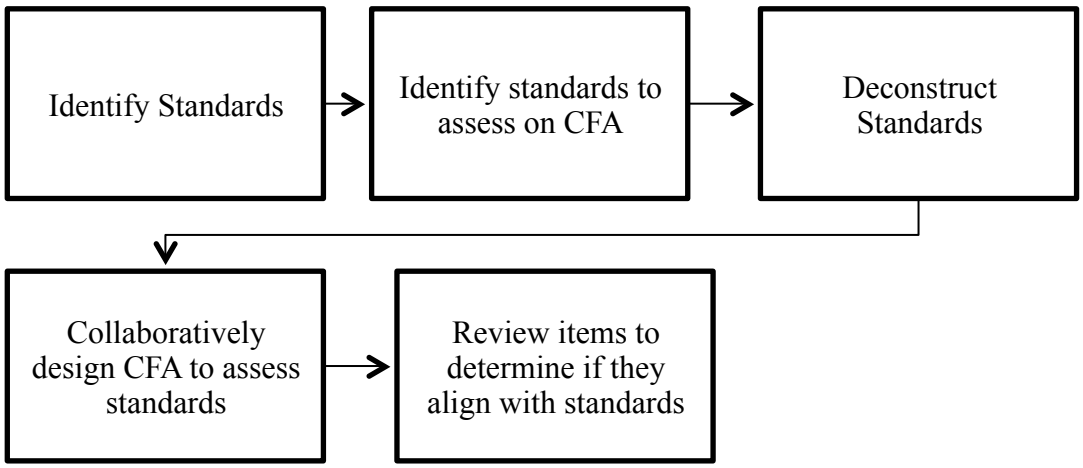


Figure 2:2: Ainsworth & Viegut CFA Development Process. Adapted from Ainsworth, L., & Viegut, D. (2006). Common formative assessments: How to connect standards-based instruction and assessment. Thousand Oaks, CA: Corwin Press.

Although the models presented by Goodwin (2009) and Ainsworth and Viegut (2006) are practical for PLCs, they fail to provide specific details on how to ensure true alignment. Three of the most widely used models that help PLCs to be more methodical in their alignment processes are: (a) Webb's alignment model, (b) the Survey's of Enacted Curriculum (SEC) model, and (c) the Achieve model (Roach, Niebling & Kurz, 2008). These three approaches emphasize the importance of involving teachers who are very knowledgeable about standards, assessments methods, and instructional strategies most effective for use in their content area. Many teachers have begun to apply these collaborative alignment models during day-to-day practices such as common formative assessment (CFA). Table 2.2 provides a brief overview of the three major models.

	Alignment Models		
	Webb	**Surveys of Enacted Curriculum**	**Achieve**
Components Evaluated	Assessment Standards	Assessments; Standards/Curriculum; Instruction	Assessments
Raters or Evaluators	Panel of 6-8 educators with subject expertise	Teacher; Panel of 3 or more content specialists	Panel of 3 or more content specialists
Alignment Evaluation Process	1. Recognize and apply four depth-of-knowledge (DOK) levels. 2. Reach consensus on DOK level. 3. Independently rate the DOK level and corresponding objective.	1. Teachers complete Surveys of Enacted Curriculum ratings. 2. Rate the level of coverage for topics and subtopics and cognitive demand of tasks and activities for standards, curriculum materials, and assessments.	1. Panels make consensus judgments regarding the quality of the content and performance match. 2. Panels judges whether item sets assess the respective standards. 3. Each set of items is evaluated regarding the grade-level appropriateness.

Table 2.2: Overview of Major Alignment Models. Adapted from Roach, A., Niebling, B., & Kurz, A. (2008). Evaluating the alignment among curriculum, instruction and assessments: Implications and applications for research and practice. *Psychology in the Schools*, *45* (2), 158-246.

Webb's Alignment Model

Various state agencies endorse specific alignment models that correlate with their state assessments frameworks. The Texas Education Agency has used Webb's Alignment Model in the past for alignment studies comparing the TEKS and TAKS. Therefore, many educational support centers and district level assessment facilitators across the state of Texas have begun to apply Webb's model for objective based assessment alignment.

Webb's model broadly defined assessments to include classroom, district and state assessments (Webb, 1997). Following Webb's model, PLCs must guarantee that unyielding alignment exists between the depth of knowledge (DOK) or rigor of the objective and the corresponding assessment item. An integral element of aligning assessment rigor includes designing questions that require students to think at the DOK levels specified in the TEKS. Webb's (2007) procedure allows teachers to align assessment questions by (a) engaging in a justification or consensus process to determine the DOK level of the objective and (b) individually and collectively analyzing each assessment question to ensure a DOK level match between the objective and the question. Assessment questions are designed at the appropriate level of rigor when "what is elicited from students on the assessment is as demanding cognitively as what students are expected to know and do as stated in the standards" (Webb, 2007, p. 11). Being able to determine the appropriate DOK level also requires an in depth understanding of vertical alignment and the cognitive demands needed as students progress from to year to year in the content. Table 2.3 outlines the four DOK levels

developed by Webb (2007). Level 1 consists of basic recall questions and one step problems. Level 2 requires students to use multiple steps to solve and retrieve data from charts or graphs. Level 3 challenges students to apply various concepts to solve problems in multiple ways. Level 4 consists of complex projects, such as project- and problem-based learning that require students to make connections within and across subject domains.

DOK Level	Characteristics
Level 1 – Recall	Recalling information such as a fact, definition, term or simple procedure; One-step, straight forward problem
Level 2 – Skill/ Concept	Engagement of some mental processing; requires students to make some decisions as to how to approach the problem; Multi-step problem; Requires students to make observations, classify, and compare data.
Level 3 – Strategic Thinking	Requires reasoning, planning, using evidence, and a high level of thinking; Requires students to justify their response or solve using varied methods
Level 4 – Extended Thinking	Requires complex reasoning, planning, developing and thinking over extended periods of time; Requires students to make connections within and across subject domains.

Table 2.3: Webb's Depth of Knowledge Levels. Adapted from Webb, N. L. (2007). Issues related to judging the alignment of curriculum standards and assessments. *Applied Measurement in Education, 20* (1), 7-25.

Webb (2007) also recommended that teachers consider the extent to which one or more objective is given extra emphasis on an assessment. Webb (2007) referred to this alignment process as creating a "balance of representation" (p. 14) to ensure the

appropriate levels of rigor on each assessment. For math teachers in the state of Texas, balance of representation applies to the percentage of readiness verses supporting standards included on assessments. The sixth grade math STAAR assesses 60-70% readiness standards and 30-35% supporting standards. However, 30% of the sixth grade math TEKS are readiness standards while 70% are supporting(Texas Education Agency, 2010). Although perfect alignment is never expected (Ananda, 2003), teachers who apply Webb's model are better able to gauge the rigor of assessment and instructional practices to ensure a more precise connection to the curriculum.

Professional Learning Communities

Overview of Professional Learning Communities

Current research on collaboration by classroom teachers originated with Dewey (1910) who argued that teachers must continually reflect on their work. Dewey (1910) asserted, "the operation of the teacher's own mental habit, unless carefully watched and guided, can make the child a student of teacher's peculiarities rather than of the subjects that he is supposed to study" (p. 49). During the early 1980s, educational leaders began to reemphasize the importance of reflection and collaboration between teachers as a means for more productive and effective instructional practices. Little (1982) outlined four practices to help schools improve performance through collaboration: (a) frequent discussions regarding classroom teaching, (b) participation in classroom observations and team discussions by all team members, (c) shared development of curriculum, and (d) shared responsibility for making instructional improvements. The nationwide focus

on improved instructional practice through collaboration led to the evolution of professional learning communities (PLCs) (DuFour, DuFour, Eaker, & Many, 2006).

A PLC is defined as an interdependent group of educators pursing a common goal—student learning (Senge, 1990). PLC are characterized by: (a) shared norms and values, (b) collaboration, (c) a shared focus on student learning, (d) de-privatized practice, and (e) reflective dialogue (Rectanus, 2006). The theory behind PLCs evolved from the constructivist view, which promotes individuals working in concert with peers in a learner-centered environment (Brooks & Brooks, 1993). This model is practical as it allows teachers to work collectively to create assessments, review student work samples, analyze data, modify instruction, design interventions and engage in job-embedded professional learning. According to Giles and Hargreaves (2006), PLCs embody three major instructional components of school reform: (a) collaborative conversations, (b) a constant focus on teaching and learning, and (c) the continual use of assessment data to evaluate progress. Collaboration and constant reflection on instructional practices within a PLC are powerful means for maintaining a focus on alignment and standards-based teaching.

Collaborative Processes within Professional Learning Communities

Teachers who work in PLCs have the collective ability to change instructional practices by grappling with challenging questions regarding the work, and learning from each other as a result of these conversations (DuFour, DuFour, Eaker, & Many, 2006; Hargreaves, 2002). PLCs that share a common set of beliefs and dialogue about effective teaching practices create learning environments in which teachers flourish

(Stoll, Bolam, McMahon, Wallace, & Robert, 2006). This ability to engage in collaborative processes with a team of professionals creates effective teachers, leading to optimal student performance and maximum school performance. Collaborative processes refer to the way teachers think, dialogue, and interact with one another as a PLC. According to Crane (2009) the communication processes that exist during collaborative processes include: (a) mutual accountability, (b) willingness to learn, (c) truthfulness, (d) self-responsive language, and (e) coaching. Crane (2009) added that effective dialogue within a PLC requires "emotional safety for all participants…openness, trust, willingness and support. It levels the playing the field and creates a more egalitarian and participative environment" (p. 105). By engaging in collaborative processes within a safe PLC environment, teachers improve their instructional capabilities thus increasing their abilities to help students achieve at high levels (Newmann & Wehlage, 1995; Darling-Hammond, 2000; McLaughlin & Talbert, 2006).

Traditionally teachers have had very few opportunities to observe each other or share best practices. Fullen (2001) argued that PLCs fill this void by allowing teachers to share ideas in a collegial setting. These collaborative processes, however, must be guided by four critical questions:

1. What do we want each student to learn?
2. How will we know when each student has learned it?
3. How will we respond when a student experiences difficulty in learning?

4. How will we extend the learning for students who have mastered the essential concepts? (DuFour, Dufour, & Eaker, 2008).

By focusing on these questions, teachers are able to deliberately focus on the alignment of curriculum, assessment, and instruction. As PLCs collectively identify learning targets, each teacher becomes better equipped to design learning experiences that are aligned with assessments and the curriculum.

Collaborative CFA Development in PLCs

Several researchers (Fisher & Johnson, 2006; Martin, 2006; Ainsworth & Viegut, 2006; DuFour, Dufour, & Eaker, 2008) promote common assessments because of their usefulness in helping teachers identify areas of weakness and improve instruction. DuFour et al. (2006) claimed the following:

1. CFAs are more efficient than assessments created by individual teachers because of the shared responsibility of assessment development;
2. CFAs are more equitable for students;
3. CFAs represent the most effective strategy for determining whether the guaranteed curriculum is learned;
4. CFAs inform the practice of individual teachers;
5. CFAs build a team's capacity to improve its program; and
6. CFAs facilitate a systematic, collective response to students who are experiencing difficulty (p. 56-57).

Collaborating to build CFAs prior to instruction compels teachers to discuss *how* students learn, common misconceptions, and strategies to scaffold student

understanding. According to Fisher (2005), "the power of designing common assessments lies in the opportunity for groups of teachers to review their content standards" (p. 10). The collective process of deconstructing the objectives during CFA development helps teachers gain a better understanding of what students are expected to learn. Deconstructing objectives is a sophisticated process that allows teachers to identify the essential learning targets, determine the cognitive level of the objectives, and design rigorous learning experiences to help students meet the targets. Stiggins, Chappuis, Chappuis, and Arter (2007) defined the deconstruction process as "taking a broad and/or unclear standard, goal, or benchmark and breaking it into smaller, more explicit learning targets than can be incorporated into daily classroom teaching" (p. 80). Every teacher within a PLC may not possess the type of expert knowledge that is needed to dissect the learning objectives and develop instruments that precisely align with the objectives. Therefore, aligned CFAs are more easily accomplished through collaboration in PLCs.

Fisher et al. (2008) analyzed the impact of CFAs at an urban high school. The findings revealed that as a result of common assessment development prior to instruction, "teaching moved from well-intentioned guesswork to a finely-tuned dance…[increasing] the precision of teaching" (p. 64-65). PLC-developed CFAs allow for authentic professional dialogue that helps teachers delve deep into the content and share ideas about best practices. As a result of collaboration during assessment development, teachers are better equipped to create engaging and aligned learning experiences for students

The process of collectively creating CFAs prior to instruction allows teachers to have advanced notice and a deeper understanding of the content and rigor that will be needed to help students be successful. Teachers are also able to use PLC-developed CFA data more rapidly than state assessments or district benchmarks. DuFour and Eaker (1998) added that teachers are more willing to respond to assessment data if they participated in the development of the assessment items. Additionally, immediate access to common assessment data helps teachers to: a) see the connection between daily instruction and state standards (McTighe & Emberger, 2006; Herman & Baker, 2005), and b) be strategic in developing timely, objective specific interventions for struggling learners (Datnow, Park, & Wohlstetter, 2007).

The Role of an Instructional Coach in PLCs and CFA Development

Instructional coaches (ICs) are campus-based content experts who model instructional practices, observe teachers, analyze data, reflect with teachers, assist with assessment development, and help design lessons (Knight, 2007). Effective ICs possess a deep understanding of the curriculum, of high quality instructional practices, and of varied assessment methods (Sweeny, 2007). The use of ICs evolved during the early years of the accountability era as a means to provide on-campus content support and help teachers reflect on their practices. Gallucci, Van Lare, Yoon, and Boatright (2010) describe instructional coaching as "embedded and situated" (p. 922) work that supports the individual needs of teachers within PLCs. Knight (2004), however, argued, "an IC has to be more than an expert in instructional practice. She or he is part coach and part anthropologist, advising teachers on how to contend with the challenges and

opportunities they face" (p. 32). Instructional coaches provide the necessary support to help teachers deepen their content understanding, incorporate innovative strategies, as well as help teachers meet the many demands placed on them daily.

The roots of coaching can be traced back to Dewey (1933) who introduced the idea that teachers should be reflective professionals. According to Peterson, Taylor, Burnham and Schock (2009), the ICs role is to "deepen the teacher's understanding of how students learn by facilitating self-reflection to bring about change in classroom instruction" (p. 501). Stover, Kissel, Haag, and Shoniker (2011) also argued that an IC's primary job is to foster "reflection so that teachers acknowledge the realities of their classroom practice" (p. 500).

One of the most effective IC models is that which allows the IC to be an active member of PLCs. By being an equal member of a team, ICs are able to contribute to the collaborative processes which evolve during objective deconstruction, assessment development, and lesson planning. When ICs are positioned within a team, trust is easier to build and professional dialogue about practice is more likely to occur. Knight (2007) asserts:

> Dialogue brings people together as equals so they can share ideas, create new knowledge, and learn. Specifically, a coach and a teacher engaged in [professional] dialogue attempt to open up discussion and share what is on each other's mind…if people come together as equals, if they feel free to voice their opinions, if they are listened to, and if they act on the exhilarating belief that they are free to agree, disagree and reflect on ideas as they choose, something marvelous can happen" (p. 46).

During professional dialogue, ICs are able to pose reflective questions and offer content-specific advice to teachers. It is during these moments that the IC adds to the collective knowledge of the team and puts the IC in a position to contribute rather than dominate.

ICs are also instrumental in the CFA development process. Knight (2007) outlined the following strategies that ICs must employ when helping PLCs develop CFAs: (a) help teams identify the type of assessment, (b) prompt teams to access or develop course and unit maps, (c) assist teachers in the development of quality assessments, and (d) ensure that PLCs have a plan for providing feedback to students and peers. The constant presence of the instructional coach as teachers grapple with interpreting the objectives, aligning assessment items and creating rigorous instructional activities, allows teachers to receive immediate support from a content specialist. Research found that PLCs who worked with ICs improved their practice by incorporating more high-level thinking questions, encouraging active engagement from students, and increasing their ability to differentiate instruction for diverse learners (Stover, Kissel, Haag, & Shoniker, 2011). Truesdale (2003), after conducting a 15-week study to analyze benefits for teachers who had instructional coaches verses those without coaches, also found that teachers were more likely to reflect and implement new ideas if they had support of a content specific coach.

PLCs in Title I Schools

Teaching in Title I Schools

Title I originated as a federal program designed to provide financial assistance to schools that serve a high percentage of low socioeconomic students. Title I funds are

used to provide additional educational services to low income students who are considered to be at risk of not meeting minimum standards on standardized summative assessments. Title I, although recently updated by NCLB, originated in the Elementary and Secondary Act of 1965 (ESEA). The program was designed to accomplish four main goals:

1. Provide supplemental education to students eligible for services,
2. Provide additional funding to schools and districts serving high concentrations of children from low-income families,
3. Focus educators on the needs of special students populations, and
4. Improve the academic achievement of eligible students, reduce performance gaps between advantaged and disadvantaged students and assist eligible students in meeting high academic standards (Riddle, 1996).

Title I funds are generally used to hire staff, provide professional development for teachers, purchase computers, and increase parent involvement.

Teacher quality is one of the single most important factors in helping students from low socioeconomic backgrounds achieve academic success (Haberman, 2005). According to Goldhaber and Brewer (1999), there is a strong association between students achievement and teacher knowledge of the content. Understanding the importance of effective instructors, NCLB included legislation requiring that Title I schools guarantee that all teachers are highly qualified, or hold a minimum of a bachelor's degree, obtain state certification, and demonstrate content area competence in the subject taught (U.S. Department of Education, 2002). According to Barth, Haycock,

Jackson, Mora, Ruiz, Robinson and Wilkins (1999), high performing Title I schools spend at least 10 percent of their Title I budgets on professional development directly linked to instructional practice and continuous improvement. Kannapel and Clements (2005) also found that Title I schools who were most effective utilized PLCs to enhance teachers' opportunities to critique and assist each other. In additional to content knowledge and collaboration, Foster (1994) argued that effective Title I teachers have (a) a disposition of cultural congruency, (b) skills of cultural compatibility in communication patterns, (c) a disposition to focus on the intellectual, social, and emotional needs of every child, and (d) the ability to connect classroom content to the real world (Foster, 1994).

PLCs at the Title I Middle School in the Southern United States

The Title I middle school for this case study is currently in its sixth year of implementing PLCs and has a structure which allows all core departments to have a daily common conference period for assessment development and lesson planning. The campus uses the acronym CAR—Curriculum, Assessment, and Recovery—as an instructional framework (Campus Advisory Team, 2011). The *Curriculum* aspect involves a commitment to team planning that aligns with the TEKS and incorporates differentiated instructional strategies to meet the needs of diverse learners. The *Assessment* component stems from a school-wide focus on using CFAs to monitor and promote student learning. All major assessments are common within each PLC. *Recovery*, the final element of the framework, is a systematic way of addressing the needs of students who are not successful. PLCs use data from CFAs to plan re-teaching

activities for students who need additional time and support. These mini-lessons are objective-specific and occur during the daily advisory period. In theory, the structure of PLCs and the instructional framework at the school allows teachers to work as teams to achieve continuous campus improvement.

Each PLC at the Title I school is at a different stage on the assessment development continuum—ranging from novice to advanced. The campus leadership team has developed a culture which values the alignment of curriculum, assessment, and instruction as a means for continuous campus improvement. As a result, PLCs across the campus have developed annual goals that include collaboration through PLCs, ongoing TEKS deconstruction, differentiated instructional strategies, and frequent CFAs. In addition, a campus-based content-specific IC is assigned to each department for ongoing support and job-embedded professional development.

Most PLCs at the Title I middle school are also provided one uninterrupted day with the instructional coach each semester for assessment development and lesson planning. Due to AYP data goals and projections, Math PLCs are provided one uninterrupted day each six week grading period for common assessment development and lesson planning with the IC. This model of uninterrupted planning time for each PLC was created based on Flowers, Mertens, and Mulhall (1999) who found that teachers who were provided appropriate planning time with their PLC improved alignment and increased the number of common assessments created by the team. Hoy and Feldman (2003) also found that high performing Title I schools set aside significantly greater collaborative planning time for teachers.

The increased rigor of the STAAR presents unknown challenges for all teachers at the Title I middle school. Math is a critical area of concern due to the stagnant proficiency levels in most subpopulations as revealed by Texas Assessment of Knowledge and Skills (TAKS) data. Longitudinal TAKS data for the middle school revealed a significant need to reflect on the current practices used by math PLCs to align curriculum, assessment, and instruction. Table 2.4 below shows the 2009 through 2011 Math TAKS data for each student sub-population as well as the entire campus. This data shows a pattern of lower performance by African American, Hispanic, and Special Education students.

Year	*State*	*District*	***Campus***	***African American***	***White***	***Hispanic***	***Special Education***
2011	84	93	**85**	**79**	**87**	**83**	**66**
2010	84	92	**83**	**72**	**88**	**82**	**57**
2009	80	90	**86**	**76**	**90**	**86**	**50**

Table 2.4: 2009-2011 Math TAKS Scores for Title I Middle School.

Despite the longitudinal TAKS data, the math PLCs at the Title I middle school have remained focused on continuous improvement through the use of CFAs. The teams began to build assessment literacy and in-depth knowledge of CFAs in 2009 and have become more advanced in the process of creating rigorous assessments. In 2011, the PLCs began to develop their assessment prior to instruction as a means of creating more precise alignment between curriculum, assessment, and instruction.

