

**THE RELATION OF TEACHERS' USE OF CLASSROOM FORMATIVE
ASSESSMENT STRATEGIES TO SUMMATIVE READING RESULTS**

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ABSTRACT

The Relation of Teachers' Use of Classroom Formative Assessment Strategies to Summative Reading Results

In the research reviewed for this study, there is strong evidence and consensus among researchers that the formative assessment process used by teachers and students during instruction has very powerful and positive effects on student achievement. Summative, large scale assessments, and a focus on standards and accountability that ignore the process of teaching and learning in classroom, do not provide the direction that teachers need to inform instruction and improve student learning.

The purpose of this study was to determine the relation between “end of year” student growth on the Northwest Evaluation Association/Measures of Academic Performance (NWEA/MAP) reading assessments and teachers’ classroom formative assessment practices. For the purpose of this study, end of year classroom assessment results were compared to teacher formative assessment survey results.

Results of this study revealed an overall significant positive effect on reading achievement in classrooms where teachers engage in more frequent use of formative assessment strategies. On average, teachers who engage in more frequent use (1-3 times a day) of formative assessment strategies compared to teachers who engage in less frequent use (1-3 times a week or less) of these strategies, realized a significant, positive effect of plus sixteen (+16%) on the end of year classroom reading results as measured by the NWEA/MAP assessment.

Of the teachers in this study who were identified with higher end of year reading growth and achievement results, three of twelve formative assessment strategies were used significantly more often by these teachers than others were: 1) opportunities for students to analyze models of strong and weak work as it relates to the intended learning, 2) students in their classrooms can communicate what they are learning and what steps they need to take to reach their learning goals, 3) students receive feedback that is descriptive and interactive.

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CHAPTER ONE INTRODUCTION

On January 8, 2002, President George W. Bush signed the *No Child Left Behind Act* (NCLB) that connected federal funding to schools by requiring all U.S. schools to evaluate all students on standardized tests annually. As a nation, we have mandated more frequent and more intense standardized testing as the path to school improvement but the research would show that the data from these large-scale assessments, looked at in isolation, has had minimal impact on an individual child's academic growth (Popham, 2008).

After twenty years as a principal and leader of an elementary school, policy continues to mandate large-scale summative assessments but it is the formative assessment process used during instruction that informs teaching and learning for students and the teacher. Educational experts are united and firm in their message that educators must do more with formative assessment and the research is clear, consistent, and overwhelming regarding the significant impact of formative assessment on student achievement (Black, Harrison, Lee, Marshall, & Wiliam, 2004; Black & Wiliam, 1998a; Chappuis, Chappuis, & Stiggins, 2009; Chappuis, Stiggins, Chappuis, & Arter, 2012; Fullan, 2001; Hattie, 2009; Marzano, 2006; Wiliam, 2011; Wiliam & Thompson, 2007).

Formative and summative assessments serve the same learning goals and they are connected. In *Understanding by Design*, Wiggins and McTigue (2005) show how formative assessment is an essential part of teaching and learning. They emphasize

planning instruction and assessment around desired understandings. These desired understandings are the learning targets that should focus both formative and summative observations.

Decades of research reveal that teaching matters enormously. Linda Darling-Hammond (Darling-Hammond, 2010) argues, “the single most important determinant of success for students is the knowledge and skills of that child’s teacher” (Goldberg, 2001). Allan Odden and Marc Wallace (2003) observe, “improved classroom instruction is the prime factor to improve student achievement gains” (p. 64). Evidence has compelled us to acknowledge that instructional quality is indisputably “the most important school factor in how much children learn” (Colvin & Johnson, 2007). Formative assessment is integral to quality teaching. Formative assessment and quality instruction go hand in hand or neither moves forward at all (Chappius et al., 2009; Chappius et al., 2012; Wiliam 2011).