CHAPTER III

METHODS

Research Overview

As federal and state accountability measures such as No Child Left Behind (NCLB), Adequate Yearly Progress (AYP) and Texas Education Agency (TEA) school ratings continue to increase, it is imperative that teachers maintain a clear focus on assessment practices that will yield an increase in academic achievement through precise alignment between curriculum, assessment, and instruction. Despite accountability requirements, many researchers argued that high stakes standardized summative testing has little impact on improving student learning (Arter, 2003; Linn, 2000; Sacks, 1999). Instead, these researchers proposed that educators make use of frequent common formative assessments (CFAs) to drive instructional decisions and measure incremental learning gains.

Using a qualitative case study approach, this study analyzed the collaborative processes used by five sixth grade math teachers and one instructional coach (IC) at a Title I middle in the Southern United States to align the rigor between the Texas Essential Knowledge and Skills (TEKS), PLC-developed common formative assessments (CFAs) and classroom instruction. A case study approach was used to gain insight into the current realities of how the five sixth grade math teachers and IC used PLC-developed CFAs created prior to instruction, to guide the correlation between curriculum, assessment, and instruction. A review of literature revealed that a far-

reaching problem that has not been adequately addressed in earlier research is the collaborative processes used by teachers to develop CFAs prior to lesson design, thereby gaining a means to enhancing teacher understanding of the curriculum and promoting precisely aligned, rigorous classroom instruction. CFAs are instruments (a) created by two or more teachers, (b) scored collaboratively and (c) used to provide immediate feedback to PLCs (Reeves, 2004). Collaborative processes include the way teachers think, dialogue, and interact with one another as a PLC. This case study helped me gain a deeper understanding of how these theories translate to practice.

Research Questions

This case study answered the following overarching question: What collaborative processes are used to build CFAs in a PLC comprised of five sixth grade math teachers and one instructional coach (IC) at a Title I middle school in the Southern United States? The sub-questions of the research were:

1. What professional dialogue occurs when the sixth grade math PLC collaborates to develop CFAs that align with the rigor of TEKS and STAAR?
2. What resources does the sixth grade math PLC use to develop CFAs that align with the rigor of the TEKS and STAAR?

Design of the Study

This research used a qualitative case study research methodology (Creswell, 2007) to investigate and analyze the use of CFAs at a Title I middle school in the

Southern United States. A qualitative approach was most appropriate because I aspired to analyze CFA development in the "natural settings, attempting to make sense of, or interpret, phenomena" (Denzin & Lincoln, 2005, p. 3). Creswell (1998) outlined the following criteria for selecting a qualitative approach: (a) the research question(s) use "how" or "what", (b) the study explores variables, behaviors, or theories, (c) the findings will present a detailed view of the subjects using a literary narrative, (d) data is gathered in a natural setting, (e) sufficient time will be spent in the field, (f) the participants are receptive to a qualitative study, and (f) the researcher is an active learner instead of an expert.

I approached the study from the interpretivists paradigm which postulates that "reality is subjective, a social product constructed and interpreted by humans as social actors according to their beliefs and value systems" (Darke, Shanks, & Broadbent, 1998, p. 276). Schwandt (1994) asserted that interpretivists seek to understand "the complex world of lived experiences from the point of view of those who live it" (p. 119). McMillan and Schumacher (2001) also suggest using a qualitative approach when the intent is to gather insight into policy development, education practice, and social issues.

A case study methodology was used to closely analyze the practical processes of the math PLC. Stake (2005) defined a case as a "complex entity located in a milieu or situation embedded in a number of contexts or backgrounds" (p. 449). A case study, as defined by Yin (1994), is "an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident" (p. 13). Qualitative case studies are

designed to investigate the behaviors of a small group to gain insight into the events, processes and interactions of the case. McMillan and Schumacher (2001) provided the following reasons for selecting a case study approach: (a) it employs an open-ended approach to discover complex patterns and relationships in the subjects of study, (b) it offers an in-depth analysis and description of the subjects, (c) it uses a holistic approach to discover themes, and (d) it uses multiple data collection methods to gather data. All of these elements supported the rationale to select the sixth grade math PLC. By analyzing the case, I was able to better understand the formal and informal collaborative processes that evolved regarding the alignment of curriculum (TEKS), assessment (CFAs), and instruction during the CFA development process.

Participants

The case, or "bounded system" (Stake, 2008, p. 119) for this field-based case study was the sixth grade math PLC of five teachers and one IC at a Title I middle school in the Southern United States. This Title I middle school has approximately 1150 students enrolled in grades 6-8. The demographic make-up is approximately 17.8% African American, 46.5% Hispanic, 23.7% White, and 9% Asian/Pacific Islander. Approximately 8% of the students are limited English proficient, 11.9% special education and 59% economically disadvantaged. The campus has 91 total staff, 78 of which are teachers. The 2011 Texas Education Association school rating was *Academically Acceptable*, a decline from the *Recognized* rating in 2010. In additional,

the campus did not meet AYP goals for 2011 due to the Reading performance of special education students.

The five sixth grade teachers and IC were selected as the case in order to gain insight into the practical processes involved in building math CFAs prior to instruction and how these collaborative processes promote a precise connection between the curriculum, assessment, and instruction. Purposeful sampling was used to identify this PLC because the team had the ability to "purposefully inform an understanding of the research problem and central phenomenon of study" (Creswell, 2007, p. 125). Characteristics that made the case ideal for the study were:

1. Sixth grade math was a STAAR tested grade level and content,
2. The sixth grade math PLC had a consistency of members within the PLC for two years,
3. The sixth grade math PLC consistently collaborated to design lessons, assessments and interventions,
4. The sixth grade math PLC had a trusting partnership with the IC, and
5. The sixth grade math PLC consistently implemented the campus instructional framework, which includes PLC-developed CFAs.

This sample of teachers represented a vast array of experiences and expertise in the field. Table 3.1 below provides a visual representation of the demographic profile of the group. The most experienced teacher had 41 years of teaching experience while the least experienced had two years of experience. The group was majority female but two males were included. The ethnic groups represented were White and African American.

Generational footprints, which include veterans, baby boomers, generation X, and millennials (Lancaster & Stillman, 2002; Raines, 2003; Zemke, Raines & Filipczak, 2000), were used as descriptors to provide insight into how the different age groups represented influenced the collaboration of the PLC. Lovely and Buffum (2007) assert that generational footprints provide a basis for understating results-based and improvement-driven PLCs.

Position	Gender	Ethnicity	Years Teaching	Years on PLC	Generational Footprint
Teacher 1	Female	White	2	2	Millennials
Teacher 2	Female	White	6	6	Millennials
Teacher 3	Female	Afr. American	22	4	Baby Boomer
Teacher 4	Male	Afr. American	3	3	Millennials
Teacher 5	Male	White	41	4	Baby Boomer
Instructional Coach	Female	White	9	3	Millennials

Table 3.1: Math PLC Demographic Profile

This PLC was also a unique group in that they are a highly advanced team of teachers operating within a Title I school setting. Although 59% of the students at the school site were low socioeconomic, only 30% of students across the district were economically disadvantaged. Additionally, the tax base and financial resources of the district was evenly distributed to support all schools. Therefore, the financial support and systematic instructional framework of the district offers several advantages to this PLC that PLCs at other Title I schools may not have. District support systems include instructional coaches model for embedded professional development, an online scope

and sequence for unit planning, professional development for teachers and access to instructional resources for planning.

Methods

According to Creswell (2007), data collection in case study research draws from multiple sources including interviews, documents, and audio-visual materials. Clandinin and Connelly (2000) also suggest collecting data from journals, conversations, interviews, and document. To gather data for this case study, I used audio recordings of the PLC during CFA development sessions, one focus group interview, eJournal lesson reflections by teachers, and supporting documents from the PLC. The data collection phase of the research spanned eight weeks, September 2012 through October 2012. Table 3.2 outlines the dates and sources of data collection.

Method	Date of Collection
CFA Development Session 1/Supporting Documents	September 4, 2012
eJournal Reflection 1	September 17-25, 2012
CFA Development Session 2/Supporting Documents	September 25, 2012
eJournal Reflection 2	October 22-23, 2012
Focus Group Interview	October 24, 2012

Table 3.2: Case Study Data Methods and Dates of Collection.

Audio Recordings of PLCs during CFA development

The IC created two electronic audio recordings of the team process of building two CFAs. These recordings provided insight into the assessment development processes, group interactions, and professional dialogue that occurred during assessment

development. The instructional coach actively participated in all PLC meetings and was accepted as an *insider* in the group. Therefore, the presence of the IC was the norm for the PLC. By voice recording the processes, instead of direct observations by me, the PLC had limited reason to alter their normal procedures and conversations based on my presence.

Participant eJournal

eJournals were used to provide a subjective perspective from the view of the teachers. Each teacher individually and anonymously reflected via eJournal on two lessons—one from each unit for which the pre-developed CFAs were created. Each teacher selected the specific lessons for reflection after both CFA development sessions. Upon identification of the lesson dates, the IC provided a hyperlink to a Google Doc eJournal. The reflection questions prompted participants to analyze how each lesson was designed and implemented to align with the rigor of the learning objectives and the pre-designed CFAs. Within seventy-two hours after implementing the lesson, each case study participant drafted a minimum of a 200 word eJournal response to the following questions: (a) What impact did building the common assessments prior to instruction have on the design of this lesson? (b) Which TEKS were covered in this lesson? What structures, activities, and strategies were used to help students reach the cognitive complexity outlined in the TEKS and incorporated into the common assessment? (c) Do you have any additional information that you would like to share about this lesson? and (d) Do you have any additional information that you would like to share about the development of the common assessment prior to the lesson?

Focus Group

An in-depth, semi-structured focus group interview with the PLC was used to allow participants to reflect on assessment development practices and the impact of pre-designed common assessments on the alignment of instruction. Merriam and Associates (2002) explained that a semi-structured interview approach uses highly structured questions to gain specific information as well as less structured questions to explore teacher experiences. The following factors outlined by Creswell (2007) validated the focus group interview approach for gaining insightful information from the PLC:

> Focus groups are advantageous when the interaction among interviewees will likely yield the best information, when interviewees are similar and cooperative with each other, when time to collect information is limited, and when individuals interviewed one-on-one may be hesitant to provide information (p. 133).

The focus group interview occurred during the final week of the study—after both CFAs had been developed and all reflection eJournal entries were completed. The IC facilitated the focus group and used questions that were tailored to address the unique characteristics of the case. See Appendix B for the focus group protocol and questions. The role of the IC was to put the PLC at ease and make teachers feel comfortable sharing their experiences.

Prior to the interview, the IC reviewed informed consent and confidentiality with participants. All interview questions were open-ended to allow participants to express varied perspectives without influence from the researcher (Creswell, 2007). In order to reduce any potential anxiety about the focus group interview, each participant was sent the interview protocol two weeks prior to the focus group meeting. The focus group

lasted 45 minutes and was held in one of the teacher's classrooms. Participants were informed that the interview would be taped in order to accurately capture their feedback. The recorded responses were transcribed using a word processing program.

Supplemental Documents from the PLC

Data in this category came from a variety of supporting documents that were used during the CFA development process. These included unit plans, prior year's CFAs, current year's CFA's, and CFA blueprints. These documents provided insight into the resources used, and products created, during the CFA development process.

Data Analysis

Data Analysis Process

Marshall and Rossman (2006) presented the following phases for analyzing qualitative data: (a) organize the data, (b) immerse in the data, (c) generate categories and themes, (d) code the data, (e) offer interpretations through analytic memos, (f) search for alternative understandings, and (g) write the report or other format for presenting the study (p. 156). This strategic format was used to present a clear description of this case and the observed phenomenon.

The data corpus transcribed from the data collection sources equaled ninety-five pages doubled spaced in Times New Roman size 12 font. All data was uploaded into HyperRESEARCH, a qualitative data analysis software program. This software assisted with coding and classifying main and sub-categories that evolved from the research questions. Coding is the process of filtering through the data for ideas or themes for the

purpose of making comparison or drawing conclusions (Taylor & Gibbs, 2010). The coding system for this study incorporated the following conceptual framework which provided a basis for the research: (a) assessment literacy, (b) curriculum, assessment, and instruction alignment, and (c) professional learning communities. As the data was reviewed, I looked for certain words, phrases, ways of thinking, and processes that were emphasized. Open coding (Straus & Corbin, 1990), or labeling words or phrases found in the transcript, was used to identify the initial codes. After the initial codes were identified, "constant comparative analysis" (Glaser, 1965) was used to identify patterns, compare codes and merge interrelated themes. After analyzing the data from all sources, I searched for interconnected patterns between the CFA development sessions, eJournal reflections, focus group, and supplemental documents. Hierarchical relationship coding (Muhr, 1994) was used to group codes based on similarities. After multiple reviews, I sorted the codes into one overarching theme—curriculum, assessment, and instructional alignment process—with several sub-themes.

Researcher Subjectivity

I am the campus principal for the Title I middle school; therefore my position as researcher and principal introduced bias to this case study. As principal, I have a vested interest in the performance of all students and the continuous improvement of the campus. My position, however, may have encouraged teachers to participate in ways that they would not ordinarily have done so in order to satisfy or convince me. To address this, I was only involved at the introduction of the study and established myself as a researcher, not as campus principal. I removed myself from the data collection

phase of the case study. My removal after the introduction of the study and the establishment of trust in my role as a researcher was critical to obtaining accurate and meaningful data that was not influenced by a desire to satisfy the campus principal. The following measures were taken to build trust and protect the participants:

1. I met with all participants prior to the start of the data collection to inform them of all aspects of the research project and the ethical considerations of the study (e.g., informed consent, confidentiality, and protection of participants' anonymity). Prior to the study, participants were given a consent form (See Appendix D) to sign that guaranteed all responses would remain anonymous and all data gathering, including audio recordings, transcripts, and eJournal entries will remain confidential. They were also informed that information presented in the findings would protect all participants from having their identity exposed.
2. I thoroughly explained the consent form to ensure that participants understood the rights, risks and benefits of participating. Throughout the study participants were frequently reminded of their right to refuse to participate and/or withdraw from the study.
3. I shared my personal bias regarding the importance of designing formative assessments prior to instruction, the value of collaboration between PLC members, and the significance of effective systems to help align curriculum, assessment, and instruction.

4. I delineated a strict separation between the research study and teacher evaluations. I guaranteed teachers that I would not conduct, participate in, or contribute to any portion of their Professional Development and Appraisal System (PDAS) evaluation nor would any information gathered during the study be used in evaluating performance in PDAS domains.
5. I elicited the assistance of the IC to collect all data during the study. The IC was trusted by the teachers, accepted as a member of the PLC and ensured confidentiality and anonymity of teachers involved in the study. I assured the IC that I would not conduct, participate in, or contribute to any portion of her evaluation nor would any information gathered during the study be used in evaluating performance.

To remove myself from the data collection process, I used the math IC as the moderator, gatekeeper, data collector, and primary point of communication once the study began. The instructional coach had no supervisory authority and was accepted as a member of the PLC. This person had worked with the PLC for approximately three years and had built rapport with each teacher. As an IC, this professional had also received extensive training in active listening, showing respect, maintaining confidentiality, and exercising empathy with teachers.

By using the instructional coach as the *insider* to collect the data, teachers were more comfortable expressing themselves in a non-threatening environment. Agar (1980) supported the use of insiders for case studies and argued that these individuals must be people who are respected by participants and who are viewed to be neutral facilitators.

The IC audio taped the assessment development sessions, facilitated the anonymous eJournal reflections, conducted the focus group interview, gathered supporting documents and shared overarching themes with the PLC as part of the member checking process.

Limitations

There were distinct limitations to this case study. Although this case study provided detailed insight into the collaborative processes used to create PLC-developed CFAs, the findings do not generalize to other settings due to the small number of members in the case at a single school and the brief time for data collection. The fact that the PLC members had remained constant and had worked with the same IC for three years also impacted the findings of the study. A different PLC composition may render dissimilar findings.

In addition, it is possible that the teachers involved in the case were more diligent in their efforts to contribute to the research because they knew that I, the campus principal, would analyze and present the findings. Therefore, the IC was used as the gatekeeper and data collector. This professional did not hold a supervisory role at the school and had worked with the PLC for approximately three years. By using the IC as the *insider* to collect the data, teachers appeared to be more comfortable expressing themselves in a non-threatening environment. Although I had no involvement in the data collection, the teachers were aware that the data was being collected on my behalf. The data and written drafts of the record of study chapters were shared with the IC and

teachers to ensure that my findings reflected the true realities of what occurred within the PLC. The teachers and IC made adjustments and offered clarification to the data as necessary.

Qualifications of the Researcher

Qualitative researchers are advised to disclose personal information that could potentially add bias to research findings (Krathwohl & Smith, 2005). It is important for me to acknowledge that I am the principal of the Title I middle school. Although I exercise a great deal of influence over most aspects of the school, I am also a researcher. My commitment to improving the quality of instruction and to conducting ethical research surpasses my need to tell a story with a good ending or one that portrays the school in a good light. As a researcher, I directed my data collection and interpretation away from the activities of principal *per se* and toward the work of PLCs in the use and development of common assessments.

I am currently in my fourth year serving as principal. Prior to this position, I was an instructional assistant principal and a grade level assistant principal at a local high school. As a teacher, I taught government, economics, United States history and geography at both the high school and junior high levels. I also served as a long-term substitute in Special Education. I attended Southern University in Baton Rouge as an undergraduate student and obtained my bachelor's degree in Secondary Education. After college, I relocated to Florida to begin my teaching career. While there, I earned my master's degree in Educational Leadership from Florida A&M University in

Tallahassee, Florida. My overall goal as an educational leader and researcher is to improve practice by adding to the wealth of knowledge that currently exists about PLCs by focusing specifically on the use of PLC-developed common formative assessments as a means to increase alignment between curriculum, assessment, and instruction.

CHAPTER IV

FINDINGS AND INTERPRETATIONS

Background

The primary research intent of this case study was to analyze the collaborative processes used by five sixth grade math teachers and one instructional coach (IC) to create CFAs that aligned with the rigor of the STAAR and TEKS. This case study was designed to respond to the following overarching research question: What collaborative processes are used to build CFAs in a PLC comprised of five sixth grade math teachers and one instructional coach (IC) at a Title I middle school in the Southern United States? The two sub-questions of the research are:

1. What professional dialogue occurs when the sixth grade math PLC collaborates to develop CFAs that align with the rigor of TEKS and STAAR?
2. What resources does the sixth grade math PLC use to develop CFAs that align with the rigor of the TEKS and STAAR?

Collaborative processes are to the ways in which teachers think, dialogue, and interact with one another as a PLC. CFAs are formative assessment instruments created by a team of teachers and used to help improve instructional practices. Alignment refers to the extent to which curriculum standards, assessments and instruction are designed at a level of cognitive demand that allows students to meet learning targets (Webb, 2007). Rigor includes the learning experiences that allow students to become cognitively engaged in activities that align to the learning objectives (Blackburn, 2008).

This chapter provides an analysis of data collected from common formative assessment (CFA) development sessions, eJournal reflection notes, one focus group interview, and supporting documents from a sixth grade math PLC at a Title I middle school in the Southern United States.

Methodology Summary

Methods

This case study used a qualitative case study research methodology (Creswell, 2007) to investigate and analyze the use of common formative assessments (CFAs) at a Title I middle school in the Southern United States. A qualitative approach was most appropriate as it allowed me to analyze CFA development in the "natural settings, attempting to make sense of, or interpret, phenomena" (Denzin & Lincoln, 2005, p. 3). I used multiple data sources and data analysis techniques to gain an understanding of the collaborative processes and the professional dialogue that evolved during assessment development.

Data was collected via audio recordings of PLCs during two CFA development sessions, one focus group interview, two eJournal lesson reflections per teacher, and supporting documents shared by the PLC. The transcribed text from each data source was analyzed multiple times for repetitions and ideas that connected to the theoretical framework presented in Chapter II. The data collection phase of the research spanned eight weeks, starting in September 2012 and ending in October 2012. Table 4.1 provides

a cross reference of the alignment between the research questions, eJournal questions (See Appendix A) and focus group questions (See Appendix B).

Research Sub-Question	Data Source	eJournal (J) or Focus Group Question (F)
What professional dialogue occurs when the sixth grade math PLC collaborates to develop CFAs that align with the rigor of TEKS and STAAR?	Focus Group	J3, J4
	Focus Group Interview	F5, F6, F7, F8
What resources does the sixth grade math PLC use to develop CFAs that align with the rigor of the TEKS and STAAR?	eJournal	J1, J2, J3, J4
	Focus Group Interview	F1, F2, F3, F4

Table 4.1: Case Study Research Questions Aligned to Data Sources.

Data Analysis

The data analysis process consisted of analyzing the raw data, formatting the data into codes, and combining the codes into broader themes (Creswell, 2007). Coding consisted of sorting through the data for themes, ideas and categories for the purpose of making comparison or drawing conclusions (Taylor & Gibbs, 2010). After the initial codes were identified, "constant comparative analysis" (Glaser, 1965) was used to identify patterns, compare codes and merge interrelated themes. Open coding (Straus & Corbin, 1990), or labeling words or phrases found in the transcript, was used to identify the initial codes. Hierarchical relationship coding (Muhr, 1994), or the grouping of codes based on similarities, was used to establish a major theme—curriculum, assessment, and instructional alignment processes.

Throughout the coding process, a codebook was established to represent the major findings of the study. Codebooks are developed to "reflect the analyst's implicit or explicit research questions…and link features in the text (e.g., words, sentences, dialog) to the analyst's constructs" (MacQueen, McLellan, Kay, & Milstein, 1998, p. 33). The major theme—curriculum, assessment, and instructional alignment—connected to the theoretical framework and is supported by the following sub-themes: (a) collaborative CFA development process, (b) collaborative processes for deconstructing the TEKS, (c) collaborative processes for developing CFA blueprints, (d) aligning CFA questions to the TEKS, and (e) aligning the rigor of instruction to match the rigor of TEKS and CFAs. Table 4.2 provides a codebook of the major theme and sub-themes that evolved during analysis of the case study data.

Overarching Question: What collaborative processes are used to build CFAs in a PLC comprised of five sixth grade math teachers and one instructional coach (IC) at a Title I middle school in the Southern United States?	
Research Sub-Questions	
Q1: What professional dialogue occurs when the sixth grade math PLC collaborates to develop CFAs that align with the rigor of TEKS and STAAR?	**Q2: What resources does the sixth grade math PLC use to develop CFAs that align with the rigor of the TEKS and STAAR?**
Major Theme Curriculum, Assessment, and Instructional Alignment Processes	
Sub-Themes 1A-1: Collaborative CFA Development Process 1A-2: Collaborative Processes for Deconstructing the TEKS 1A-3: Collaborative Processes for Developing CFA Blueprints 1A-4: Aligning CFA Questions to TEKS 1A-5: Aligning CFA Question Rigor using Webb's DOK Levels 1A-6: Aligning the Rigor of Instruction to Match the Rigor of TEKS and CFAs	

Table 4.2: Case Study Data Themes Codebook.

To triangulate the data patterns, I used audio recordings of the CFA development process, eJournal reflections, focus groups audio recordings, and supplemental documents from the PLC. The data triangulation matrix in Table 4.3 substantiates the sub themes and reveals the sources of data that support each theme.

Sub-Themes	**SOURCE OF DATA**			
	C	**J**	**F**	**S**
Collaborative CFA Development Process	X		X	X
Collaborative Processes for Deconstructing the TEKS	X	X	X	X
Collaborative Processes for Developing CFA Blueprints	X		X	X
Aligning CFA Questions to TEKS	X		X	X
Aligning CFA Question Rigor using Webb's DOK Levels	X		X	X
Aligning the Rigor of Instruction	X	X	X	X

Table 4.3: Case Study Data Triangulation Matrix.
Note: C = CFA Development Sessions, J = eJournal, F= Focus Group, S = Supplemental Documents

To validate the accuracy and offer credibility to the data of this case study, "writ large" (Creswell 2007, p. 208), or member checking, was used to ensure that the themes captured the true realities of the PLC. During the process, the themes and my interpretation of the data were shared with each teacher to ensure that my discoveries were "congruent with the participants' experiences" (Curtin & Fossey, 2007).

Findings

The findings were organized to respond to the following overarching research question: What collaborative processes are used to build CFAs in a PLC comprised of five sixth grade math teachers and one instructional coach (IC) at a Title I middle school

in the Southern United States? The following sub-questions also guided this research study:

1. What professional dialogue occurs when the sixth grade math PLC collaborates to develop CFAs that align with the rigor of TEKS and STAAR?
2. What resources does the sixth grade math PLC use to develop CFAs that align with the rigor of the TEKS and STAAR?

From these questions, one overarching theme evolved—curriculum, assessment, and instructional alignment.

Curriculum, Assessment, and Instructional Alignment

The theme curriculum, assessment, and instructional alignment encompasses the collaborative processes, professional dialogue, and resources used by the PLC during CFA development. It also included the practical processes used by the PLC to use the CFA development process to assist with the precise alignment between curriculum, assessment, and instruction. As outlined in the codebook in Table 4.2, six sub-themes also evolved from the data analysis. These sub-themes include: (a) collaborative CFA development process, (b) collaborative processes for deconstructing the TEKS, (c) collaborative processes for developing CFA blueprints, (d) aligning CFA questions to TEKS, (e) aligning CFA Question Rigor using Webb's DOK levels, and (f) aligning the rigor of instruction. Explanations and data surrounding the overarching theme and sub-themes are presented in the subsequent section.

Collaborative CFA Development Process

CFA development processes are the formal and informal steps that a PLC follows to create assessments. Several researchers shared protocols to guide the CFA development process. As outlined in Chapter II, there are three common developmental threads from researchers (e.g., Ainsworth & Viegut, 2006; DuFour et al, 2006; Guskey, 2003; Goodwin, 2009) who have investigated CFA development processes—(a) identify the learning objectives, (b) deconstruct the objectives, and (c) design assessments that measure conceptual understanding of the objectives. These processes rest on the premise that CFAs are collaboratively crafted prior to instruction with the purposeful intent of providing evidence that students are meeting the predetermined learning goals (Wiggins & McTighe, 2005).

The five math teachers and instructional coach (IC) who participated in this qualitative case study provided insight into the practical processes involved in developing CFAs prior to instruction. Their conversations during the assessment development process, reflections via eJournal, focus group, and supporting documents provided a clear understanding of the CFA assessment development process. During the two CFA development sessions and the focus group interview, the team of teachers referred to the campus-based "Roadmap to Assessments" (Focus Group Interview, October 2012) as their protocol for developing CFAs. The PLC also shared the following campus-developed core beliefs that guide their practice:

1. Common assessments will be created prior to instruction.
2. Every major assessment will be common among the PLC.

3. Common assessments will resemble the depth and complexity of the TEKS/STAAR/EOC tests.
4. Common assessments in the form of projects, essays, etc. will have a detailed rubric with TEKS/SEs, essential questions, and student outcomes identified, and will be common among the PLC.
5. Common assessments will be TEKS/SE specific by question and identified on the test.
6. Data analysis, recovery, and spiraling will occur after every common assessment (PLC Supporting Documents, October 2012)

During the focus group discussion, one teacher shared the following regarding their overall process of creating CFAs:

> We used the 'Roadmap to Assessments' for the protocols. Our process is that we take the old test based off of TAKS to be restructured. We check for the TEKS that need to be covered on the test. We make sure we cover the material. We check for each question to be leveled properly…we then start creating, adjusting and eliminating questions to then make our new test (Teacher A, Focus Group Interview, October 2012).

Another teacher gave the following description for the process, "I feel like it's one big circle and it all correlates…If you start with the TEKS and test, it helps to bridge everything together and forms a big circle" (Teacher B, Focus Group Interview, October 2012). A third teacher from the PLC noted that the process is "beginning with the end in mind" (Teacher C, Focus Group Interview, October 2012). *Beginning with the end in mind* (Wiggins & McTighe, 2005) involved starting with a clear understanding of what students were expected to learn from the TEKS or district-provided unit plan. Unit plans are defined as an electronic lesson planning system which provided the scope and

sequence, and outlined a structured format to ensure coverage of the TEKS (See Appendix C & D).

Collaborative Processes for Deconstructing the TEKS

Collaborative processes refer to the way teachers think, dialogue, and interact with one another as they design lessons, share best practices, deconstruct the learning objectives and create assessments. The process of aligning common formative assessments (CFA) questions to the TEKS refers to the act by which teachers ensure that each assessment question measures the depth and complexity outlined in the state objective. Deconstructing the TEKS entails identifying every component of each learning objective and "breaking it into smaller, more explicit learning targets" (Stiggins, Chappuis, Chappuis, & Arter, 2007, p. 80).

DuFour, DuFour and Eaker (2008) identified the following four critical questions to guide the work of any PLC:

1. What do we want each student to learn?
2. How will we know when each student has learned it?
3. How will we respond when a student experiences difficulty in learning?
4. How will we extend the learning for students who have mastered the essential concepts?

The first two questions are critical alignment factors that must be discussed prior to instruction. When designing rigorous CFAs that align with the curriculum, PLCs must collaborate to address the first two questions, which begins with deconstructing the learning standards and then creating assessments that align with these standards.

Ainsworth and Viegut (2006) explained that CFA design must begin with a clear understanding of the depth and complexity of the learning standards. Teachers must understand the standards and *teach to the skills not to the test* in order to help students meet the cognitive demand of the standards and the corresponding CFA (Popham, 2003). The process of collaboratively deconstructing the standards involves "taking a broad and/or unclear standard, goal, or benchmark and breaking it into smaller, more explicit learning targets" (Stiggins, Arter, Chappuis, & Chappuis, 2006, p. 80).

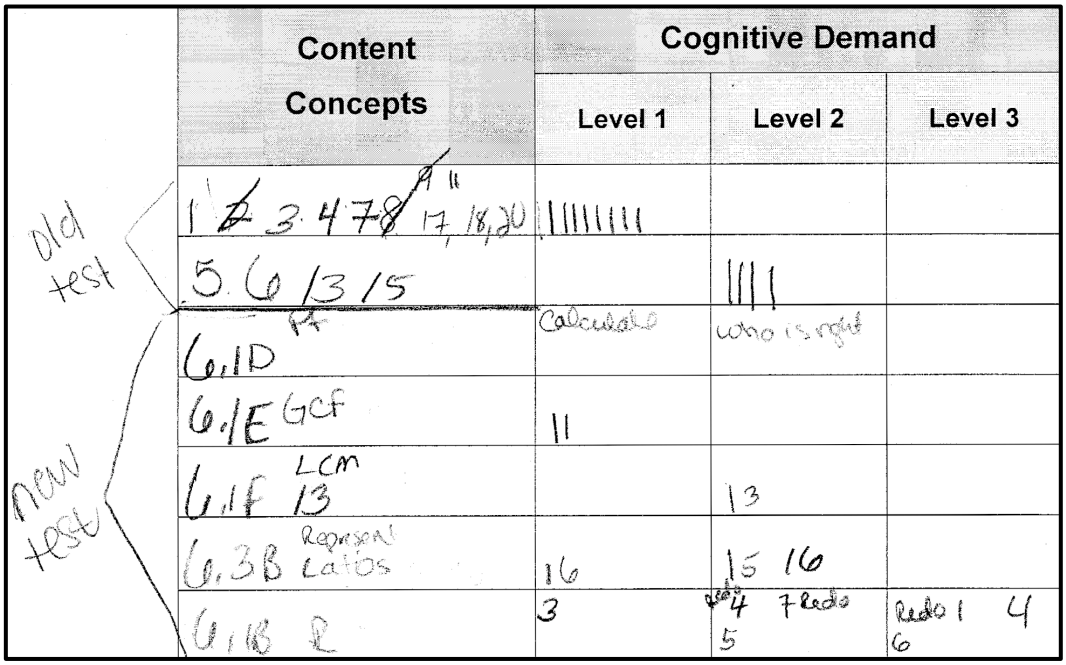
Teacher A shared the following regarding TEKS deconstruction, "We broke the TEKS down and really analyzed them for a deeper understanding of what we were supposed to be teaching and what the students were supposed to learn" (Focus Group Interview, October, 2012). Teacher B posted the following in the eJournal, "as we planned the assessment, we really analyzed the TEKS associated with it. This gave me an intentional focus as I helped students discover the material" (October, 2012, eJournal Reflections). Teacher C elaborated on how the deconstruction process assisted in the alignment of curriculum, assessment, and instruction in the following statement, "[For TEKS 6.1B] We knew they would not only need an introduction to ratios, but also that they needed that knowledge to flow into tables, equivalent ratios, and simplifying. So we designed a task to help all of these merge together into one engaging lesson" (eJournal Reflection, October, 2012).

Collaborative Processes for Developing CFA Blueprints

An assessment blueprint is a chart or table which outlines the specific concepts, the number of questions that will address each concept, and the cognitive demand for

assessing each concept (Gareis & Grant, 2008). Ainsworth and Viegut (2006) assert that much like architectural blueprints provide a guide for the construction of buildings, it is necessary to create blueprints prior to engaging in the assessment development process.

The process of aligning TEKS to each assessment question was evident during both CFA development sessions. As a starting point, the PLC created a blueprint which specified the student expectations or TEKS, cognitive demand outlined in the TEKS, and total number of questions that should exist per objective. The PLC also referred to the district-provided unit plan (See Appendix C & D) as a guide to determine the appropriate objectives. Figure 4.1 displays an excerpt of the blueprint from the second CFA development session. The blueprint identifies the concepts, number of questions and cognitive demand to be incorporated on the CFA (Gareis & Grant, 2008). The blueprint also shows the miscellaneous notes from one teacher, as well as modifications to concepts and cognitive demand from the *old test* and *new test*. *Old Test* refers to the blueprint from the previous year's CFA, while *new test* was the CFA created during this case study. The PLC engaged in a collaborative process of updating their blueprint (see "new test" in Figure 4.1) as the rigor or cognitive demand of the questions was modified during the CFA development session. See Appendix H and I for the entire CFA before and after leveling and modifications.



	Content Concepts	Cognitive Demand		
		Level 1	Level 2	Level 3
old test	1 2 3 4 7 8 9 11 17, 18, 20	||||||||		
old test	5 6 13 15		||||	
new test	6.1D	Calculate	who is right	
new test	6.1E GCF	11		
new test	6.1F LCM 13		13	
new test	6.3B Represent Ratios	16	15 16	
new test	6.1B R	3	4 7 Redo 5	Redo 1 4 6

Figure 4.1: Excerpt from Sixth Grade Math CFA 2 Blueprint.

The process of creating the test blueprint involved each PLC member identifying explicit TEKS on the prior year's assessment over the same unit. By analyzing the prior year's unit assessment, the team had a starting point from which to build the new CFA. The following dialogue regarding the appropriate TEKS to be included on the second CFA occurred between team members:

> Teacher A: So [test] 2A has to start here. So go through this, identify the questions that you have on here, don't determine whether you will keep or throw away, then make sure that we cover this and develop the new test.
>
> IC: Will you pull the screen down? I will pull up [the unit plan] (CFA Development Session 2, September 2012).

This introductory dialogue revealed that the teachers were strategic about determining and identifying the TEKS for each question from the prior year and aligning those TEKS with the upcoming unit of study. It is important to note that the IC prompted the PLC to

view the unit plan to guide the team's decision making. The following except is a continuation of the dialogue regarding the appropriate TEKS to include on the second CFA:

> Teacher C: It is split between 2 six weeks and we are trying to determine where to split it at.
>
> IC: Can we go all the way to multiples?
>
> Teacher C: We are ending the 6 weeks at LCM [least common multiple]. That doesn't start until next 6 weeks.
>
> IC: Where are you stopping to give a test?
>
> Teacher C: Well according to this from [TEKS] 6.1D to [TEKS] 6.1F, which is repeated multiplication, exponents, prime factorization, GCF [greatest common factor] and LCM [least common multiple].
>
> Teacher B: But that's just where the 6 weeks cut off. So we don't have to give a test after [TEKS] 6.1F?
>
> IC: But you haven't tested this group here on test 1B.
>
> Teacher B: We will test it on the test that we are writing.
>
> Teacher A: So this test needs to start here.
>
> IC: Look at the screen, this is our unit.
>
> Teacher D: We have 5 weeks to cover the rest of the material.
>
> Teacher B: We will have 5 weeks but still give 2 tests.
>
> Teacher E: So what will we call these tests?
>
> Teacher C: So we have 5 weeks to cover this entire fraction unit, correct?
>
> Teacher E: Because we only want to test on so many TEKS at one time. We don't want to overload.

In the preceding segment the teachers are thinking ahead to determine the best stopping

point for the CFA based on the unit plan. Multiple members of the team weighed in on the conversation but the final decision rested on the structure of the unit plan. It is also important to note that the team considered the number of weeks needed to teach the unit. This required teacher forethought regarding the scope and sequence of the curriculum. Teacher E also made a comment regarding not "want[ing] to overload. This was important as if the PLC placed too many objectives one test it becomes less useful for instructional adjustments. The following segment is a continuation of the comments regarding which TEKS to include on the CFA:

> IC: So look up here and pick a stopping point to determine where we want to cut this test off. Do we want to cut it off after multiples, after ratios, after multiple numbers? We can cut it wherever you want it.
>
> Teacher C: So the only readiness standards will be the equivalent forms and the simplest forms? And then we have a bunch of supporting standards. So stop at [TEKS] 6.1B (CFA Development Session 2, September 2012).

Throughout this entire dialogue the IC served a critical role in helping align the CFA to the unit plan and TEKS. Saphier and West (2009) argued that ICs must lead group planning meetings when appropriate and use some "tool or set of tools that encourage people to stay focused on the important variables that must be considered to ensure robust lesson design" (p. 48). As noted in the conversation above, the IC consistently provided guiding questions to prompt the team to review the unit plan. Although this professional is seen as part of the team, this segment provided insight into the supportive prompting that was used to empower teachers during this process. However, all of the decision making power regarding *what* to assess rested in the hands of the teachers.

Aligning CFA Questions to TEKS

Webb (2007) argued that precise alignment exists when the objectives and assessment items are in agreement. The sixth grade math PLC analyzed each question to review the TEKS associated with each item. During the first CFA development session, one of the teachers initiated the process of aligning the TEKS to each question with the following statement, "So we are looking for the TEKS or are we looking for levels?...Let's agree on the TEKS first." (CFA Development Session 1, September 2012). Figure 4.2 provides an example of an assessment question from the previous year that aligned with TEKS 6.1B. Miscellaneous notes from the collaborative conversation regarding this CFA item are also included in Figure 4.2. The PLC used this question as a starting point for development of a new question that aligned with TEKS 6.1B.

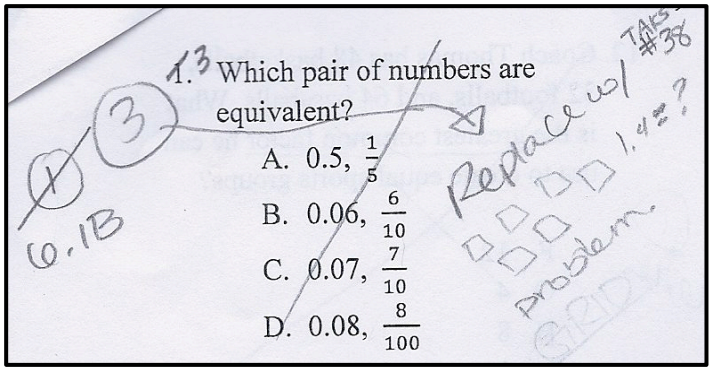


Figure 4.2: CFA Question Aligned to TEKS 6.1B (before modification).

Throughout the process of creating an alignment between the TEKS and the CFA, the PLC continuously engaged in collaborative processes regarding the type of TEKS, readiness or supporting, and which were to be included on the CFA. The

readiness standards are TEKS that are necessary for the current grade level or course and are critical for preparing students for the next grade level. The supporting standards are TEKS designed to prepare students for the next grade level (Texas Education Agency, 2010). During the second CFA development session, the team engaged in the following exchange regarding readiness and supporting TEKS:

> Teacher A: We need that page to look like this—[TEKS] 6.1B, 6.2B.
>
> Teacher A: What TEKS are we looking at?
>
> Teacher B: [TEKS] 6.1D there is nothing there.
>
> Teacher B: [TEKS] 6.1E.
>
> Teacher C: [TEKS] 6.1F, 6.3B.
>
> Teacher B: [TEKS] 6.1B.
>
> Teacher C: Do you want the readiness standards?
>
> Teacher B: There are only two that I have seen—simplest form and generate equivalent forms. Everything else is supporting.
>
> Teacher D: [TEKS] 6.1B.
>
> Teacher A: What was 6.3B?
>
> Teacher B: That is representing ratios.
>
> Teacher A: Which ones were readiness?
>
> Teacher B: Just the [TEKS] 6.1B. Everything else was supporting (CFA Development Session 2, September 2012).

In the segment above, the PLC focused their attention on creating a CFA that mirrored the type of TEKS that would be assessed on the sixth grade math STAAR. The sixth grade STAAR test assesses 65 to 70% readiness standards and 30 to 35% supporting

standards (Texas Education Agency, 2010). The team used the STAAR Quick Reference Sheet and Blueprint (See Appendix J) to help identify readiness verses supporting standards during this discussion. The STAAR, however, is based on the full grade level curriculum. Since the CFAs created by the sixth grade math PLC were developed based on the TEKS contained in a single unit plan, the percentage of readiness versus supporting standards did not mirror the STAAR.

During the focus group interview, the PLC was asked to elaborate on how the TEKS were used in the building of CFAs. Teacher A replied that the TEKS were, "the basis or foundation for building them…we focused on the readiness standards. We used those TEKS to make sure that we were covering what we were supposed to be covering based on our [unit] plan" (Focus Group Interview, October 2012). Teacher B commented that the team engaged in self-audits by "placing the TEKS at the end of each question" (Focus Group Interview, October 2012) on the CFAs that were given to students. This teacher also commented, "next year when we look at these again, we don't have to go back through and say, What TEKS is this?" (Focus Group Interview, October 2012). See Figure 4.3 for an example of how the PLC noted the specific TEKS for the question on the student copy of the CFA.

Use the model below to answer Question 2.

2. Which fraction represents the un-shaded part of the model? 6.1B

F. *3/4*

G. *1/4*

H. *6/8*

J. *4/3*

Figure 4.3: TEKS Alignment for CFA Question.

The PLC engaged in a thoughtful process of aligning each assessment question to the TEKS. The team used the prior year's CFA, the unit plan, and the STAAR blueprint to align each CFA question. Each team member appeared to have experience analyzing questions to determine the appropriate TEKS. It was evident that the team understood the importance of not only assigning a TEKS to each question to ensure alignment, but also for ease of identifying post assessment strengths and weaknesses based on objectives. They also placed the TEKS on the student copy of the CFA, which could be used to promote student reflection and metacognitive analysis of their strengths and weaknesses. Aligning each assessment question to the TEKS and identifying the TEKS on the CFA helped teachers ensure a connection between the questions and the objectives, and also served as a starting point to help students self assess based on specific objectives. According to Marzano (2003), assessment data is most meaningful

when teachers and students can highlight strengths and weaknesses within discrete categories or learning targets.