John Hattie has analyzed hundreds of meta-analyses that themselves represent thousands of studies. As he puts it, “variability in student outcomes” is largely “the consequence of the variability in teacher effectiveness” (Hattie, 2015). In chapter 7 of his book, Hattie synthesizes the research on ways that teachers differ in their influence on student achievement. Nearly all teachers are effective (that is, if we mean having positive achievement effects, $d > 0.00$) and many have an effect above the hinge-point in the “zone of desired affects” ($d > 0.40$). For any particular intervention to be considered worthwhile, it needs to show an improvement in student learning of at least an average gain – that is, an effect size of at least 0.04. Fundamentally, he goes on to say that teachers need to see themselves as evaluators of their effects on students. Teachers need to use evidenced-

based methods to inform, change, and sustain these evaluation beliefs about their effect. These beliefs relate to claims about what each student can do as a consequence of the teacher's actions, and about how every resource (especially peers) can be used to play a part in moving students from what they can do now to where the teacher considers they should be – and to do so in the most efficient, as well as effective, manner. It matters what teachers do – but what matters most is having an appropriate mind frame relating to the impact of what they do. When teachers see learning occurring and not occurring, they intervene in calculated and meaningful ways to alter the direction of learning to attain the various shared, specific, and challenging goals (Hattie, 2009).

Paul Black and Dylan Wiliam (1998b) in their essay, “Inside the Black Box: Raising Standards Through Classroom Assessment,” point to the critical importance of formative assessment and examination of learning inside the classroom. Learning, they say, is driven by what teachers and students do inside the classroom. Formative assessment works because it has a direct effect on the two most important players in the teaching and learning process: the teacher and the student. If we really want to maximize student achievement, we must pay far more attention to classroom assessments and the formative assessment process. (Black and Wiliam, 1998b).

Paul Black and Dylan Wiliam's review (1998a) of formative assessment practices found effect sizes - between 0.4 and 0.7, which are among the largest found for any educational intervention. The achievement gains realized by students whose teachers rely on formative assessment can range from 15 to 25 percentile points, or two to four grade equivalents, on commonly used standardized achievement test scale scores. In the review of the literature, researchers agree that formative assessment has a direct effect on the two

most important players in the teaching and learning process - the teacher and the student. Strengthening the formative assessment practices of all teachers can raise student achievement for all students but it is especially important if teachers want to affect the learning of low-achieving students (Black and Wiliam, 1998b).

Purpose of this Study

Summative assessments and a focus on standards and accountability that ignores the process of teaching and learning in the classroom, will not provide the direction teachers need to inform instruction and improve student learning. These assessments sometimes referred to as assessments “of learning,” mark the end of learning. On the other hand, formative assessments “for learning,” guide and inform instruction, thereby maximizing student achievement.

The purpose of this study is to examine the formative assessment strategies used by teachers of grades two through five during reading instruction in Hudson Public School District in Hudson, Wisconsin. In a survey (Appendix A), teachers will be asked to self-report the kinds of formative assessment strategies they use in their own classroom. These will include classroom strategies such as communicating learning targets to students prior to and during learning, giving students descriptive feedback, involving students in determining their learning goals, and specific strategies such as exit slips, cold call, and white boards as defined in Appendix B (page 55).

Teachers will also be asked to self report on the frequency of their use of these strategies on a scale of 1-3 times a day, 1-3 times a week, 1-3 times a month, or less than

once a month. These frequency results will then be compared to the teachers' students learning results over a two year period as measured by NWEA "Measures of Academic Performance" (MAP) reading assessment. The NWEA/MAP student reading results were chosen because the results are immediate and those results are used in the Hudson Public School District to measure reading growth in kindergarten through 5th in the fall and spring of the year.