Aligning CFA Question Rigor using Webb's DOK Levels

Webb (2007) argued that precise alignment exists when the objectives and assessment items are in agreement. Furthermore, the depth of knowledge (DOK) or rigor of the objective and the corresponding CFA questions must match. Webb (2007) also suggested that teachers create a "balance of representation" (p. 14) to ensure the appropriate mixture of questions on each assessment. There were four distinct collaborative processes carried out by the sixth grade math PLC as they aligned CFA questions using Webb's DOK levels. These included: (a) assigning DOK levels, (b) reaching consensus on DOK levels, (c) balancing the number of questions at each DOK level and (d) adjusting the DOK level or rigor of CFA questions.

Assigning DOK Levels

To guide the work of aligning the rigor of each question, the PLC started by using a blueprint template that contained columns for each DOK level. As the PLC compared alignment of each pre-existing question to readiness or supporting TEKS, they also assigned a DOK level to the question. As part of the alignment process, the PLC also discussed the percentage of DOK levels that were most advantageous for the CFA. During the focus group discussion, one teacher noted, "We check for each question to be leveled properly. The 25/50/25. We then start creating, adjusting and eliminating questions to then make our new test. Level 1 is 25%, Level 2 is 50% and Level 3 is 25%" (Teacher C, Focus Group Interview, October 2012). Figure 4.4 is a finalized

blueprint after the PLC completed the second CFA. The pie chart at the bottom left of Figure 4.4 served as a visual representation of the intended, versus actual, percentages of each DOK level on the completed assessment. The pie chart on the right was completed after the assessment was finalized to guarantee a balance of Level 1, 2, and 3 questions.

The majority of the CFA development sessions were devoted to the process of leveling each question and balancing the percentage of questions within each level. After engaging in the process of aligning each question to the rigor of the TEKS and balancing the percentage of DOK levels, the PLC created CFAs to match their blueprints. Figure 4.4 is an the finalized blueprint from the second CFA development session, which consisted of three Level 1 questions, six Level 2 questions and three Level 3 questions.

Content Concepts	Cognitive Demand			Total Items
	Level 1	Level 2	Level 3	
6.1 D prime fact	Calc.	who is right		2
6.1 E GCF	11			1
6.1 F LCM		13		1
6.3 B ratios		15, 16		2
6.1 B equiv. forms	3	5, 7	1, 4, 6	6
Total Items	3	6	3	12

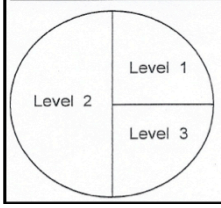


Figure 4.4: Finalized CFA Blueprint for CFA 2.

The data revealed that the PLC was deliberate in their collaborative processes for leveling the CFA questions. The teachers were trained on Webb's (2007) alignment processes one year prior to this case study. The ability of the team to clearly articulate their procedures and carry it out intuitively was due to the extensive training that was provided by their IC and the experience the teachers gained by applying the alignment techniques for an entire school year.

Reaching Consensus on DOK Levels

Webb's (2007) alignment process suggests that teachers align questions to the DOK levels specified in the objectives by engaging in a validation process to determine the DOK of the objective. Both CFA development sessions provided insight into the collaborative "consensus building and justification" (Webb, 2007, p. 9) processes used during CFA development. To accomplish this, the team used the unit tests from the previous school year (See Appendix F & H) as a foundation to (a) determine the TEKS for each question, (b) analyze the TEKS for the target DOK levels, and (c) determine whether the preexisting question met the intended level of rigor outlined in the TEKS. After determining the levels of the previous year's CFA, the team grappled with determining which questions would remain the same and which should be adjusted to match the rigor of the TEKS. The rigor of each identified question was then modified based on the input from each PLC member. This method required effective dialogue within the PLC. Effective dialogue within a PLC requires "emotional safety for all participants…openness, trust, willingness and support. It levels the playing the field and creates a more egalitarian and participative environment" (Crane, 2009, p. 105).

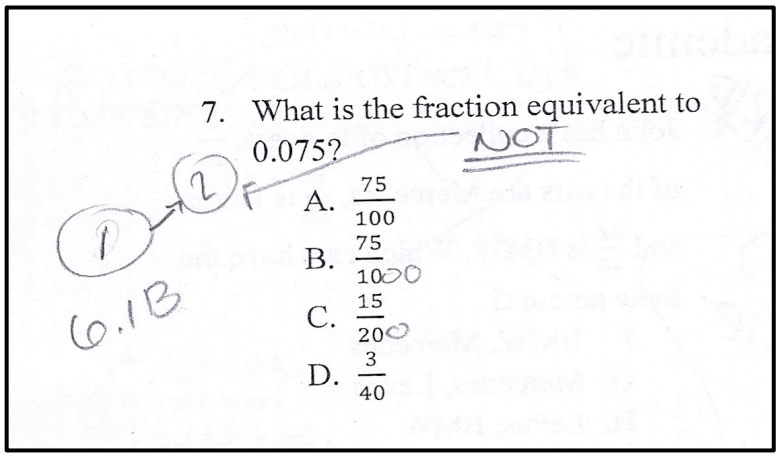
The following dialogue provides insight into the DOK strategies used by the PLC to align the rigor of each CFA question:

> Teacher A: What is the TEKS for this one 6.1B?
>
> Teacher B: Number 4; 6.1B is Level 1
>
> Teacher C: So what did we say on number 2 and 3?
>
> Teacher D: For 6 grade it's a [level] 1.
>
> Teacher B: So 1, 2, 3, and 4 are Level 1?
>
> Teacher E: [Number] 2 is a Level 2 isn't it?
>
> Teacher A: I thought 4 might have been bumped up a little.
>
> Teacher D: I mean it's just express fraction and ratios in the simplest form.
>
> Teacher A: Not only are you converting them, you also have to compare them to see which two have the same amount.
> Teacher D: It depends on how you are doing the comparing. You can set them all equal to each other and determine.
>
> Teacher B: But you have to convert and compare which is a multi-step.
>
> Teacher C: If we were to make this a Level 2 question…on number four it would be easy to make a Level 2 but right now I think it's a Level 1.You [are] just looking at 3 fractions and determining which ones are equal (CFA Development Session 2, September 2012).

In the dialogue above the teachers established the levels of their assigned questions and provided a rationale for the levels they assigned. The goal of this process was to ensure that the DOK levels of the individual questions were the same as the DOK level of the corresponding objective. Throughout this process, the teachers shared their reasoning for variance if discrepancies existed about the DOK levels. The final comments between Teacher A, D, B and C revealed some collegial disagreement between the teachers on

the level for a particular question. This cognitive dissonance prompted a deeper analysis into understanding why the question should remain a Level 1. However, the safe PLC environment was fertile ground for "exploring one another's thinking, and [making] a conscious effort to understand as well as to be understood" (DuFour, et al., 2006, p. 163). The synergy and respect between the teammates made it harmless to share, disagree, justify, and establish consensus.

During both CFA development sessions there were also instances in which teachers were undecided as to which DOK level to assign specific questions. To work through this process, teachers offered justifications as to why they chose specific DOK levels. Figure 4.5 and the excerpt below provide an example of two teachers talking through their rationale for leveling and how to increase the rigor of the question to match the TEKS. One teacher's notes are also included in Figure 4.5. The notes identify the TEKS, DOK level, and proposed changes to be made to increase the rigor of this question (e.g., change the value of the fractions, add the word NOT). The objective for this question and the corresponding dialogue is TEKS 6.1B, which requires students to generate equivalent forms of rational numbers including whole numbers, fractions, and decimals.


7. What is the fraction equivalent to 0.075?

NOT

A. $\frac{75}{100}$

B. $\frac{75}{1000}$

C. $\frac{15}{200}$

D. $\frac{3}{40}$

1 2

6.1B

Figure 4.5: CFA question for TEKS 6.1B (prior to leveling and modifications).

Teacher A: Number 7; this one I was torn between a 1.5 and 2; it is 6.1B again.

Teacher B: It has to be a 2 because of multi step. You have to turn it into 75 over 1000. A is not the answer; you have to give it in simplest form.

Teacher C: They write it in fraction and then reduce it.

Teacher B: If they don't simplify, they will get it wrong.

Teacher C: I will say Level 2, but that is the skill.

Teacher B: The reason I say that the reason most people got this question wrong is because they skipped the second step.

Teacher C: You had to convert and compare; but on the others we had to convert and compare too.

Teacher B: If it were written different, then maybe…

Teacher A: So we can bump number up in the future with different answer choices.

IC: Can you [state] on number 7, what is the fraction *not* equivalent to? Then I would see that this is a Level 2 if you had some that were simplified.

Teacher B: So you think it's a 1 and could add the word "not"?

Teacher B: So change the answer choices.

> IC: But I think you should change 75/100 as the wrong answer.
>
> Teacher B: Change b to 75/1000.
>
> Teacher E: So that makes it a Level 2 (CFA Development Session 2, September 2012).

The dialogue above represents the type of collaborative processes that evolved as the teachers leveled questions and aligned them to the TEKS. Teacher B made reference to the multiple steps needed for solving the question during the dialogue. Although some of the teammates disagreed, this teacher saw the CFA question as a Level 2 because students were required to complete two steps—simplify then solve. According to Webb (2007), teachers should offer their opinions regarding "problems with the item that might cause the student who knows the material to give a wrong answer" (p. 9). The IC also chimed in during this discussion. It appeared that the IC used "reflective questioning" (Lee & Barnett, 1994, p. 16) to encourage the PLC to think about and discuss ways to promote rigor by adding *not* and adjusting the answer choices. After a brief discussion, the team added the word *not* to increase the rigor to Level 2.

Balancing the Number of Questions at each DOK Level

As the teachers worked together, they also discussed the percentage of questions at each level that would create in ideal CFA. The conversation below from the second CFA development process goes into greater detail regarding the balancing of DOK levels.

> Teacher A: If you are going to balance this, you have to have about three [level] 1s, six [levels] 2s and three [level] 3s.
>
> Teacher B: So we have an extra [level] 1 and we need to switch one of them to a [level] 3.

Teacher C: We have to switch a one to a three?

Teacher B: We have four Level 1s and we only have two Level 3s so we need to take one of these (CFA Assessment Development 2, September 2012).

In order to create a *balanced* CFA with 25% at Level 1, 50% at Level 2 and 25% at Level 3, the teachers established the exact numbers of question needed at each level. Due to the limited number of TEKS covered on one CFA, the team established this balance so that students are exposed to rigorous assessment questions that apply to each TEKS.

During CFA development session 1, the PLC had a discussion regarding the levels of rigor for the following TEKS: (a) 6.1A Compare and order non-negative rational numbers, (b) 6.2D Estimate and round to appropriate reasonable results and to solve problems where exact answers are not required, and (c) 6.2B Use addition and subtraction to solve problems involving fractions and decimals. During this conversation, the team revisited the CFA blueprint (See Figure 4.6) from the previous year's CFA. The following conversation evolved during the team's analysis of each question:

Teacher A: Will you tell me on 6.1As, what levels did we have?

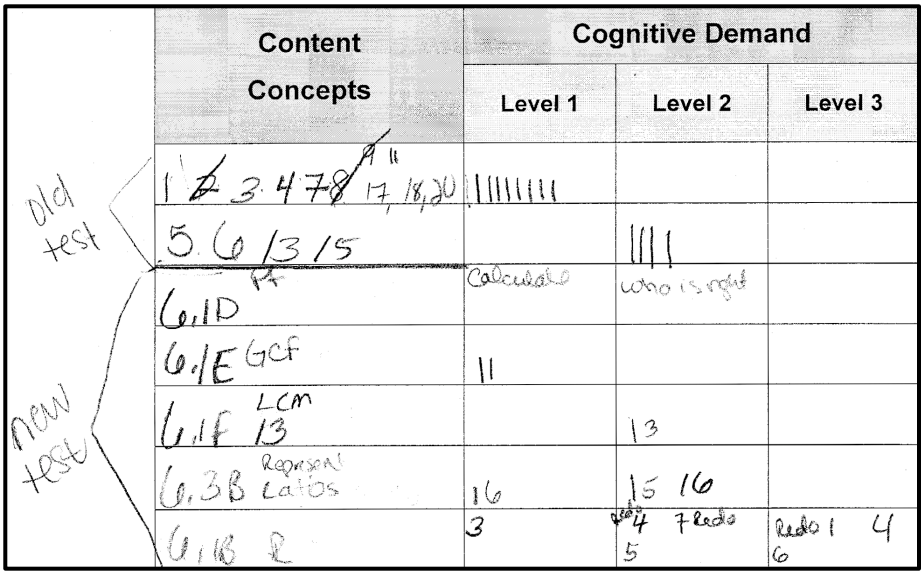
Teacher B: Level 1for both.

Teacher A: What about 6.2D?

Teacher B: D…yeah, we do have it. We have a 3!

Teacher A: And then what about 6.2b?

Teacher B: Level 1.



	Content Concepts	Cognitive Demand		
		Level 1	Level 2	Level 3
old test	1 2 3 4 7 8 17, 18, 20	IIIIIIIII		
old test	5 6 13 15		IIII	
new test	6.1D	Calculate	who is right	
new test	6.1E GCF	II		
new test	6.1F LCM 13		13	
new test	6.3B Represent Ratios	16	15 16	
new test	6.1B R	3	4 7 Redo 5	Redo 1 4 6

Figure 4.6: Original CFA Blueprint for CFA 2 (before modifications).

The excerpt above helped the team discover that most of the preexisting questions were at DOK Level 1. Figure 4.6 provides evidence that the teachers were novices at applying Webb's leveling procedures during the creation of the prior year's CFA. Although the CFA process was not new to the team, they were in their second year of applying Webb's alignment strategies. It is important to note that the data collection in this case study was done during the first grading period. Thus the prior year's CFAs were developed at the onset of the team's experimentation with Webb's (2007) leveling approach. During the school year preceding this study, the IC led the PLC through a series of job-embedded professional development sessions to establish in-depth understanding and practical knowledge of the alignment process. As a result, the ability of the PLC to collectively align the rigor of the TEKS and CFA questions increased over a year's time. The intuitive nature or "internal processes " (Elmore & City, 2007, p. 3)

witnessed in the PLC when applying Webb's alignment approach appeared to be that of an experienced team.

Adjusting the DOK Level or Rigor of CFA Questions

During both CFA development sessions, the PLC also discussed ways of increasing the rigor by rewording questions, requiring students to complete multiple steps, or having students justify their solutions. Figure 4.7 is an item that was previously thought to align with TEKS 6.1A from the previous year's CFA. This objective required students to compare and order non-negative rationale numbers.

Sam recorded the lengths of his model cars in inches. Which list shows the lengths in order from greatest to least?

A 6.8 in., 6.78 in., 6.45 in., 6.5 in, 6.34 in.

B 6.34 in., 6.45 in., 6.5 in., 6.78 in., 6.8 in.

C 6.8 in., 6.78 in., 6.45 in., 6.34 in., 6.5 in.

D 6.8 in., 6.78 in., 6.5 in., 6.45 in., 6.34 in.

Figure 4.7: CFA question for TEKS 6.1A (prior to leveling and modifications).

The following discussion occurred during the analysis of the question in Figure 4.7:

> Teacher A: Number 11, again was a 6.1A, and it does put it in the real world, but they're basically ordering from greatest to least, so it kind of seems like a Level 1.
>
> Teacher B: And it's a supporting standard for 6.1a, so it's not like they have never seen that before—they have.
>
> IC: In sixth grade, we probably need to…make something go to the thousandths place. And put something in a table (CFA Development Session 1, September 2012).

Teachers A and B identified this item as a Level 1 due to the simplicity of the question. It was apparent, however, that the IC was instrumental in prompting the team to think of ways to adjust the rigor of this question to align with the sixth grade TEKS. Supportive language (e.g., use of the word *probably*) was used to make suggestions during this dialogue. It was obvious that the IC had in-depth knowledge of vertical alignment and the appropriate rigor at each grade level. By suggesting that the PLC incorporate a table, the IC was attempting to align the question with STAAR sample questions, which require students to capture data from tables before organizing, comparing, analyzing or manipulating the data. Figure 4.8 is the more rigorous question that resulted from discussion. The PLC added a table and modified the answer choices.

5. Sam recorded the length of his model cars in inches.

Length of Model Cars in inches.
6.8 in.
6.78 in.
6.450 in.
6.502 in.
6.34 in.

Which list shows the lengths in order from greatest to least? *(6.1A, Level II)*

A 6.8 in., 6.78 in., 6.450 in., 6.502 in., 6.34 in.

B 6.34 in., 6.450 in., 6.502 in., 6.78 in., 6.8 in.

C 6.8 in., 6.78 in., 6.450 in., 6.34 in., 6.502 in.

D 6.8 in., 6.78 in., 6.502 in., 6.450 in., 6.34 in.

Figure 4.8: CFA question for TEKS 6.1A (after leveling and modifications).

Throughout the leveling process the team also discovered that some questions were easier to *bump up,* or increase the rigor, than others. In the following scenario, the team discussed increasing the rigor for the question in Figure 4.9, which required

students to represent ratios and percents with [concrete] models, fractions and decimals.

16. What is the ratio of M's to all letters in the word Mathematics?
    F. 29
    G. 211
    H. 119
    I. 112

Figure 4.9: CFA question for TEKS 6.3B.

> Teacher A: Can we bump number 16 to a Level 3?
>
> Teacher B: That's what we were trying to do but we got off track.
>
> Teacher C: Is this their first time seeing ratios?
>
> Teacher D: Yes.
>
> Teacher C: So do we want to bump a ratio question up to a Level 3?
>
> Teacher B: What does a Level 3 look like? That's the question (CFA Development Session 2, September 2012).

After much discussion, the team felt that a Level 3 was not appropriate for assessing TEKS 6.3B. Teacher C had the foresight to consider the scope and sequence to help determine whether or not the ratio question needed to be adjusted. Teacher B also acknowledged his or her struggle with how to increase the rigor of the question. Perhaps the TEKS for this question is one that can only be assessed at Level 1. The comfort level of each member made it appear easy to work through the analysis of this question.

During the leveling process, the PLC also chose to decrease the rigor of some assessment questions. This decision was made based on the number of questions per

TEKS and the percentage of DOK levels that were represented on the entire CFA. During the first CFA development session, the team analyzed the problem presented in Figure 4.10. The TEKS associated with this question was: Use addition and subtraction to solve problems involving fractions and decimals.

Harold made a drawing of his rectangular kitchen for art class. The length of the drawing was 8.6 inches, and the width of the drawing was 2.5 inches less than the length. Find the width of the drawing.

F 6.1 in.

G 8.6 in.

H 11.1 in.

J 21.5 in.

Figure 4.10: CFA question for TEKS 6.2B (prior to leveling and modifications).

The team determined that this question was a Level 3 because:

> [it could] be solved in more than one way [and] they have to know certain things within that problem to be able to solve it, so the kids have to set it up…they have to do a drawing, set up a rectangular kitchen, and then they have to find the length, which is given, but they have to find the width which is 2.5 less than the length (September, 2012, CFA development session 1).

The team decided to lower the rigor level of this question. The following dialogue ensued regarding adjusting this item:

> IC: What about 12? We could add a picture. That would bump it down.
>
> Teacher B: Yeah, so let's just change 12 and put the picture—
>
> Teacher C: Can't we just change the wording?
>
> IC: How would you change the wording?

Teacher C: Well, just--.5 less than 8.6. But if I did that, it would come to Level 1. It's not real world, then, yeah. What if we just add a picture?

Teacher D: I like the picture…put the equation on there, and they can see it?

Teacher A: And put on one side, 8.6 minus, or L minus 2.5. So it's a little equation.
Teacher B: And on the west side you have 8.6. L minus 2.5, right?

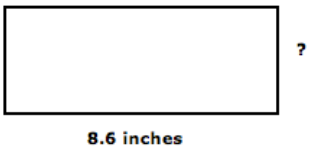
Teacher E: Now, that might confuse them because they're not used to seeing letters.

Teacher B: Actually, they know L and W from elementary school.

Teacher A: That would be a strong Level 2, then.

The collegial exchange between the group members made it evident that the opinion of each group member was valued during the discussion. It also appeared that team members were comfortable questioning each other to think deeper about ways to adjust the question. Teachers on the team proposed the major adjustments to this question, modifications that may not have occurred of these teachers were working in isolation. The IC interjected minimally during this segment, but did initiate the dialogue about adding a picture as a means of adjusting the question. Figure 4.11 is the less rigorous item that resulted from the discussion.

6. Harold made a drawing of his rectangular kitchen for art class. The length of the drawing was 8.6 inches, and the width of the drawing was 2.5 inches less than the length. Find the width of the drawing.*(6.2B, Level II)*



A. 6.1 in.

B. 8.6 in.

C. 11.1 in.

D. 21.5 in.

Figure 4.11: CFA question for TEKS 6.2B (After leveling and modifications).

Aligning the Rigor of Instruction to Match the Rigor of TEKS and CFAs

According to Webb (2007), alignment refers to the extent to which curriculum standards, assessments and instruction are designed at a level of cognitive demand that allows students to meet learning targets. True alignment between instructional rigor, learning objectives, and CFA items can only be accomplished when assessments are created prior to instruction. Rigor exists when classroom instruction is aligned to the state objectives and allows students to collaborate with peers, apply new concepts, and use critical thinking skills to solve complex problems regarding the learning target.