Research questions

1. What is the relationship between teacher assessment strategies and end of year student growth results on the NWEA "Measures of Academic Performance" (MAP)?
2. Are those teacher assessment strategies consistent from classroom to classroom and which teacher assessment practices demonstrate a greater effect on student growth results?
3. In high growth classrooms (those that demonstrate higher student growth reading results), what formative assessment strategies may have influenced student achievement results? (as identified in the teacher survey)

Definition of Terms

Effect Size - An effect size is a useful method for comparing results on different measures (such as standardized, teacher-made tests, student work), or over time, or between groups, on a scale that allows multiple comparisons independent of the original

test scoring (for example, marked out of 10, or 100), across content, and over time. This independent scale is one of the major attractions for using effect sizes, because it allows relative comparisons about various influences on student achievement.

Summative Assessment - Assessments that provide evidence of student achievement at the end of an instructional unit by comparing it against a standard or benchmark.

Formative Assessment - Formal or informal processes teachers and students use during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes.

Northwest Evaluation Association (NWEA)/ “Measures of Academic Performance” (MAP) Assessment - MAP is a computer-adaptive test, which uses the Rasch Unit (RIT) equal-interval scale to accurately measure what students know, regardless of their grade level. If a child answers a question correctly, the next question is more challenging. If s/he answers incorrectly, the next one is easier. Teachers can use the score to inform instruction, personalize learning, and monitor the growth of individual students. Most schools give MAP tests to students at the beginning, middle, and end of the school year. It is normed every three years with over ten million students across the country so teachers can compare achievement for individual students to other students in that grade level and measure expected growth from the beginning to the end of the year.

CHAPTER TWO REVIEW OF LITERATURE

This chapter reviews current literature pertaining to assessment practices and the powerful impact that formative assessment can have on student achievement. Paul Black and Dylan Wiliam in their essay, “Inside the Black Box: Raising Standards Through Classroom Assessment,” point to the critical importance of formative assessment and examination of learning inside the classroom. Learning, they say, is driven by what teachers and students do inside the classroom. Formative assessment works because it has a direct effect on the two most important players in the teaching and learning process: the teacher and the student. (Black and Wiliam, 1998b).

Historical Perspectives on Testing

We are a nation obsessed with the belief that the path to school improvement is paved with better, more frequent, and more intense standardized testing. In the early 1900s the Stanford-Binet Intelligence Test was developed and used to determine educational opportunities under the idea that students should be educated based on their capabilities, “It was wasteful to teach people things that they would never use” (Shepard, 2001, p.4). In the late 1920s, the Scholastic Aptitude Test (SAT) was first used to predict college success and the gates were opened for wide spread testing. In the 1950s, tests played a large role in the tracking and selection of students for certain programs (Linn, 2000). The 1960s brought the use of tests for program accountability, while the 1970’s focused heavily on back-to-basics and minimum competency testing. “In a single decade (1973-1983) the number of states with some form of minimum competency testing

requirement went from 2 to 34” (Linn, 2000, p.6). The use of standards and test scores as the basis for promoting students from grade to grade, determining program placements, and making graduation decisions, has been an accepted practice in American schools for many years.

In 1993, the publication of *A Nation at Risk*, by the National Commission on Excellence, (United States Department of Education, 1993) led to dramatic increases in standardized achievement testing, as standards-based accountability became a focus. The report claimed, “American students were not studying the right subjects, were not working hard enough, and were not learning enough. Their schools suffered from slack and uneven standards. Many of their teachers were ill-prepared” (Finn, 1989, p.17). This report also warned that "our social structure would crack, our culture erode, our economy totter, [and] our national defenses weaken" if the United States did not make immediate attempts to remedy the situation by finding a cure for our fatally-ill education system (United States Department of Education, 1993).

In response to the report, many states and districts raised academic standards and instituted new testing programs to determine whether students were meeting those standards. (Finn, 1989, p.17 as cited in Schugurensky, 2005. p. 1) The publication of *A Nation at Risk* led to an education reform movement known as the “excellence movement.” Also, because the United States felt it was falling behind in the space race during the post-Sputnik hysteria, another direct assault on American public education began. In 1990, the result was a cry for public schools to be reformed drastically and give priority to the sciences and mathematics.