To ensure curriculum, assessment, and instructional alignment, teachers must design learning experiences that allow students to meet the expectations of the content standards and assessment rigor (Fisher & Kopenski, 2008). Classroom activities must be developed to meet the rigor of assessments that were created based on the depth of knowledge outlined in the TEKS. Ainsworth and Viegut (2006) present the following argument regarding aligning the rigor of instruction:

> Knowing in advance the concepts, skills, and understanding students will be required to demonstrate on the common formative pre- and post-assessments, each individual teacher on the team can plan and teach an instructional unit that is truly aligned with the assessments that will be used to evaluate student progress (p. 50).

When these connections occur, PLCs are better equipped to help students optimize academic success. In essence, the collaborative CFA development process allows teachers to continuously dialogue, examine their practice and develop more effective instructional practices to help students be successful.

Although no direct observations were done during instruction, eJournal reflections from the case study participants, the focus group's discussion, and collaborative conversations during both CFA development sessions provided data regarding how the rigor of classroom instruction aligned with the curriculum and pre-designed CFAs. One recurring idea during the focus group interview was that PLC members were more focused on teaching to the rigor of the TEKS when they created the CFAs prior to instruction. The following question was posed during the focus group interview: What do you find are the strengths of creating common assessments prior to instructional planning? Teacher A commented, "if you plan your test to a certain level of complexity then it forces you to teach to that complexity in order for you to prepare your students adequately for the test, even though you are not teaching to the test" (Focus Group Interview, October 2012). Teacher B added, "It [pre-developed CFAs] makes us have a higher rigor of instruction so that we match the higher rigor of our tests. There are no surprises." (Focus Group Interview, October 2012). One of the PLC members mentioned the following when reflecting on a lesson that was implemented

after the CFA was developed, "with the test already made, it helped with forming the lessons and the rigor of the lessons" (eJournal reflection, September, 2012).

The following dialogue regarding the rigor of instruction occurred during the development of the second CFA:

> Teacher A: I think this year we know now how our test is going to be made. We know how we need to teach this in class.
>
> IC: You don't need to teach the question. You need to teach the concept not the question.

This scenario outlined the importance of creating novel situations that allow students to apply their knowledge in rigorous ways. Teacher A commented on the difference between the prior school year and the current school year. It appeared that the teacher was alluding to the benefit of using the pre-developed CFA to help guide lesson development. In this discussion, the IC reminded the teacher of the need to avoid creating the exact same situations during instruction that students will see on the assessment. The IC stressed the importance of creating rigorous experiences that allow students to learn and apply their knowledge of the key understandings.

Several teachers also felt that creating the CFAs prior to instruction allowed them to better differentiate and address misconceptions during first time instruction. While reflecting via eJournal Teacher A wrote,

> As a teacher you know what students will be expected to do on the assessment and you will help set them up for success by tailoring the lesson to meet the standards set for the assessment. You know the things students will get stuck on and can incorporate these misconceptions as a learning aide for students (eJournal reflection, September, 2012).

Teacher B added, "we knew they would not only need an introduction to ratios, but also that they needed that knowledge to flow into tables, equivalent ratios, and simplifying…So we designed a task to help all of these merge together" (eJournal reflection, September, 2012). In essence, the teachers within the PLC supported the argument that students benefit by having access to more precise and varied instructional practices when CFAs were created prior to instruction (Frey & Fisher, 2009).

eJournal reflections and supplemental documents were also used to show the alignment that existed between the TEKS, CFA questions, and instructional design. The following eJournal questions were posed to each PLC member in order to gain insight into the rigor of the lesson design that evolved after CFA development.

1. Which TEKS were covered in this lesson?
2. What structures, activities, and strategies were used to help students reach the cognitive complexity outlined in the TEKS and incorporated into the common assessment?

Tables 4.4 and 4.5 provide teacher reflections on lessons that were designed after CFA development. The corresponding CFA questions that were designed by the PLC are also included in the tables.

TEKS: 6.1A Compare and order non-negative rational numbers

CFA Question:

5. Sam recorded the length of his model cars in inches.

Length of Model Cars in inches.
6.8 in.
6.78 in.
6.450 in.
6.502 in.
6.34 in.

Which list shows the lengths in order from greatest to least? *(6.1A, Level II)*

A 6.8 in., 6.78 in., 6.450 in., 6.502 in., 6.34 in.

B 6.34 in., 6.450 in., 6.502 in., 6.78 in., 6.8 in.

C 6.8 in., 6.78 in., 6.450 in., 6.34 in., 6.502 in.

D 6.8 in., 6.78 in., 6.502 in., 6.450 in., 6.34 in.

eJournal Reflection from Teacher A: We prepared an engaging lesson in which the students raced to create their own data. We went outside and timed runners then recorded the decimal times into a table. We then discussed how we might put the times in order from fastest to slowest. This sounds like an easy task but we really had to discuss if a slow person would take a large amount of time to run or a small amount. Students tend to think that because the fastest person "wins" and winners typically have a big score, that a fast person would have a big time. By having this conversation it got them to pause and think about what the task at hand really was. We then discussed different strategies to finding the least and greatest decimals. Practice problems are then given to help them connect our activity to common assessment problems.

Table 4.4: Curriculum-Assessment-Instruction Alignment for TEKS 6.1A.

The teacher reflection in Table 4.4 outlined the types of rigorous learning experiences that existed in the classroom after CFA development and the teacher's ability to anticipate, respond to, and correct, misunderstanding prior to assessment. The students participated in activities designed to allow them to collect data and compare/order non-negative rational numbers. The CFA question in the table is an example of one question that aligned with TEKS 6.1A. This question had no direct connection to the specific components of the lesson. However, the CFA question

incorporated a data chart for students to analyze and apply their knowledge of ordering non-negative rational numbers as outlined in the TEKS. Teacher A designed the learning activity in a way that would help students be successful at applying their knowledge of the concept.

TEKS: 6.1B Generate equivalent forms of rational numbers including whole numbers, fractions and decimals

CFA Question:

The table below shows the number of grams of protein, fat, and carbohydrates in a serving of two different meals. The serving size of each meal is 200 grams.

Meal		
	Mac/Cheese	Ravioli
Protein	22g	24g
Fat	26g	18g
Carbohydrates	41g	38g
Sodium	111g	120g

3. Protein is what fraction of a serving of ravioli? 6.1B

A. $\frac{1}{24}$

B. $\frac{3}{25}$

C. $\frac{2}{5}$

D. $\frac{6}{25}$

eJournal Reflections from Teacher B: We had the students gather their own data by playing "basketball" and recording the amount of times they made their paper ball into the trash, how many times they missed, and the total number of times they tried. We organized this information into a table and made predictions about if they kept shooting. How many would be made or missed? We talked about the simplest form and equivalent baskets made as well as how to convert ratios. They recorded all of this into their Interactive Notebook so that they could practice making their own equivalent ratios and figure out the missing part to any given statistic.

Table 4.5: Curriculum-Assessment-Instruction Alignment for TEKS 6.1B.

Table 4.5 showed the deliberate techniques used the by Teacher B to align the rigor of instruction to the TEKS and pre-designed CFA question. The lesson for TEKS

6.1B applied the following hallmarks of rigor as noted by Jenkins, Goldham, and Webb (2012): (a) relevance, (b) integration, (c) application of conceptual knowledge, (d) critical thinking, and (e) student ownership of the learning. The students gathered their own data, organized it into a table, made predictions and converted ratios. The corresponding CFA question allowed the students to apply their knowledge of ratios but in an unfamiliar scenario from that which was presented during instruction.

Discussion

Although the major and sub-themes provided insight into the collaborative processes, professional dialogue, and resources, it is critical to analyze the wide-ranging practical processes that evolved during CFA development. The following sections will merge the interconnected elements of the major theme and sub-themes and discuss the way they illuminate the overarching and sub-questions of the case study.

Overarching Research Question

The overarching question of this case study set out to discover the collaborative processes that were used to build CFAs in a PLC comprised of five sixth grade math teachers and one instructional coach at a Title I middle school in the Southern United States. The purpose of this question was to reveal the intricate details and nuances that occurred within a PLC as they collaborated to build CFAs prior to instruction. The discussion surrounding the overarching question is wide-ranging and thus has been divided into the following key ideas: (a) collaborative processes for creating CFAs, (b)

collaborative processes for deconstructing the TEKS, and (c) collaborative processes for alignment to the TEKS.

Collaborative Processes for Creating CFAs

According to Flowers, Mertens, and Mulhall (1999) teachers who are provided appropriate planning time within PLCs are better able to improve alignment and increase the number of rigorous common assessments created by the team. The school site for this case study is currently in its sixth year of implementing PLCs. Each PLC has a 45-minute common conference period daily and one uninterrupted planning day with a content-specific instructional coach per semester. The sixth grade math PLC has had a consistency of team members for two years. The IC has also worked with the team for approximately three years. This PLC had at least one formal weekly meeting and met informally multiple times each week. This structure allowed for purposeful PLC meetings that assisted the team in establishing collaborative process for creating CFAs.

As noted by Popham (2008) there are "all sorts of glittering procedural variations" (p. 114) to the assessment development processes. The sixth grade math PLC incorporated several common threads of collaborative assessment development presented by prior researchers (e.g., Ainsworth & Viegut, 2006; DuFour et al, 2006; Guskey, 2003), but did so in a way that flowed logically for their individual PLC needs. Although the team noted that they followed the "Roadmap to Assessments" (Focus Group Interview, October 2012), their collaborative processes seemed to transpire organically without a prompt to follow certain steps.

Respect and collegiality among the team members was evident as the teachers engaged in rich dialogue during CFA development. Each team member also had an equal voice in collective decision-making as they worked through the assessment development cycle. It was evident that each team member valued the collaborative processes and remained committed to implementing the CFA development process with fidelity.

Collaborative Processes for Deconstructing the TEKS

Ainsworth and Viegut (2006) confirmed that teachers who engage in objective deconstruction prior to instruction know exactly what students will be expected to know in regards to content, skill and rigor. This in-depth knowledge prior to instruction is critical for ensuring alignment. It was evident that the sixth grade math PLC intuitively engaged in job-embedded professional development by deconstructing each TEKS. Deconstructing the objectives was key to ensuring the alignment of curriculum, assessment, and instruction. This collaborative process created "instructional coherence" (Blanc, Christman, Liu, Mitchell, Travers, & Bulkley, 2010) and forced each team member to gain a profound understanding of what students must know, understand, and be able to do. The teachers logically discussed the explicit components of each TEKS in the unit plan, shared ideas about how each TEKS translated to instruction, and ensured that assessment questions addressed each element of the TEKS. As a result, the PLC grew in their understanding of the content, student expectations outlined in each TEKS, vertical alignment and how prior student learning connected to the current curriculum.

Collaborative Processes for Alignment to the TEKS

As noted in Chapter II, an essential element that impacts the effectiveness of CFAs is their alignment with the essential standards (DuFour, DuFour & Eaker, 2006). The following three sub-themes, each of which dealt with aligning CFAs to the TEKS, are merged for discussion due to the interconnectivity between each process: (a) collaborative processes for creating CFA blueprints, (b) aligning CFA questions to the TEKS, and (c) aligning CFA question rigor using Webb's DOK levels. The sixth grade math PLC automatically followed a systematic process of aligning CFA questions to the TEKS and DOK levels. Although these themes are separated in the findings, they occurred in a seamless manner during the CFA development sessions. The teachers referenced the unit plan to ensure that they only assessed TEKS that were in the upcoming unit. As an internal audit to guarantee alignment, the PLC also designed a blueprint that represented the concepts, TEKS, and cognitive demand of each CFA. The strategic alignment between the objectives and CFAs is mandatory in order to meet the goals of strengthening learning systems and ensuring that students meet rigorous accountability expectations (Betsy, Margaret, & Zucker, 2004). According to Ainsworth and Viegut (2006), creating assessments that are aligned to the learning objectives is "sound and fair educational practice" (p. 30).

Webb (2007) argued, "interpreting and assigning DOK levels to both objectives within standards and to assessment items is an essential requirement of alignment analysis" (p. 11) that must be done by content experts. As revealed in the data from the sixth grade math PLC, the process of aligning the rigor of CFA questions to the TEKS

involved knowledge of the content and a skillful *balancing act*—balancing the percentage of DOK levels and the number of readiness versus supporting standards included on each CFA. This task was accomplished through the collaborative process of examining existing questions for DOK levels, determining the number of questions that aligned with supporting and readiness standards, and adjusting the rigor of individual questions.

Although the logistics of aligning the CFA questions to the TEKS was teacher driven, the instructional coach frequently prompted the group to specific resources and posed reflective questions to stimulate deeper conversations regarding alignment. This person used a "supportive tone to minimize the possibility of triggering people's defensive reactions" (Crane, 2009, p. 108). The ability of the IC to infuse ideas into the conversation without being a forefront leader required excellent communication skills and the ability to empathize, listen, and build supportive relationship (Knight, 2007). As a result, the teachers led most of the discussion with little direction from the instructional coach.

Collaborative Processes for Aligning the Rigor of Instruction to Match the Rigor of TEKS and CFAs

Fisher and Kopenski (2008), when describing the impact of creating assessments prior to instruction, found that "teaching moved from well-intentioned guesswork to a finely-tuned dance" (p. 64-65). When assessments are created before designing lessons math teachers are forced to align instruction by changing their teaching strategies,

increasing their use of manipulatives, and incorporating better questioning techniques (Fisher & Kopenski, 2008).

The data gathered from this PLC revealed that the PLC was deliberate in the types of activities they created to challenge students at the depth and complexity of the TEKS. The dialogue during the CFA development sessions and eJournal reflections made it apparent that they ensured that the rigor of the TEKS and CFAs transferred to first time instructional design. Creating CFAs that aligned with the TEKS and STAAR prior to instruction forced the team to dialogue about lessons that would allow students to meet the intended learning targets during the learning experience.

Sub-Question 1

The first sub-question of this case study was: What professional dialogue occurs when the sixth grade math PLC collaborates to develop CFAs that align with the rigor of TEKS and STAAR? This purpose of this question was to gain a practical understanding of how the dialogue during assessment development served to advance each teacher's assessment literacy, alignment practices, and knowledge of the content.

The CFA development sessions, focus group responses, and eJournal comments provided insight into the dialogue that evolved in the group of math teachers. Although the focus of the CFA development sessions were centered on developing common assessments, the PLC continuously engaged in meaningful discourse that added to the collective knowledge of the group. During the CFA development sessions, which occurred prior to teaching the units, the teachers deconstructed the TEKS, identified misconceptions, shared instructional strategies, and filled voids in their own

understanding of mathematical concepts. These essential discussions evolved naturally as the team developed the assessments. The cohesiveness, respect, and collegiality amongst the team members created an optimal environment for adult learning. The dialogue from the focus group discussion revealed that the teachers benefited from discussing strategies, talking about how students learn, analyzing vertical alignment connections, and sharing best practices.

Although classroom observations were not included in the study, teacher reflections on their first time instruction revealed that they planned rigorous lessons based on the professional dialogue that evolved during TEKS deconstruction and alignment processes. During the CFA development process, the PLC discussed the specific student expectation of each TEKS, shared ideas about how these expectations might translate to the classroom, and ensured that the corresponding assessment items measured the depth and complexity of the TEKS. Additionally, the teachers posed questions to group members to help fill voids in their individual content knowledge.

The instructional coach played an integral role in posing reflective questions to stimulate team dialogue. As the PLC faced disagreement regarding alignment or leveling, the IC also guided the team to resources to help them discover the best solution. This person did not assume the role of group leader, but led in covert ways. Throughout the discussion, the IC used appropriate questioning techniques to promote deeper content discussions and empower the PLC to access the collective knowledge of the team.

Sub-Question 2

The second sub-question of this case study was: What resources does the sixth grade math PLC use to develop CFAs that align with the rigor of the TEKS and STAAR? The purpose of the question was to delve deeper into the resources that allowed for the development of rigorous CFAs. The CFA development sessions, several focus group questions, and supplemental documents shared by the PLC provided insight into the processes and resources used by the PLC.

Multiple resources were used as the PLC worked through the CFA development process. A campus-specific CFA process (See Appendix E), called the Roadmap to Assessments, was used as a framework to guide their work. They also used district-developed unit plans (See Appendix C and D) to determine the TEKS for each CFA. The PLC used a CFA blue print template to outline the TEKS and the depth of knowledge (DOK) levels (See Appendix K), as well as the prior year's CFAs, which included released TAKS questions. Each team member had an equal opportunity to share ideas and resources during the CFA development process. The IC was also viewed as an equal member of the PLC and contributed by sharing resources, and frequently prompting the PLC to refer to the unit plan. Overall the resources used by the math PLC at this Title I school in the Southern United States indicated that the PLC was organized and deliberate in their assessment development practices.

A New Practical Framework

Based on the findings of this study, I developed a new framework to represent the collaborative processes used during the CFA development process. The

collaborative processes, as outlined in this Chapter, indicated that the sixth grade math PLC followed a methodical cycle for developing CFAs that aligned with the rigor of the objectives. Figure 4.12 provides a visual representation of this unique approach to assessment development.

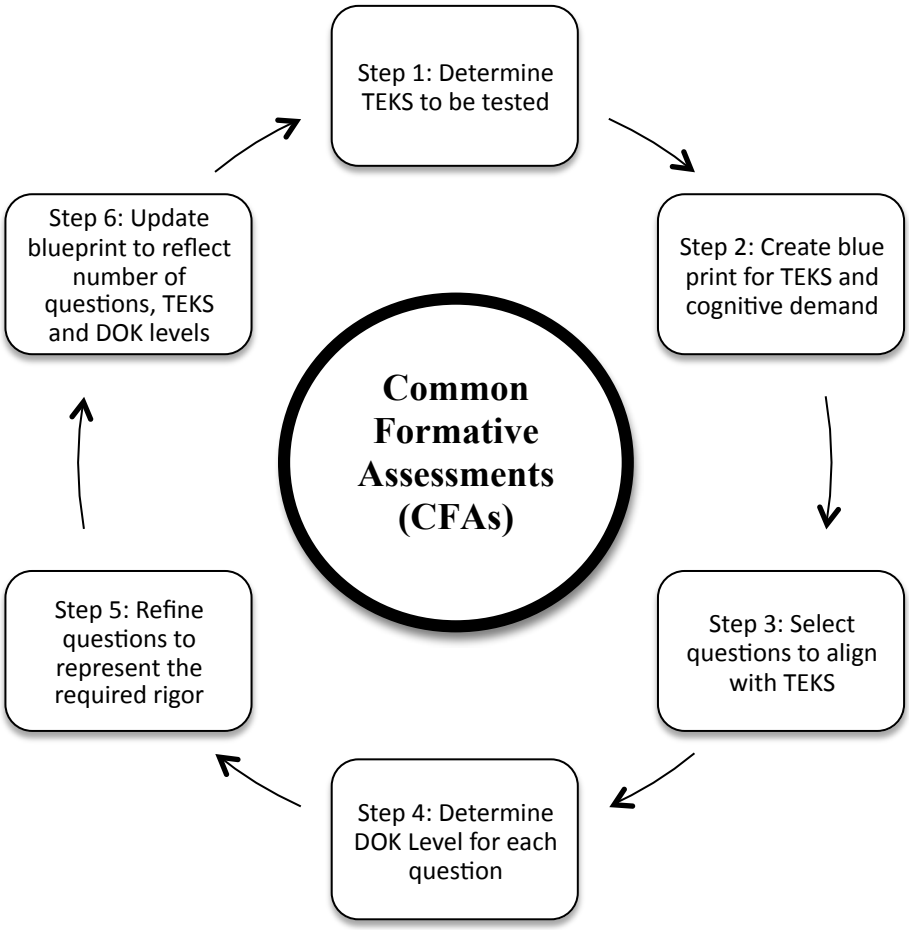


Figure 4.12: CFA Development Process.

This unique CFA development process occurred intuitively as revealed by the PLC conversations during CFA development. The first two steps of the process, determining the TEKS to be tested and creating the blue print, is illustrated by the following comments made by Teacher A during the second CFA development session: "So [test] 2A has to start here. So go through this, identify the questions that you have on here, don't determine whether you will keep or throw away, them make sure that we cover this [TEKS] and develop the new test" (CFA Development Session 2, September 2012). After identifying the TEKS to be assessed, the team aligned questions from previous year's CFAs to Webb's (2007) DOK levels. During the second CFA session, one of the teachers prompted the team to transition to step 3 and 4, selecting questions to align with TEKS and determining DOK level for each question, with the following statement: "So we are looking for the TEKS, or we are looking for levels? Let's agree on the TEKS first." (CFA Development Session 1, September 2012). The fifth step, refining questions to represent the suggested rigor, was evident as the PLC reached consensus regarding DOK levels, balanced the number of questions at each DOK level and adjusted questions to either increase or decrease the rigor. The PLC-developed goal for each assessment was that 25% of the questions would be at Level 1, 50% at Level 2 and 25% at Level 3. The final stepped was validated by the finalized CFA blue print which each teacher created at the conclusion of the development sessions.

The new framework incorporates several common threads of collaborative assessment development presented by prior researchers (e.g., Ainsworth & Viegut, 2006; DuFour et al, 2006; Guskey, 2003), which include objective deconstruction and aligning

assessments questions to specific objectives. The unique element of the new process, however, rests on the fact that the components of the processes were gleaned from a team of teachers at a Title I school who collaborated to developed CFAs *prior to instruction*. The idea of creating the assessment prior to instruction adds to the work of Wiggins and McTighe (2005) who argued that CFA development is a carefully planned process that requires teachers to apply a backwards approach of creating assessments prior to instruction. Another critical element to this framework that enriches current literature is the emphasis on the alignment process during CFA development. As noted in the data and in Figure 4.12 a large portion of the CFA development process was devoted to alignment. The process was quite lengthy. but appeared to help each teacher gain a deeper understanding of the depth of knowledge within each objective, how to best assess the objective at the appropriate depth of knowledge, and how the objective might translate to rigorous learning experiences for students.

CHAPTER V

RESEARCH OVERVIEW, SUMMARY OF FINDINGS, IMPLICATIONS, RECOMMENDATIONS AND CONCLUSION

Research Overview

Using a qualitative case study approach, this research analyzed the collaborative processes used by five sixth grade math teachers and one instructional coach (IC) at a Title I middle in the Southern United States to align the rigor between the Texas Essential Knowledge and Skills (TEKS), PLC-developed CFAs, and classroom instruction. A case study approach was used to gain insight into the current realities of how the math teachers an instructional coach (IC) used PLC-developed CFAs created prior to instruction to guide the correlation between curriculum, assessment, and instruction.

The overarching research question was: What collaborative processes are used to build CFAs in a PLC comprised of five sixth grade math teachers and one instructional coach (IC) at a Title I middle school in the Southern United States? Data was collected via audio recordings of the PLC during CFA development sessions, one focus group interview, eJournal lesson reflections by teachers, and supporting documents shared by the PLC. The data collection phase of the research spanned eight weeks, starting in September 2012 and ending in October 2012. The overall data analysis process consisted of analyzing the raw data, formatting the data into codes, and combining the codes into broader themes (Creswell, 2007). Coding included sorting through the data

for themes, ideas and categories for the purpose of making comparisons or drawing conclusions (Taylor & Gibbs, 2010). After the initial codes were established, "constant comparative analysis" (Glaser, 1965) was used to identify patterns, compare codes, and merge interrelated themes.

Chapter V provides an overview of the research, a summary of the findings, analysis of the findings, limitations of the study, practical implication for educational leaders, recommendations for future research, and a conclusion to the study.

Summary of Findings

The findings of this case study discovered that the sixth grade math PLC at this Title I school in the Southern United States was systematic in their use of collaborative processes to build CFAs that aligned with the rigor of the TEKS and STAAR. The collaborative processes involved deconstructing the TEKS, sharing instructional strategies, identifying student misconceptions regarding the content, and reflecting with peers. Table 5.1 provides a summary of the overall findings for each sub-question that was presented in Chapter IV.

Research Sub-Question	Findings
What professional dialogue occurs when the sixth grade math PLC collaborates to develop CFAs that align with the rigor of TEKS and STAAR?	Professional Dialogue During CFA Development: 1. Deconstructed the TEKS 2. Dialogued about how students learn the content 3. Discussed student misconceptions 4. Shared instructional strategies 5. Reviewed vertical alignment and student prior learning 6. Teachers posed questions regarding the content to fill voids in individual and group understanding of mathematical concepts 7. Instructional Coach posed reflective questions to stimulate content-specific discussions 8. Instructional Coach guided team to resources to fill voids in PCK
What resources does the sixth grade math PLC use to develop CFAs that align with the rigor of the TEKS and STAAR?	Resources for Developing Common Formative Assessments (CFAs): 1. Campus-developed CFA Roadmap 2. District-developed Unit Plan 3. Texas Essential Knowledge and Skills (TEKS) 4. Blue Print Template for Alignment 5. Prior Year's CFAs

Table 5.1: Key Findings Linked to Case Study Sub-Questions.

The findings of this case study discovered that the sixth grade math PLC was methodical in their collaborative processes for building CFAs. The progression from start to finish involved deconstructing the TEKS, sharing of strategies, identifying of student misconceptions, and posing reflective questions to peers. The CFAs that were produced during the two CFA development sessions of this research were noticeably different from the CFAs produced during the prior school year (See Appendix F, G, H & I). Few CFA questions remained in their original form after discussion within the PLC. Throughout the CFA development processes, the teachers made countless adjustments to either increase or decrease the rigor of CFA questions. Although the sixth grade math

TEKS remained the same and the teachers on the PLC also remained constant, the CFAs from the previous year were modified drastically. After further investigation into why this occurred, I discovered that this was the PLCs second year applying Webb's alignment techniques. Continuous engagement in the collaborative CFA process appeared to be beneficial in helping the teachers modify and improve the CFAs. One teacher noted the following:

> …You can use a test from a previous year but it almost never works identical to the previous year. You are always adjusting something for a better understanding. You are always growing. You are changing for the better. You are adjusting questions for a greater level of rigor. You are adjusting questions for a certain pace. It works every year. It builds on itself (Focus Group Interview, October 2012).

The intuitive nature of the collaborative processes signified that the PLC engaged in CFA development on a regular basis and valued the collaborative experiences. Throughout the CFA development process, the teachers completed each other's statements and predicted the thoughts of their peers. The ideas within the team seemed to "bounce around like balls in a pinball machine…[making it] difficult to see where one person's thoughts ended and another's began" (Knight, 2007, p. 56). The synergy and respect amongst the team members allowed for open dialogue, disagreements, and consensus building which ultimately aided in the development of precisely aligned CFAs.

Practical Implications for Educational Leaders

As a result of this case study, including the literature review, and the data analysis, I have identified the following practical implications for district and campus-

level leaders who wish to implement PLC-developed CFAs: (a) campus leaders must create a culture based on collaboration through PLCs, (b) campus leaders must establish a shared understanding of assessment literacy, and (c) campus leaders must provide uninterrupted time for collaborative CFA development.

Campus Leaders Must Create a Culture Based on Collaboration through PLCs

In building a culture of collaboration in PLCs, it is imperative that campus leaders create a community that values a shared vision for continuous improvement. This vision must rest on the premise that teachers must work as effective professional learning communities (PLCs) in order to achieve continuous instructional improvements. In addition, daily practices must include deliberate acts on the part of teachers to improve the rigor of learning experiences by ensuring a clear and concise alignment between curriculum, assessment, and instruction. According to Sparks (2004), " leaders shape [collaborative] conversations by persistently offering their values, intentions, and beliefs to others and by expressing themselves in clear declarative sentences" (p. 157). In essence, the campus leaders must communicate clear expectations and systematic protocols for ongoing collaboration through PLCs.

Campus Leaders Must Establish a Shared Understanding of Assessment Literacy

According to Popham (2009a), assessment literacy is seen as indispensable or "sine qua non for today's educator" (p. 4). It is imperative that teachers possess a clear understanding of effective assessment practices that monitor and promote student learning. In order to build a shared understanding of assessment literacy, teachers must engage in traditional professional learning followed by job-embedded support. DuFour,

DuFour and Eaker (2008) argued, "classroom assessment is not rocket science…what educators need to know about assessment is quite straightforward rather than mysterious or esoteric" (p. 224). Reeves (2007) also noted that the simple intent of building assessment literacy is to give teachers the necessary tools to gather meaningful data from students so that instruction can be adjusted to help every student be successful.

Campus Leaders Must Promote Collaborative CFA Development as a Means to Increase Teacher Pedagogical Content Knowledge

Fisher and Kopenski (2007) noted, "the best professional development occurs when teachers create assessments together" (p. 280). Loucks-Horsley, Love, Stiles, Mundry, and Hewson (2003) refer to CFA development as "a professional learning experience in itself" (p. 18) because teachers increase their pedagogical content knowledge through collaborative processes. Pedagogical content knowledge "represents the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction" (Shulman, 1987, p. 8). Pedagogical content knowledge entails understanding (a) the content, (b) how students think about the subject matter, (c) the difficulties or misconceptions that exists and (d) effective strategies for helping students master the intended concepts (Fernandez, 2005).

According to Fisher (2005), "the power of designing common assessments lies in the opportunity for groups of teachers to review their content standards" (p. 10). The collective process of deconstructing the objectives during CFA development helps teachers gain a better understanding of what students are expected to master. Stiggins,

Chappuis, Chappuis, and Arter (2007) defined the deconstruction process as "taking a broad and/or unclear standard, goal, or benchmark and breaking it into smaller, more explicit learning targets than can be incorporated into daily classroom teaching" (p. 80).

As revealed in this case study, educators must have sound pedagogical content knowledge in order to design assessment questions that align with the learning targets. According to the National Research Council (2000), content experts have a deep understanding of their subject matter, notice meaningful patterns in the content, and easily apply their knowledge to varied situations. Simply having knowledge of the content is not sufficient; teachers must be able to design appropriate assessment questions and design rigorous learning experiences to help students master the content. Educational leaders must understand that every teacher within a PLC may not possess the pedagogical content knowledge that is needed to dissect the learning objectives and develop instruments that precisely align with the objectives. Therefore, leaders must promote the use of collaboration to develop CFAs prior to instruction. CFA development sessions have the ability to serve as job-embedded learning opportunities allowing teachers to increase their pedagogical content knowledge by discussing *how* students learn, common misconceptions and strategies to scaffold student understanding.

Campus Leaders Must Provide Uninterrupted Time for Collaborative CFA Development

The ability of campus leaders to provide time for PLC-developed CFAs is critical for the fidelity of implementation. Unless adequate time is provided for CFA development prior to instruction, it cannot be expected that teachers will be able to engage in the sophisticated collaborative processes surrounding CFA development.

According to Jackson and Davis (2000), teachers need three to four hours of uninterrupted planning time per week for collaborative measures to positively impact practice. Flowers, Mertens, and Mulhall (1999) also noted that PLCs should meet four times per week for at least 30 minutes per meeting to effectively plan instruction and create assessments. One of the teachers in this case study shared the following regarding CFA development, "I have noticed that the more and more that we have been doing this, the easier and easier it is getting. As a team, we are able to really move through it very well. It is starting to flow" (Focus Group Interview, October 2012).

Some ways to address the dilemma of uninterrupted time for CFA development include daily common conference periods for each PLC, adjusted bell schedules to allow for planning (e.g., late start), before or after school PLC meetings, or full PLC planning days with substitute coverage for each teacher. In order to maximize this time, PLC norms, planning agendas, and member roles (e.g., time keeper, note taker) must be established. Teachers must also be held accountable for creating products, such as CFAs or instructional plans, as evidence of efficient use of their time together.

Campus Leaders Must Proactively Plan for Implementation Challenges

The overall success of implementing CFAs school wide rests on the ability of campus leaders to provide a clear vision and a plan to proactively address implementation challenges. In order to proactively plan for implementation challenges, campus leaders must clearly understand and articulate how CFAs fit into the current instructional framework of the school or school district. This entails narrowing the instructional focus or eliminating other initiatives to provide time for CFA development.

In order to address the difficulties associated with implementation of CFAs, Ainsworth and Viegut (2006) claim that campus leaders must clearly communicate: (a) what CFAs are, (b) how they will be used, (c) resources that will be provided for implementation, (d) realistic timelines for implementation, and (e) realistic timelines that it may take to see the expected results (p. 112).

In addition to articulating expectations, campus leaders must provide professional development for implementation. Traditional professional development, followed by the support of a job-embedded instructional coach (IC), is critical for effective execution. These essential elements, however, require additional funding. One approach to tackling professional development costs includes implementing a trainer-of-trainer model in which one person (e.g., IC) attends extensive training on assessment practices. This person, in turn, would be responsible for training teachers that he or she works with.

A final challenge that must be considered includes the human and resource capital that must be allocated for effective CFA implementation. To allow time for CFA development, campus leaders must devise a plan to provide uninterrupted time for PLCs to meet. The model used at the case study site included hiring substitute teachers for each member of the PLC. Funds for substitutes were allocated to each PLC in order to allow for school wide implementation of this initiative. There are also costs associated with implementing the IC model which vary depending on the type of model used. Some campus leaders across the nation use the format of allocating one teaching unit or teacher's salary to cover the cost of the IC while other schools split the IC salary costs

between multiple campuses. To defray the costs, some school leaders also hire one IC to work with multiple content areas. Title I or district funding might also be used to cover the costs of incorporating an IC. In addition to human resources, capital resources such as computer software, hardware, and CFA answer documents must also be purchased for teacher use. There are many cost efficient software programs available to support CFA data analysis. Overall, it is important that campus leaders consider the many implementation challenges that must be considered in order to effectively implement collaboratively developed CFAs.

Recommendations

Recommendations for the District of the Title I Middle School

The PLC which was analyzed in this case study was quite advanced in the collaborative processes used the build CFAs. Based on my analysis of the data, I recommend that that district make deliberate efforts to build the assessment literacy of all teachers within the organization. In order to overcome teacher assessment literacy gaps, this isolated case study revealed that the following must occur:

1. Job-embedded professional development regarding formative assessments strategies and alignment methods must be provided regularly;
2. Administrative support and structures must be provided for collaborative CFA development (e.g., expectations, protocols, time, resources);
3. Professional development must be followed by job-embedded, content-specific support from an instructional coach.

In additional to addressing teacher assessment literacy gaps, teachers must also be provided uninterrupted time for developing CFAs. Due to the professional learning value of collaboratively creating CFAs prior to instruction, at least one additional day per semester without students should be added to the school calendar to allow for CFA development.

Recommendations for Future Research

This research provided insight into the practical processes used by one PLC to build CFAs prior to instruction. There are multiple ways that this qualitative case study might be enhanced through future studies. Three recommendations for future research include: (a) analyzing the complete cycle of curriculum, assessment, instruction, and student data analysis (b) exploring the collaborative processes used in content areas other than math, and (c) investigating the specific role that an instructional coach plays in building teacher pedagogical content knowledge during PLC collaboration.

One area worthy of future analysis is the complete cycle of aligning curriculum, assessment, and instruction, as well as analyzing the resulting student data. This case study delved only into the collaborative processes surrounding CFA development. Data was gathered from CFA development sessions, eJournals, a focus group interview, and supplemental documents shared by the PLC. Additional studies might investigate the rigor of instructional practices that occur in the classroom setting after CFAs are developed. Direct classroom observations might add a deeper understanding to how CFA development prior to instruction translates to improved structures and strategies in the classroom. In addition, a thorough analysis of CFA student data would also provide

insight into the effectiveness of this process for maximizing student success. A mixed methods approach that analyzes instructional practices in the classroom and student data from CFAs would be helpful in determining the effectiveness of CFAs created prior to instruction.

Further investigation into how the CFA-development process applies in other content areas would also add to the results of this case study. The practical view of one math PLC provides a constricted perspective of the collaborative processes used by PLCs to align curriculum, assessment, and instruction. The STAAR assessment and updated TEKS has introduced heightened rigor in all core content areas across Texas and therefore it is imperative that CFA development processes be examined to ensure alignment in all contents.

Finally, further research is needed to explore the specific roles that a content specific IC plays in building teacher pedagogical content knowledge. The Title I school in this study currently implements the IC model in math four days per week to model instructional practices, observe teachers, assist during assessment development, analyze data, design lessons, and provide job-embedded professional development. During CFA development process at the Title I school, the IC played an integral role in guiding TEKS deconstruction and DOK alignment process. The IC also provided resources and posed guiding questions to stimulate collaborative conversations within the group. Perhaps future research might focus on questions that concentrate solely on the role of the content-specific IC in building pedagogical content knowledge during CFA development.

Conclusion

This case study set out to explore the collaborative processes involved when a sixth grade math PLC at the Title I middle school in the Southern United States worked as a team to create PLC-developed CFAs prior to instruction. This team of teachers provided insight into how assessment literacy, alignment methods, and collaboration through PLCs translated to the practical setting. The findings from the case study reveal that the collaborative processes involved in creating CFAs prior to instruction were quite complex. The PLC also demonstrated the detailed methods involved in deconstructing the learning objectives, aligning the depth to knowledge of the assessment questions to the TEKS, and sharing strategies to help students meet the learning targets. Three practical ideas can be drawn from the findings of this qualitative case study:

1. PLC-Developed CFAs created prior to instruction promote alignment between curriculum, assessment, and instruction,
2. PLC-Developed CFAs created prior to instruction promote teacher assessment literacy, and
3. PLC-Developed CFAs created prior to instruction promote continuous instructional improvement.

A concluding synopsis will be provided to support each of these important ideas regarding the collaborative processes involved in the implementation of CFAs.

PLC-Developed CFAs Created Prior to Instruction Promote Alignment

PLCs accomplish precise alignment when they engage in collaborative processes to identify what students are to learn and how might they be assessed to determine

whether they actually learned it. When PLCs collectively identify the learning targets and create assessments prior to instruction, true alignment is more likely to exist (Ainsworth & Viegut, 2006). The findings from this case study support prior research (e.g., Stiggins, 1998; Ainsworth & Viegut, 2006; Earl & LeMahieu, 1997) surrounding the professional learning value of collaborative CFA development prior to instruction. The findings support Wiliam's (2006) claim that the collaborative processes that evolve during assessment development serve as professional growth and help teachers gain a deeper understanding of the curriculum prior to planning learning experiences for students. As the teachers in this case study deconstructed TEKS and aligned assessment questions to meet the rigor of the TEKS, it allowed them to be better prepared to design rigorous learning experiences for students.

PLC-Developed CFAs Created Prior to Instruction Promote Assessment Literacy

The findings of this case study contradict the arguments presented by prior researchers (e.g., Stiggins & Conklin, 1992; Black & Wiliam, 1998b; Brookhard, 2004) regarding teacher inability to recognize and create assessments that measure the rigor of the learning objectives. Several researchers argued that teachers have not been adequately trained on how to recognize or write assessment questions that measure the learning objectives (Stiggins & Conklin, 1992; Black & Wiliam, 1998b; Brookhard, 2004). It has also been argued that teacher-made assessments lack higher order thinking at the depth and complexity outlined in state objectives (Rieck, 2006; Taylor, Pearson, Peterson & Rodriguez, 2005).

The sixth grade math PLC in this case study was advanced at deconstructing the TEKS, assigning Webb's leveling method and modifying the rigor of CFA questions to ensure alignment. The intricacies of the processes displayed by the sixth grade math PLC and the level of sophistication involved were far-reaching. The content specific discussions were high level and helped teachers align curriculum, assessment, and instruction. This contradiction was due in part to the fact that the sixth grade math PLC engaged in the following activities with the IC to build a shared understanding of assessment literacy: (a) established core beliefs regarding the use of formative assessments, (b) modified the campus CFA procedures to meet the content specific needs of the PLC, and (c) participated in job-embedded professional learning on Webb's alignment methods.

PLC-Developed CFAs Created Prior to Instruction Promote Continuous Instructional Improvement

The era of accountability has created a profession of educators who are under pressure to continuously improve practice. In order to achieve the goals that are dictated by No Child Left Behind (NCLB), Adequate Yearly Progress (AYP) and state accountability measures, teachers must incorporate the use of frequent common formative assessments (CFAs) to assess student learning. Teachers must understand the value of CFAs, how the assessments relate to the curriculum, and how to plan optimal first-time instruction based on the rigor of pre-designed assessments. Teachers must also understand that precise alignment must exist between curriculum, assessment, and instruction.

To realize continuous improvement, teachers must collaborate within PLCs to create rigorous and precisely aligned CFAs. As noted by Frey and Fisher (2009), CFAs must align with state standards, resemble the standardized test format, and be created prior to instruction. CFAs, when created collaboratively, also represent one of the most important tools for transforming instructional practice and promoting continuous improvement. When teachers collaborate to "(a) analyze, understand and deconstruct standards and (b) transform standards into high-quality classroom assessments" (Stiggins, 2005, p. 26) the entire team benefits from the combined wisdom of the group. When created by PLCs, assessments are: (a) more efficient, (b) of higher quality and (b) help to build the capacity of individual teachers (DuFour, et al., 2006).

The overall findings of this case study add to a growing body of research that promotes the use of formative assessments as a means of continuously monitoring and enhancing student learning. The sophisticated assessment development processes used by the PLC prior to instruction supported the argument presented by Stiggins, Chappuis, Chappuis and Arter (2007) that formative assessment must rest at the core of the teaching and learning process. Ainsworth and Viegut (2006) also validated the power of CFAs in by stating:

> Understanding the role [common] formative assessments play in an interdependent instruction and assessment system, educators come to realize how all the pieces fit together into one cohesive and powerful whole. In glimpsing the potential impact this practice can have on advancing all students to proficiency and beyond, teachers *make time* for this powerful practice (p. 3).

CFAs represent "best practice in assessment…and is the gold standard in educational accountability" (Reeves, 2004, p. 114). In order to improve instructional practice and

promote greater student performance, teachers and educational leaders must incorporate collaborative formative assessment instruments into the day-to-day teaching and learning process.

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APPENDIX A

EJOURNAL REFLECTION QUESTIONS

1. What impact did building the common assessment prior to instruction have on the design of this lesson?
2. Which TEKS were covered in this lesson? What structures, activities, and strategies were used to help students reach the cognitive complexity outlined in the TEKS and incorporated into the common assessment?
3. Do you have any additional information that you would like to share about this lesson?
4. Do you have any additional information that you would like to share about the development of the common assessment prior to the lesson?