On January 8, 2002, President George W. Bush signed the *No Child Left Behind Act* (NCLB) that connected federal funding to schools by requiring all U.S. schools to evaluate all students on standardized tests annually. Schools failing to make certain levels of annual improvement are viewed as failing to make adequate yearly progress and face a progressive list of sanctions up to and including closing the school. School administrators in federal, state, and local education agencies contribute to the unwavering focus on accountability and how to make the scores go up. These decision makers believe in the power of standardized tests to improve schools and over the decades, we have continued to believe that by checking achievement status and reporting the results to the public we can intensify and speed school improvement.

Formative Assessment - Defined

Richard J. Stiggins in his June 2002 article, *Assessment Crisis: The Absence Of Assessment FOR Learning*, states, "If we wish to maximize student achievement in the U.S., we must pay far greater attention to the improvement of classroom assessment," Mr. Stiggins warns. "Both assessment of learning and assessment for learning are essential but one is currently in place, and the other is not. To maximize the energy devoted to school improvement, we have "raised the bar" by setting world-class standards for student achievement, as opposed to minimum competencies. To further intensify the impact of our standards and assessments, policy makers often attach the promise of rewards for schools that produce high scores and sanctions for schools that do not. In this context, we rely on high-stakes assessments of learning to inform our decisions about accountability."

The goal of summative assessment or assessment of learning is to provide an overall measure of student performance for someone outside the classroom, for example, a SAT score for college admissions officials or state test score results for local, state, or national accountability reports. These large-scale assessments are designed to rank order schools and students for the purposes of accountability but they do little to improve student learning. (Barton, 2002; Kifer, 2001) Research suggests that external “state mandated tests” do not provide teachers with diagnostic student performance results and that those test results are not provided in a timely enough fashion for teachers or schools to improve performance on those same state tests. Research suggests they do not build proficiency in basic skills, close the achievement gap, or foster the knowledge and skills that students will need in a competitive global society, the three most cited goals of testing.

On the other hand, assessments for learning, or formative assessments, can do for classroom teachers what large-scale assessment of learning, by design cannot. They assess student understanding of the particular standards that the grade level or department educators are currently focused on in their individual instructional programs. In this way, they inform instruction. Starkman writes, broadly speaking, summative assessment answers the question, “How did I do?” and formative assessment answers the question, “How am I doing?” (Starkman, 2006). According to Thomas Guskey (2003, p. 9) assessments must be followed by high-quality corrective instruction designed to remedy whatever learning errors the assessment identified.

Black and Wiliam (1998b) point to the critical importance of formative assessment and they argue that teaching and learning must be interactive. When assessment results are

used by teachers to modify teaching, to better meet the learning needs of students inside the classroom, those assessments are considered *formative*. (Black and Wiliam, 1998b) "When anyone is trying to learn, feedback about the effort has three elements: recognition of the desired goal, evidence about present position, and some understanding of a way to close the gap between the two." So assessment in the classroom involves both student and teacher awareness of a goal-perhaps meeting a state standard, a baseline of knowledge, or a strategy of instruction. In this way, formative assessment differs from summative assessment because the results can be used immediately to modify teaching and learning.

In order for student performance data to improve learning it should:

- 1) Identify student strengths and weaknesses.
- 2) Measure individual growth in student achievement.
- 3) Provide timely feedback to teachers in order to inform instruction.

Black and Wiliam (1998a) argue that formative assessment, properly employed in the classroom, will help students learn what is being taught to a substantially better degree. They support this argument with their research review a meta analysis in which they conclude that student gains in learning triggered by formative assessment are “amongst the largest ever reported for educational interventions” (p.61). Their research was based on nine years worth of research reports and used two earlier extensive reviews (Crooks, 2001; Natriello, 1987). They narrowed 681 publications to 250 reports that were included in the final meta-analysis. Black and Wiliam report typical effect sizes between 0.4 and 0.7 in favor of students taught in classrooms where formative assessment was employed. These effect sizes “are larger than most of those found for educational interventions”

(1998b, p.141). Of particular note was the finding that in the bulk of the meta-analyzed studies, improved formative assessment helps low achievers, or students who are performing below proficiency, more than other students- and so reduces the range of achievement while raising achievement overall (Black & Wiliam, 1998b, p 141).

The assessments best suited to guide improvements in student learning are the quizzes, tests, writing assignments that teachers administer on a regular basis in their classrooms (Guskey, 2003). Teachers trust the results from these assessments because of their direct relation to classroom instructional goals. Plus, results are immediate and easy to analyze at the individual student level. Guskey also says, teachers need to see their assessments as an integral part of the instruction process and as crucial for helping students learn. If assessments provide information for both students and teachers, then they cannot mark the end of learning. Teachers must follow their assessments with instructional alternatives that present concepts in new ways and engage students in different and more appropriate learning experiences (Guskey, 2003). The challenge is for teachers to use their classroom assessment results to provide all students with individualized assistance - corrective actions - just as a coach helps an athlete improve by giving specific strategies for improvement. Feedback and corrective instruction will then become a source of continuous improvement and learning.

Again in their essay, "Inside the Black Box," Paul Black and Dylan Wiliam cite D. Royce Sadler, a professor of higher education at Griffith University in Australia, writing: The habits and skills of self-assessment are within the grasp and capabilities of almost every student. Students take greater responsibility for their own learning when they regularly assess themselves (Sadler, 1989).

In 2006, 60 participants of the Council of Chief State School Officers (CCSSO) representing 25 states met for a four-day meeting to reach consensus on the definition of formative assessment, with the ultimate aim of shaping the way U.S. educators understood this practice. Prominent among the concerns of the members was that the definition reflect the latest research findings regarding assessment practices found to improve the quality of students' learning. The Formative Assessment for Students and Teachers State Collaborative on Assessment and Student Standards was formed and adopted the following definition of formative assessment. Formative assessment is a process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes.

They further defined the key features of the definition as:

- Formative assessment is a process, not any particular test.
- It is used not just by teachers but by both teachers and students.
- Formative assessment takes place during instruction.
- It provides assessment-based feedback to teachers and students.
- The function of this feedback is to help teachers and students make adjustments that will improve students' achievement of intended curricular aims.

W. James Popham (2008) in his book Transformative Assessment, differentiates between instruction and formative assessment by defining instruction as the set of

teacher-determined activities carried out in an effort to get students to accomplish a curricular outcome. Formative assessment, however, is a process intended to make a teacher's instructional means more effective. In other words, the evidence of students' mastery status is used to make instructional adjustments if the adjustments are warranted. Both students and teachers make adjustments that are directly focused on improving student learning. His definition of formative assessment is quite similar. "Formative assessment is a process whereby assessment-elicited evidence is used by teachers to improve their ongoing instruction or by students to improve how they're trying to learn something" (p. 142). He suggests there are four levels of formative assessment:

Level 1: Teachers' Instructional Adjustments

1. Identify adjustment occasions
2. Select assessments
3. Establish adjustment triggers
4. Make instructional adjustments

Level 2: Students' Learning Tactic Adjustments

1. Consider adjustment occasions
2. Consider assessments
3. Consider adjustment triggers
4. Adjust learning tactics

Level 3: Classroom Climate Shift

1. Learning expectations
2. Responsibility for learning

3. Role of classroom assessment

Level 4: School wide Implementation

1. Professional development
2. Teacher Learning Communities

Popham goes on to review the Black and Wiliam (1998b) meta-analysis concluding that the overwhelmingly positive results found from a decade's worth of empirical investigations, lends powerful support to the notion that formative assessment works. They say, "If you're a teacher, you ought to make it work for your students' well-being and if you're an administrator who supports teachers' efforts, you ought to advocate formative assessment's adoption" (Popham, 2008, p. 20).