APPENDIX B

FOCUS GROUP INTERVIEW PROTOCOL

Date of Interview	
Interviewer	Instructional Coach
Background of Interviewer/Purpose of Interview	Explained to interviewee? Yes ____ I am collecting this data as part of a field-based case study to analyze campus-based practices used by PLCs to build CFAs prior to instruction and the impact of the existing assessment development processes on lesson planning. This field-based research will also explore the influence of collaborative conversations and job-embedded professional learning on curriculum, assessment, and instructional alignment at a Title I middle school in the Southern United States.
Right to refuse answering any questions	Explained to interviewee? Yes ____ The questions in this interview are designed to allow me to gain more insight into the practices and processes involved in assessment development and lesson design. You need to know that you may refuse to answer any question in the interview for any purpose, without having to reveal to me your reasons for not answering the question. Do you understand that agreeing to participate in the interview does not mean that you must answer all questions?
Anonymity explained	Explained to interviewee? Yes ____ Your names or the campus will never be used. The final report will reference you as a sixth grade math PLC and the campus as a Title I middle school in the Southern United States. Your responses will only be used to inform ideas for a field-based research study only. The information gained in this interview will not be used for appraisal purposes. It is very important that you answer as accurately as you can. Take your time. Consult records if you want. Ask me to clarify if you have any question about what is being asked.

Formal agreement to participate	Do you agree to participate in this interview? Participants' response Teacher 1: ____ Yes ____ No Teacher 2: ____ Yes ____ No Teacher 3: ____ Yes ____ No Teacher 4: ____ Yes ____ No
Explain your basic plan of the study	• Audio recording of PLC during 2 assessment development sessions • Capture teacher reflection from 2 lessons that were planned and implemented based on pre-designed CFA • Interview focus group regarding the development of common assessments within PLCs and the impact that assessment instruments developed prior to instruction have on instructional practices
1. What processes or protocols were used by your PLC to the CFAs?	
2. How were PLC meetings structured in order to maintain a focus on assessment development and instructional practices?	
3. How were the TEKS used in the building of CFAs?	
4. What resources did your PLC use to develop CFAs that aligned with the cognitive complexity of TEKS and STAAR?	
5. What specific PLC conversations have taken place during assessment development regarding planning instruction that will lead to student success on the assessment?	
6. In what ways did the CFA development process allow for job-embedded professional development within the PLC?	
7. What were the team roadblocks that you recall during the assessment development process, specifically regarding lesson design?	
8. What were the team breakthrough moments that you recall during the assessment development process, specifically regarding lesson design?	
9. What do you find are the strengths of creating common assessment prior to instructional planning?	
10. What do you find are the weaknesses of creating common assessment prior to instructional planning?	
Thank you so much for taking time to participate in this interview. Your responses will remain confidential.	

APPENDIX C

FRACTIONS UNIT PLAN EXCERPT

Class/Course: sixth Grade Math Academic Unit: Fraction Time: 29 Days	
Unit Summary This unit focuses on using fraction operations (addition and subtraction to solve real-world and purely mathematical problems including estimating the answer to determine reasonableness of their solution and formulating a number sentence to describe the solution process. Students will explore fraction operations using a variety of methods including concrete models, pictorial, verbal and numeric representations.	
Understandings · Numbers can be represented in multiple ways. · Numbers can be compared in different ways. · There is more than one strategy/algorithm to perform a given operation.	**Essential Questions** · What is the best numerical representation for a situation? Why? · Why do we compare, contrast, and order numbers? · How are fractions and decimals and their operations alike and different?
Knowledge & Skill Objectives · **TEKS** 6.1A (**S.G.O** 1.3.2) · **TEKS** 6.1B (**S.G.O** 1.3.6, **S.G.O** 1.1.6, **S.G.O** 2.2.30) · **TEKS** 6.1D (**S.G.O** 1.2.5, **S.G.O** 1.1.1) · **TEKS** 6.1E (**S.G.O** 1.1.2) · **TEKS** 6.1F (**S.G.O** 2.1.1) · **TEKS** 6.2A (**S.G.O** 1.4.5) · **TEKS** 6.2B (**S.G.O** 1.4.8, **S.G.O** 1.4.6) · **TEKS** 6.2D (**S.G.O** 1.3.13) · **TEKS** 6.2A (**S.G.O** 1.4.6) · **TEKS** 6.3B (**S.G.O** 2.2.2) · **TEKS** 6.5 (**S.G.O** 1.4.6)	ELPS · **ELA/ELPS** 2(C) · **ELA/ELPS** 3(D) · **ELA/ELPS** 3(E) · **ELA/ELPS** 4(F) · **ELA/ELPS** 5(F)
Critical Vocabulary - Benchmark, Base (of an exponent), Exponent	
Cornerstone Focus Communication, Critical Thinking, Problem Solving	Other Sample Evidence Quizzes, Unit Tests, Tickets Out

Instructional Guidance

· In 5th grade students found common factors and added/subtracted fractions with common denominators.

· Students should have the opportunity to explore prime factorization, greatest common factor, and least common multiple in a variety of ways including tables in real world situations before using in computations with fractions. Using abbreviations such as GCF hinders student understanding of the meaning of the greatest common factor. Students should make connections about the meaning of factors and multiples.

· It is important for students to model decimals/fractions and their operations using three types of models (length, set, area or region see r) and include real world contexts for a deeper conceptual understanding. Using different models is important for future concepts. For example, using length models when adding fractions will help student better understand ruler measurement. Students may choose to use a variety of strategies to perform operations using fractions and decimals including the standard algorithm when solving problems. More information can be found in *Teaching Student Centered Mathematics* (pages 67-93) and teacher videos (see web resources)**.**

S	G	O	Knowledge & Skill Objectives	TEKS
1	**2**	**5**	Use positive integral exponents to express repeated multiplication shown using both the x and dot notation for multiplication. (Supporting Standard)	**6.1D**
1	**1**	**1**	Write prime factorizations using exponents including writing numbers in exponential form. (Supporting Standard)	**6.1D**
1	**1**	**2**	Identify factors of a positive integer and common factors and the greatest common factor of a set of positive integers using a variety of methods including factor trees, geometric models and listing factors. (Supporting Standard)	**6.1E**
2	**1**	**1**	Identify multiples of a positive integer and common multiples and the least common multiple of a set of positive integers using a variety of methods including listing multiples, ratio tables, linear models and geometric models in both real-world and purely mathematical situations. (Supporting Standard)	**6.1F**
2	**2**	**2**	Represent ratios with concrete models, fractions and decimals including using a variety of notations such as ":" and "to". (Supporting Standard)	**6.3B**
1	**3**	**6**	Generate equivalent forms of non-negative rational numbers including whole numbers, fractions and decimals using a variety of techniques including concrete models, ratio tables, the multiplicative identity (Giant 1 technique) and the coordinate grid. (Readiness Standard)	**6.1B**
1	**1**	**6**	Generate equivalent forms of non-negative rational numbers including whole numbers, fractions, mixed numbers and decimals using a variety of techniques including concrete models, ratio tables and calculators. (Readiness Standard)	**6.1B**

2	**2**	**30**	Express fractions and ratios in simplest form. (Readiness Standard)	**6.1B**
1	**3**	**13**	Estimate and round to approximate reasonable results and to solve problems involving the sums and differences of fractions and mixed numbers where exact answers are not required. (Supporting Standard)	**6.2D**
1	**3**	**2**	Compare and order two or more non-negative rational numbers in fractional form using a variety of techniques including number lines and benchmark fractions. (Supporting Standard)	**6.1A**
1	**4**	**5**	Model addition and subtraction situations involving fractions and mixed numbers with objects, pictures, words and numbers. (Supporting Standard)	**6.2A**
1	**4**	**8**	Use addition and subtraction of fractions and mixed numbers to solve multi-step problems in both real-world and purely mathematical situations. (Readiness Standard)	**6.2B**
1	**4**	**6**	Solve multi-step problems involving addition and subtraction of fractions and decimals in real-world situations including describing in words and writing equations. (Readiness Standard)	**6.2B, 6.5**

ELPS

ELPS 2(C) Learn new language heard in classroom interactions and instruction.
ELPS 3(D) Speak using grade level content area vocabulary in context.
ELPS 3(E) Share in cooperative groups.
ELPS 4(F) Use visual and contextual supports to read text.
ELPS 5(F) Write using variety of sentence structures and words.

Cornerstone Focus

Communication: Convey information and ideas to effectively engage the audience using a medium appropriate to the topic and purpose.
Critical Thinking: Analyze, evaluate, and synthesize information, ideas, or objects to make inferences and predictions, and draw conclusions**.**
Collaboration: Work respectfully with others by sharing responsibilities, exchanging and evaluating knowledge and ideas, and building consensus in order to achieve a common goal.
Problem Solving: Identify, define, and/or explore a problem or situation, work through a process to determine and evaluate solutions**.**

APPENDIX D

DECIMALS UNIT PLAN EXCERPT

Class/Course: sixth Grade Math Academic	Unit: Decimals	Time: 7 Days

Unit Summary

This unit focuses on using decimal operations to solve real-world and purely mathematical problems including estimating the answer to determine reasonableness of the solution and formulating a number sentence to describe the solution process. Students will explore decimals using a variety of methods including concrete models, pictorial, verbal and numeric representations.

Understandings	**Essential Questions**
· There is more than one strategy/algorithm to perform a given operation. · Operations affect numbers differently.	· What strategy/algorithm should I use to solve this problem? Why is this strategy best for this situation? · When is it appropriate to estimate? What makes an estimate reasonable? · How do operations with decimals compare to operations with whole numbers?
Knowledge & Skill Objectives · **TEKS** 6.1A (**S.G.O** 1.3.1) · **TEKS** 6.2B (**S.G.O** 1.4.1, **S.G.O** 2.3.1) · **TEKS** 6.2D (**S.G.O** 1.4.3) · **TEKS** 6.5 (**S.G.O** 2.3.1)	ELPS · **ELA/ELPS** 2(B) · **ELA/ELPS** 3(A) · **ELA/ELPS** 3(E) · **ELA/ELPS** 4(C) · **ELA/ELPS** 5(B)

Critical Vocabulary

Cornerstone Focus Evidence	Other Sample
Communication, Tests,	Quizzes, Unit
Critical Thinking, Problem Solving	Tickets Out

Instructional Guidance

· Estimation should be included in variety of real-world scenarios including knowing when to round.

· Students will use a variety of strategies and concrete models (such as base 10 blocks) as they explore decimal operations and make connections to standard algorithms. More information can be found in *Teaching Student Centered Mathematics* resource (pages 117-118, 124-126).

· It is important for students to model decimals operations using base 10 blocks because Algebra 1 students will use a similar concrete model (algebra tiles) to model operations involving polynomials.

S	G	O	Knowledge & Skill Objectives	TEKS
1	**3**	**1**	Compare and order non-negative rational numbers in decimal form including decimals in lists and tables in real-world situations. (Supporting Standard)	**6.1A**
1	**4**	**32**	Estimate and round to approximate reasonable results when solving problems involving addition, subtraction, multiplication and division of decimals when exact answers are not required in both real-world and purely mathematical situations. (Supporting Standard)	**6.2D**
1	**4**	**1**	Use addition and subtraction of decimals to solve multi-step real-world problems including using concrete models, describing in words and writing an equation. (Readiness Standard)	**6.2B**
2	**3**	**1**	Formulate equations involving decimals or describe the solution process that can be used to solve multi-step problems in both real-world and purely mathematical situations. (Readiness Standard)	**6.2B, 6.5**

ELPS
ELPS 2(B) Recognize English sound system in new vocabulary.
ELPS 3(A) Practice using English sound system in new vocabulary.
ELPS 3(E) Share in cooperative groups.
ELPS 4(C) Develop sight vocabulary and language structures.
ELPS 5(B) Write using newly acquired vocabulary.

Cornerstone Focus
Communication: Convey information and ideas to effectively engage the audience using a medium appropriate to the topic and purpose.
Critical Thinking: Analyze, evaluate, and synthesize information, ideas, or objects to make inferences and predictions, and draw conclusions**.**
Problem Solving: Identify, define, and/or explore a problem or situation, work through a process to determine and evaluate solutions**.**

APPENDIX E

COMMON ASSESSMENT ROADMAP

Pre-Assessment Development

1. Prior to the six weeks determine ALL Common Assessment dates for entire six weeks.
2. Determine which TEKS/SE's will be tested. Analyze student objectives and SE's to establish what students will know and be able to do. Look at released TAKS/STAAR test questions to determine rigor.
3. Create blue print of readiness, supporting and processing standards.

Assessment Development

1. All team members will take part in creating Common assessment by providing questions
2. Select questions that align with the depth and complexity of the TEKS.
3. All team members will agree on selected questions.
4. Team member(s) will format the assessment in line with STAAR.
5. Answer key will be created in AWARE with Objectives and TEKS/SE's identified.
6. All team members will review Common Assessment prior to sending to Print Shop.
7. Send Finalized Common Assessment to Print Shop.
8. Rubrics with TEKS/SEs, Essential Questions and Student Outcomes identified for projects, essays, etc… will be created and given to students prior to assignment.
9. All exams must be modified in accordance with special services ARD paperwork. Use the modified gridable when administering a modified test with an open-ended answer.

Post-Assessment Analysis

1. Data analysis of Common Assessment results will take place immediately following assessment.
2. Discuss your POWER TEKS for patterns, personal improvements and errors.
3. Develop a Recovery plan and select questions for Spiraling.
4. Document Recovery

Common Assessment Answer Key Protocol

- Share assessment with Instructional Coach two weeks prior to assessment date in AWARE.
- Follow-up with email to Instructional Coach including:
  1. Date of Test
  2. Who is taking the test
  3. How will the test be administered – online or requiring scantrons?
- Upon completion of assessment, deliver scantrons to the AWARE Scantron box located with all teacher mailboxes. Deliver no later than the 48 hours after the start of the test.
- You will receive an email once the data is available in AWARE. *Send the list of students taking modified tests to your IC.

PLC Data Analysis

1. As a team, what questions or TEKS/SEs were missed the most? Why?1.4
2. How did you students perform on the standards?
3. Are there trends, similarities or differences with the data?
4. Looking at individual teacher data how do you compare to the team?
5. How does your data differ among class periods?
6. Based on this assessment, did you find differences within the subpopulations?
7. What items will be recovered and how?
8. What items will be spiraled?
9. What students will benefit from intervention and how will the intervention be executed

APPENDIX F

CFA 1 (BEFORE LEVELING AND MODIFICATIONS)

Name: _____ Period: _____ Date: _____

Test 1B Academic

1 Sue went to the grocery store and bought a box of cereal for $2.74, a carton of milk for $1.89, and 2 bagels for $0.55 each. She gave the cashier $20.00. Which is the best estimate of how much change Sue will receive?

A $4

B $6

C $14

D $16

2 Which of the following has the same value as the expression 3^4 ?

F 3×4

G $4 \times 4 \times 4$

H $3 \times 3 \times 3$

J $3 \times 3 \times 3 \times 3$

Robert had $40 to spend on school supplies. He bought a backpack for $29.50 and a binder organizer for $8.25. How much money did he have left?

A $21.25

B $77.75

C $48.25

D $2.25

Which of the following is the prime factorization of 90?

F $2 \times 3 \times 5^2$

G $2^2 \times 3^2 \times 5$

H $2 \times 3^2 \times 5$

J $2^2 \times 3 \times 5$

What is the prime factorization of 220?

A $2 \bullet 5 \bullet 11$

B $2^2 \bullet 5 \bullet 5$

C $2^2 \bullet 5 \bullet 11$

D $2 \bullet 55$

Which set of numbers lists all of the factors for 36?

F 1, 2, 3, 6, 12, 18, 36

G 1, 3, 6, 12, 24, 36

H 1, 2, 3, 4, 6, 9, 12, 18, 36

J 2, 3, 5, 6, 8, 10, 15, 24, 36

Note: This is a CFA created by the PLC prior to this case study. The document is presented in its original format reflect the authenticity of the assessment (prior to modifications, leveling, and formatting) and for comparison purposes against the new CFA in Appendix G.

The table below shows the time it took 4 runners to finish a 100-meter dash.

Running Times

Runner	Time (seconds)
Brenda	12.04
Carla	12.4
Dora	12.34
Evi	12.18

Which list shows the runners in order from fastest to slowest?

F Brenda, Evi, Dora, Carla

G Dora, Carla, Evi, Brenda

H Carla, Brenda, Evi, Dora

J Brenda, Carla, Dora, Evi

The average male human brain weighs 49.7 ounces. The average female human brain weighs 44.6 ounces. What is the difference in their weights?

F about 95 ounces

G about 7 ounces

H about 5 ounces

J about 3 ounces

There are 52 boxes of school pencils that have been delivered to the school. If each box contains between 73 and 77 pencils, which is the best estimate of how many pencils were delivered to the school?

F about 3500 pencils

G about 3750 pencils

H about 4000 pencilss

J about 4750 pencils

Spiral Test

Marlene and 6 friends ordered a large pizza for \$15.00, 6 large drinks for \$1.29, and a salad for \$2.50. If they split these costs evenly, which equation can be used to find c, the amount in dollars and cents each person should pay, not including tax?

F $c = 15.00 + 1.99 + 2.50 \div 6$

G $c = (15.00 + 6 \text{ X } 1.29 + 2.50) \div 6$

H $c = 15.00 + 6 \text{ X } 1.29 + (2.50 \div 6)$

J $c = (15.00 + 01.29 + 2.50) \div 2$

Matthew drives 76 miles on his scooter. If the scooter gets about 38 miles per gallon of gas, about how much gas did the scooter use?

F 120 gallons

G 40 gallons

H 2 gallons

J 4 gallons

18. What is the value of this expression?

$18 \div 3 + 3 \text{ X } 7$

F 70

G 21

H 27

J 63

Juan collects stamps. The table below shows the number of stamps that Juan has collected for a given week.

Week (w)	Total Stamps Collected (t)
1	8
2	16
3	24
4	32

Which equation best represents the relationship between the week and the total number of stamps collected?

A $8w$

B $2w + 8$

C $w + 8$

D $8 + 2$

Austin bought 3 drinks for \$1.75 each, a sandwich for \$4.50, a salad for \$3.75, and a bottle of water for \$0.99. Which strategy can he use to find out how much change he will receive if he pays with a \$20 bill?

A Multiply 3 by 1.75. Then add 4.50 and 3.75 to the product.

B Multiply 3 by 1.75. Then add 4.50 and 3.75 + 0.99 to the product.

C Add 1.75 + 4.50 + 3.75 + 0.99. Then subtract the sum from 20.

D Multiply 1.75 by 3. Add 4.50 + 3.75 + 0.99 to the product. Then subtract the sum from 20.

Mrs. Fry bought 18 computer books for the library. If she paid $24.95 for each book, about how much did Mrs. Fry pay for the books?

A $40

B $600

C $500

D $300

The Springer family took a trip for the holidays. When they left home, the odometer in their car read 5,364.6 miles. When they returned from their trip, the odometer read 7,347.0 miles. How many miles did the Springers travel?

F 12, 711.6 miles

G 1,982.4 miles

H 2,983.4 miles

J 12,611.6 miles

Sam recorded the lengths of his model cars in inches. Which list shows the lengths in order from greatest to least?

A 6.8 in., 6.78 in., 6.45 in., 6.5 in, 6.34 in.

B 6.34 in., 6.45 in., 6.5 in., 6.78 in., 6.8 in.

C 6.8 in., 6.78 in., 6.45 in., 6.34 in., 6.5 in.

D 6.8 in., 6.78 in., 6.5 in., 6.45 in., 6.34 in.

Harold made a drawing of his rectangular kitchen for art class. The length of the drawing was 8.6 inches, and the width of the drawing was 2.5 inches less than the length. Find the width of the drawing.

F 6.1 in.

G 8.6 in.

H 11.1 in.

J 21.5 in.

Marcos bought a video for $21.89, a board game for $19.95 and a book for $26.49. All prices included tax. How much did Marcos spend on the video and the book?

A $41.84

B $46.44

C $48.38

D $68.33

Diana was serving cones of frozen yogurt. She gave Tina 73.6 grams of vanilla yogurt. Diana prepared 94 grams of yogurt for John. How many more grams of yogurt did John have than Tina?

F 167.6 g

G 21.4 g

H 21 g

J 20.4 g

APPENDIX G

CFA 1 (AFTER LEVELING AND MODIFICATIONS)

Name: _____

Date: _____

Period: _____

Test 1B Academic Math 6

1. Marcos bought a video for $21.89, a board game for $19.95, and a book for $26.49. All prices included tax. How much did Marcos spend on the video and the book? *(6.2B, Level I)*

   A. $41.84

   B. $46.44

   C. $48.38

   D. $68.33

2. Giovana is shelving books at the MCJH Library. As she does this, she places the books on the cart in order from lowest call number to highest call number. Which shows the call numbers of the books listed in the correct order? *(6.1A, Level I)*

   A. 765.161, 837.263, 776.8, 724.98

   B. 724.98, 765.161, 776.8, 837.263

   C. 837.263, 776.8, 765.161, 724.98

   D. 837.263, 776.8, 724.98, 765.161

3. Lori and 4 friends ordered a large pizza for $10.00, 5 drinks for $1.29 each, and a salad for $2.99. If they split these costs evenly, write and equation to find *c*, the amount in dollars and cents each person should pay, not including tax. *(6.5, Level III)*

   A. c = 10.00 + 1.29 + 2.99 ÷ 5

   B. c = (10.00 + 1.29 x 5 + 2.99) ÷ 5

   C. c = 10.00 + 1.29 + (2.99 ÷ 5)

   D. c = (10.00 + 1.29 + 2.99) ÷ 4

Name: _____

Date: _____

Period: _____

4. Mr. Strohmier ran 4 laps at MCJH track. His times per lap are in the table below.

Strohmier's Times

Lap 1	48.5 seconds
Lap 2	39.7 seconds
Lap 3	48.5 seconds
Lap 4	51.21 seconds

Which expression below represents Mr. Strohmier's total time? *(6.5, Level II)*

A. c = 48.5 + 39.7 + 51.21

B. c = 2(48.5) + 39.7 + 51.21

C. c = 48.5 + 2 + 39.7 + 51.21

D. c = (48.5 + 39.7 + 51.21) x 2

5. Sam recorded the length of his model cars in inches.

Length of Model Cars in inches.
6.8 in.
6.78 in.
6.450 in.
6.502 in.
6.34 in.

Which list shows the lengths in order from greatest to least? *(6.1A, Level II)*

A 6.8 in., 6.78 in., 6.450 in., 6.502 in., 6.34 in.

B 6.34 in., 6.450 in., 6.502 in., 6.78 in., 6.8 in.

C 6.8 in., 6.78 in., 6.450 in., 6.34 in., 6.502 in.

D 6.8 in., 6.78 in., 6.502 in., 6.450 in., 6.34 in.

Name: _____

Date: _____

Period: _____

6. Harold made a drawing of his rectangular kitchen for art class. The length of the drawing was 8.6 inches, and the width of the drawing was 2.5 inches less than the length. Find the width of the drawing.*(6.2B, Level II)*

A. 6.1 in.

B. 8.6 in.

C. 11.1 in.

D. 21.5 in.

7. Sue went to the grocery store and bought a box of cereal for $2.74, a carton of milk for $1.89, and 2 bagels for $0.55 each. She gave the cashier $20.00. Which is the best estimate of how much change Sue will receive? *(6.2D, level III)*

A. $4

B. $6

C. $14

D. $16

8. Robert had $40 to spend on school supplies. He bought a backpack for $29.50 and a binder organizer for $8.25. How much money did he have left? *(6.2B, Level II)*

A. $21.25

B. $77.75

C. $48.25

D. $2.25

Name: _____

Date: _____

Period: _____

9. Mrs. Fry bought 18 computer books for the library. If she paid $24.95 for each book, about how much did Mrs. Fry pay for the books? *(6.2D, Level II)*

A. $ 40

B. $ 600

C. $500

D. $ 300

10. The Smith family took a trip for the holidays. When they left home, the odometer in their car read 5,364.6 miles. When they returned from their trip, the odometer read 7,347.omiles. How many miles did the Smith's travel? *(6.2B, Level I)*

A. 12, 711.6 miles

B. 1982. 4 miles

C. 2, 983.4 miles

D. 12,611.6 miles

APPENDIX H

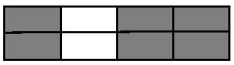
CFA 2 (BEFORE LEVELING AND MODIFICATIONS)

Name:_____Period:_____Date:_____

Test 2A, Academic

1. Which pair of numbers are equivalent?
   A. 0.5, $\frac{1}{5}$
   B. 0.06, $\frac{6}{10}$
   C. 0.07, $\frac{7}{10}$
   D. 0.08, $\frac{8}{100}$

Use the model below to answer Question 2 and 3.



2. Which two equivalent fractions name the shaded part of the model?
   F. $\frac{3}{5}, \frac{7}{10}$
   G. $\frac{3}{4}, \frac{6}{8}$
   H. $\frac{4}{5}, \frac{6}{10}$
   J. $\frac{4}{6}, \frac{9}{12}$

3. Which two equivalent fractions name the un-shaded part of the model?
   A. $\frac{1}{4}, \frac{2}{8}$
   B. $\frac{1}{5}, \frac{3}{10}$
   C. $\frac{2}{5}, \frac{5}{10}$
   D. $\frac{4}{8}, \frac{2}{3}$

4. John has a collection of toy cars. $\frac{4}{15}$ of the cars are Mercedes, $\frac{8}{30}$ is Lexus, and $\frac{22}{45}$ is BMW. Which cars have the same amount?
   F. BMW, Mercedes
   G. Mercedes, Lexus
   H. Lexus, BMW
   I. All are equal

Use the table and information below to answer Question 5 and 6.

The table below shows the number of grams of protein, fat, and carbohydrates in a serving of two different meals. The serving size of each meal is 200 grams.

Meal		
	Mac/Cheese	Ravioli
Protein	22g	24g
Fat	26g	18g
Carbohydrates	41g	38g

5. Protein is what fraction of a serving of ravioli?
   A. $\frac{1}{24}$
   B. $\frac{3}{25}$
   C. $\frac{2}{5}$
   D. $\frac{6}{25}$

6. Which decimal represents the fat in one serving of macaroni and cheese?
   F. 7.69
   G. 0.26
   H. 0.13
   I. Not here

Note: This is a CFA created by the PLC prior to this case study. The document is presented in its original format reflect the authenticity of the assessment (prior to modifications, leveling, and formatting) and for comparison purposes against the new CFA in Appendix G.

7. What is the fraction equivalent to 0.075?
   A. $\frac{75}{100}$
   B. $\frac{75}{10}$
   C. $\frac{15}{20}$
   D. $\frac{3}{40}$

8. Which fraction is equivalent to 0.31?
   F. $\frac{31}{100}$
   G. $\frac{31}{1000}$
   H. $\frac{3}{10}$
   I. $\frac{30}{1000}$

True/False

9. $8\frac{3}{4}$ is closer to 8 than 9.
   A. True
   B. False

10. $\frac{17}{30}$ should be rounded to 1.
   F. True
   G. False

11. Mrs. Sandoval has 60 folders, 45 pairs of scissors, and 30 rulers. What is the greatest common factor Mrs. Sandoval can use to divide the school supplies into equal groups?
   A. 3
   B. 5
   C. 10
   D. 15

12. Coach Thomas has 48 basketballs, 32 footballs, and 64 baseballs. What is the greatest common factor he can use to create equal sports groups?
   F. 12
   G. 4
   H. 8
   I. 16

13. Mr. Drake bought muffins and drinks for a breakfast meeting. The muffins were sold in packages of 12, and the drinks were sold in cases of 18. What is the smallest number of packages of each item that Mr. Drake could have bought and still have the same number of muffins and drinks?
   A. 2 packages of muffins
      3 cases of drinks
   B. 18 packages of muffins
      12 cases of drinks
   C. 3 packages of muffins
      2 cases of drinks
   D. 6 packages of muffins
      9 cases of drinks

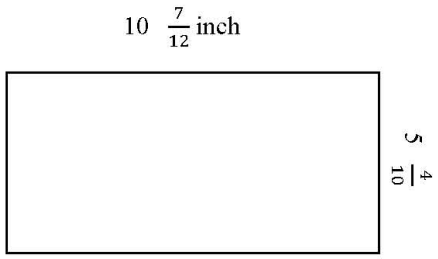
14. What is the greatest common factor of 12 and 15?
   F. 4
   G. 1
   H. 3
   I. 60

15. A box contains 3 types of fruits: apples, bananas, and pears. There are 20 pieces of fruit altogether. There 3 apples and 11 bananas. Which ratio represents apples to pears?
    A. 1:2
    B. 3 to 11
    C. $\frac{6}{3}$
    D. 6:20

16. What is the ratio of M's to all letters in the word Mathematics?
    F. $\frac{2}{9}$
    G. $\frac{2}{11}$
    H. $\frac{11}{9}$
    I. $\frac{11}{2}$

17. What is the GCF of 10 and 20?
    A. 20
    B. 10
    C. 5
    D. 3

18. What is the least common multiple of 8, 5, and 10?
    F. 40
    G. 30
    H. 25
    I. 400



19. Estimate the perimeter of the above rectangle to the nearest whole number. (perimeter: add all the sides)
    A. 30
    B. 40
    C. 52
    D. 32

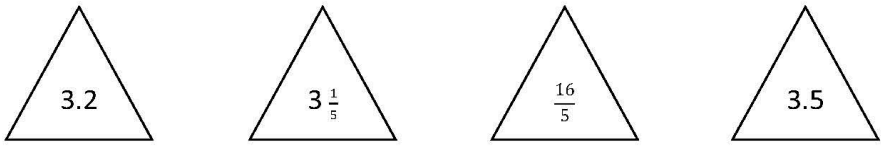
20. Which fraction is in simplest form?
    F. $\frac{10}{13}$
    G. $\frac{25}{40}$
    H. $\frac{16}{42}$
    I. $\frac{3}{9}$

APPENDIX I

CFA 2 (AFTER LEVELING AND MODIFICATIONS)

Name:_____Period:_____Date:_____

Unit 3A, Academic



1. Which value is not equivalent to the others? 6.1B

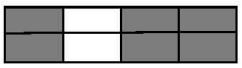
   A. 3.2

   B. $3\frac{1}{5}$

   C. $\frac{16}{5}$

   D. 3.5

Use the model below to answer Question 2.



2. Which fraction represents the un-shaded part of the model? 6.1B

   F. $\frac{3}{4}$

   G. $\frac{1}{4}$

   H. $\frac{6}{8}$

   J. $\frac{4}{3}$

Use the table and information below to answer Question 5 and 6.

The table below shows the number of grams of protein, fat, and carbohydrates in a serving of two different meals. The serving size of each meal is 200 grams.

Meal		
	Mac/Cheese	Ravioli
Protein	22g	24g
Fat	26g	18g
Carbohydrates	41g	38g
Sodium	111g	120g

3. Protein is what fraction of a serving of ravioli? 6.1B

   A. $\frac{1}{24}$

   B. $\frac{3}{25}$

   C. $\frac{2}{5}$

   D. $\frac{6}{25}$

4. Which decimal represents the fat in one serving of macaroni and cheese? Grid your response on the test AND answer document. 6.1B

				•		
⓪	⓪	⓪	⓪		⓪	⓪
①	①	①	①		①	①
②	②	②	②		②	②
③	③	③	③		③	③
④	④	④	④		④	④
⑤	⑤	⑤	⑤		⑤	⑤
⑥	⑥	⑥	⑥		⑥	⑥
⑦	⑦	⑦	⑦		⑦	⑦
⑧	⑧	⑧	⑧		⑧	⑧
⑨	⑨	⑨	⑨		⑨	⑨

5. Which ratio table is correct? 6.1B

A

1	2	3	4	5
5	6	7	8	9

B

1	2	3	4	5
5	10	15	20	25

C

5	4	3	2	1
5	10	15	20	25

D

1	5	10	15	20
5	10	15	20	25

6. Which fraction is NOT equivalent to 0.075? 6.1B

F. $\frac{75}{100}$

G. $\frac{75}{1000}$

H. $\frac{15}{200}$

J. $\frac{3}{40}$

7. Mrs. Sandoval has 60 folders, 45 pairs of scissors, and 30 rulers. What is the greatest common factor Mrs. Sandoval can use to divide the school supplies into equal groups? 6.1E

A. 3

B. 5

C. 10

D. 15

8. McDonalds is having a special. Every 4th customer will receive a free hamburger, every 5th customer will receive a free drink, and every 10th customer will receive yogurt parfait. Which number customer will win all three prizes (hamburger, drink, AND a yogurt parfait) first? 6.1F

   F. 4th

   G. 20th

   H. 40th

   J. No customer will win all three

9. A box contains 3 types of fruits: apples, bananas, and pears. There are 20 pieces of fruit altogether. There 3 apples and 11 bananas. Which ratio represents apples to pears? 6.3B

   A. 1:2

   B. 3 to ll

   C. $\frac{6}{3}$

   D. 6:20

10. In Mrs. Burnett's class there are 12 girls and 5 fewer boys. What is the ratio of girls to all students? 6.3B

   F. $\frac{5}{12}$

   G. 19 to 12

   H. 12 : 19

   J. 12 : 5

11. What is the prime factorization of 150? 6.1D

A. $2^2 \times 3 \times 5$

B. $2 \times 3 \times 5$

C. $2 \times 3^2 \times 5$

D. $2 \times 3 \times 5^2$

12. Mrs. Trentmann asked her students what the prime factorization of 120 is. She received 3 different responses. Which response is correct? 6.1D

F. $2^3 \times 3 \times 5^3$

G. $2 \times 3^3 \times 5$

H. $2^3 \times 3 \times 5$

J. None of the students were correct

APPENDIX J

STAAR QUICK REFERENCE SHEET AND BLUEPRINT

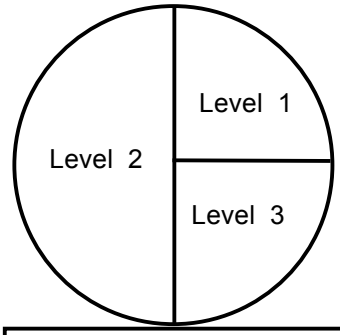
Reporting Category 1: Numbers, Operations and Quantitative Reasoning (16)		
6.1A	SS	Compare and order non-negative rational numbers
6.1B	RS	Generate equivalent forms of rational numbers including whole numbers, fractions, and decimals
6.1C	SS	Use integers to represent real-life situations
6.1D	SS	Write prime factorizations using exponents
6.1E	SS	Identify factors of a positive integer, common factors, and the greatest common factor of a set of positive integers
6.1F	SS	Identify multiples of a positive integer and common multiples and the least common multiple of a set of positive integers
6.2A	SS	Model addition and subtraction situations involving fractions with [objects,] pictures, words, and numbers
6.2B	RS	Use addition and subtraction to solve problems involving fractions and decimals
6.2C	RS	Use multiplication and division of whole numbers to solve problems including situations involving equivalent ratios and rates
6.2D	SS	Estimate and round to approximate reasonable results and to solve problems where exact answers are not required
6.2E	RS	Use order of operations to simplify whole number expressions (without exponents) in problem solving situations
Reporting Category 2: Patterns, Relationships, and Algebraic Reasoning (12)		
6.3A	SS	Use ratios to describe proportional situations
6.3B	SS	Represent ratios and percents with [concrete] models, fractions, and decimals
6.3C	RS	Use ratios to make predictions in proportional situations
6.4A	RS	Use tables and symbols to represent and describe proportional and other relationships such as those involving conversions, arithmetic sequences (with a constant rate of change), perimeter and area
6.4B	SS	Use tables of data to generate formulas representing relationships involving perimeter, area, volume of a rectangular prism, etc.
6.5A	RS	Formulate equations from problem situations described by linear relationships

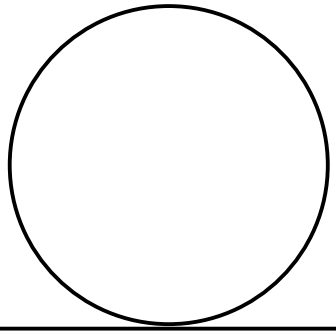
Adapted from: Education Service Center 20. (2012). *STAAR Quick Reference Guides.* Retrieved November 17, 2012, from Education Service Center, Region 20: http://portal.esc20.net/portal/page/portal/esc20public/Curriculum%20Forum/STAAR%20Quick%20Reference%20Guide

APPENDIX K

CFA BLUEPRINT BASED ON WEBB'S DOK LEVELS

Content Concepts	Cognitive Demand			Total Items
	Level 1	Level 2	Level 3	
Total Items				





Level 1:	recall, procedures, one-step problems, computations, unit conversions, evaluating, retrieving information from a table or a graph
Level 2:	multiple step problems, retrieving then using information from a table or a graph
Level 3:	non routine problems, solving a problem in more than one way

APPENDIX L

TAMU HUMAN SUBJECTS CONSENT FORM

Project Title: Common formative assessments developed through professional learning communities (PLCs): A case study to analyze the alignment of objectives, instruction and assessment in a math PLC at a Title I middle school in the Southern United States.

You are invited to take part in a research study being conducted by Tory Hill, a researcher from Texas A&M University. The information in this form is provided to help you decide whether or not to take part. If you decide to take part in the study, you will be asked to sign this consent form. If you decide you do not want to participate, there will be no penalty to you, and you will not lose any benefits you normally would have.

Why Is This Study Being Done?
The purpose of this study is to analyze campus-based practices used by PLCs to build formative common assessments prior to instruction and the impact of the existing assessment development processes on lesson planning. This field-based research will also explore the influence of collaborative conversations and job-embedded professional learning on curriculum, assessment, and instructional alignment at MCJH.

Why Am I Being Asked To Be In This Study?
Characteristics that make the four sixth grade math teachers ideal for the study are:

10. Sixth grade math is a STAAR tested grade level and content,
11. The sixth grade math PLC has had a consistency of members within the PLC for two years,
12. The sixth grade math PLC consistently collaborates to design lesson, assessments and interventions,
13. The sixth grade math PLC has a trusting partnership with the content-specific instructional coach, and
14. The sixth grade math PLC has implemented the campus instructional framework, which includes CFAs, with fidelity.

How Many People Will Be Asked To Be In This Study?
Four sixth grade math teachers

What Are the Alternatives to being in this study?
The alternative to being in the study is not to participate.

What Will I Be Asked To Do In This Study?
You will be asked to engage in assessment development with the PLC twice (approximately 120-150 minutes), submit two eJournal lesson reflections (approximately 30 minutes), and participate in one focus group interview (approximately 60-90 minutes). Your participation in this study will last up to 3 months.

Will Photos, Video or Audio Recordings Be Made Of Me during the Study?

Language for Optional recordings:
The researchers will make an audio recording during the study so that the data from interviews and PLC assessment development meeting may be accurately transcribed for data analysis only if you give your permission to do so. Indicate your decision below by initialing in the space provided.

_____ I give my permission for audio recordings to be made of me during my participation in this research study.

_____ I do not give my permission for audio recordings to be made of me during my participation in this research study.

Are There Any Risks To Me?
The things that you will be doing are no more risks than you would come across in everyday life.

The following measures will be taken to protect participants:

3. Meet with all participants prior to the start of the data collection to inform them of all aspects of the research project and the ethical considerations of the study (e.g., informed consent, confidentiality, and protection of participants' anonymity). Participants will be informed that all responses will remain anonymous and all data gathering, including audio recordings, transcripts, and eJournal entries will remain confidential. Information presented in the findings will also protect the name of all participants from having their identity exposed.

4. Thoroughly explain the consent form to ensure that participants understand the rights, risks and benefits of participating. Throughout the study participants will be frequently reminded of their right to refuse to participate and/or withdraw from the study.

5. Share my personal bias regarding the importance of designing formative assessments prior to instruction, the value of collaboration between PLC members and the significance of effective systems to help align curriculum, assessment, and instruction.

6. Delineate the strict separation between the research study and teacher annual evaluations by outlining that I will not conduct, participate in, or contribute to any portion of the teachers' Professional Development and Appraisal System (PDAS) evaluation nor will any information gathered during the study be used for PDAS domains.

7. Elicit the assistance of the instructional coach to collect all data during the study. The instructional coach is trusted by the teachers, accepted as a member of the PLC and will ensure confidentiality and anonymity of teachers involved in the study.

Are There Any Benefits To Me?
The direct benefit to you by being in this study is to contribute to a field-based study that will include an analysis of the current campus-based protocols that assist teachers in the development of meaningful common assessments as tools to guide math instructional planning. You will also gain access to literature to guide their reflection on current PLC practices regarding the alignment of curriculum, assessments and first-time instruction.

Will There Be Any Costs To Me?
Aside from your time, there are no costs for taking part in the study.

Will I Be Paid To Be In This Study?
You will not be paid for being in this study.

Will Information From This Study Be Kept Private?
The records of this study will be kept private. Pseudonyms will be used in any published reports in order to prevent identifiers that link you, the school or the district to this study. Research records will be stored securely and only the principal investigators and co-investigators will have access to the records. Information about you will be stored in locked file cabinet and computer files will be protected with a password. This consent form will be filed securely in an official area.

People who have access to your information include the Principal Investigator and research study personnel. Representatives of regulatory agencies such as the Office of Human Research Protections (OHRP) and entities such as the Texas A&M University Human Subjects Protection Program may access your records to make sure the study is being run correctly and that information is collected properly.

We may be legally obligated to disclose information under the Texas Public Information Act. Information about you and related to this study will be kept confidential to the extent permitted or required by law. The Texas Public Information Act provides a mechanism for the public to request public information in Texas A&M University's possession, which may include information about you and/or information related to this study. If Texas A&M University receives a request for public information relating to this study, the university will seek to withhold information about you and/or this study to the extent such information may be considered confidential by law and to the extent legally permitted and authorized by the Texas Attorney General's Office to do so.

Who may I Contact for More Information?
You may contact the Principal Investigator, Dr. Valerie Hill-Jackson or Dr. Lynn Walters, to tell either about a concern or complaint about this research at 979-845-8384, vhjackson@tamu.edu, or lynne-walters@tamu.edu. You may also contact the Protocol Director, Tory C. Hill at 281-726-1878 or tchill33@tamu.edu.

For questions about your rights as a research participant; or if you have questions, complaints, or concerns about the research, you may call the Texas A&M University Human Subjects Protection Program office at (979) 458-4067 or irb@tamu.edu.

What if I Change My Mind About Participating?
This research is voluntary and you have the choice whether or not to be in this research study. You may decide to not begin or to stop participating at any time. If you choose not to be in this study or stop being in the study, there will be no effect on your employment or teacher evaluation. Any new information discovered about the research will be provided to you. This information could affect your willingness to continue your participation.

STATEMENT OF CONSENT
I agree to be in this study and know that I am not giving up any legal rights by signing this form. The procedures, risks, and benefits have been explained to me, and my questions have been answered. I know that new information about this research study will be provided to me as it becomes available and that the researcher will tell me if I must be removed from the study. I can ask more questions if I want. A copy of this entire consent form will be given to me.

_____ _____
Participant's Signature Date

_____ _____
Printed Name Date

INVESTIGATOR'S AFFIDAVIT:
Either I have or my agent has carefully explained to the participant the nature of the above project. I hereby certify that to the best of my knowledge the person who signed this consent form was informed of the nature, demands, benefits, and risks involved in his/her participation.

_____ _____
Signature of Presenter Date

_____ _____
Printed Name Date