Progress Monitoring

Safer and Fleischman (2005) say student progress monitoring is a practice that helps teachers use student performance data to continually evaluate the effectiveness of their teaching and make more informed instructional decisions. To implement student progress monitoring, the teacher determines a student's current performance on skills that the student will be learning that school year, identifies achievement goals that the student needs to reach by the end of the year, and establishes the rate of progress the student must make to meet those goals. The teacher then measures the student's academic progress regularly (weekly, biweekly, or monthly) using probes - brief, easily administered measures. Each of the probes samples the entire range of skills that the student must learn by the end of the year, rather than just the particular skills a teacher may be teaching that week or month. This is the key difference between student progress monitoring and

mastery measurement approaches, such as teacher-made unit tests. Mastery measurement tells teachers whether the student has learned the particular skills covered in a unit, but not whether the student is learning at a pace that will allow him or her to meet annual learning goals. By regularly measuring all the skills to be learned, teachers can graph changes in the number of correct words per minute (reading) or correct digits (mathematics) and compare a student's progress to the rate of improvement needed to meet end-of-year goals. If the rate at which a particular student is learning seems insufficient, the teacher can adjust instruction (Safer & Fleischman, 2005).

Fuchs and Fuchs (2002) conducted an analysis of research on student progress monitoring that considered only experimental, controlled studies. These researchers concluded that when teachers use systematic progress monitoring to track their students' progress in reading, mathematics, or spelling, they are better able to identify students in need of additional or different forms of instruction, they design stronger instructional programs, and their students achieve better. (p. 1) As Fuchs and Fuchs (2002) found, using student progress monitoring with larger groups requires extra effort. But many teachers will find this strategy worth the effort because it provides a powerful tool that can help them adjust instruction to ensure that all students reach high standards.

In their article, "The Quest for Quality," Chappuis, Chappuis, and Stiggins (2009), say that NCLB has exposed students to an unprecedented overflow of testing. Although it may seem as though having more assessments will mean we are more accurately estimating student achievement, the use of multiple measures does not, by itself, translate into high-quality evidence. They go on to say that quality assessments satisfy the following five standards:

1) Clear purpose. The assessor must begin with a clear picture of why he or she is conducting the assessment. Who will use the results to inform what decisions? The assessor might use the assessment formatively - as practice or to inform students about their own progress- or summatively - to feed results into the grade book. Stiggins says, the use of assessments *of* and *for* learning are important. (Stiggins, 2004).

2) Clear Learning Targets. The assessor needs to have a clear picture of what achievement he or she intends to measure. Learning targets must be represented in the written curriculum and Chappuis, Chappuis, and Stiggins (2009) categorize them in four ways:

- Knowledge targets are the facts and concepts we want students to know.
- Reasoning targets require students to use their knowledge to reason and problem solve.
- Performance skill targets ask students to use knowledge to perform or demonstrate a specific skill such as reading aloud with fluency.
- Product targets specify that students will create something, such as a personal health related fitness plan.

3) Sound Assessment Design. The assessor has translated the learning targets into assessments that will yield accurate results. It involves using the proper assessment method and the assessment minimizes bias that might distort estimates of student learning.

4) Effective Communication of Results. The assessor must plan to manage information from the assessment appropriately and report it in ways that will meet the needs of the intended users. This relates directly to the purpose of assessment. If the assessment is formative then teachers must provide descriptive feedback linked to the targets of instruction and arising from the assessment items or rubrics and communicates to students in ways that enable them to take action immediately, thereby promoting further learning.

5) Student Involvement in the Assessment Process. Students learn best when they monitor and take responsibility for their own learning. This means teachers need to write learning targets in terms those students will understand (Chappuis, Chappius, Stiggins, 2009).

According to Stiggins (2002), formative assessment and assessment *for learning* are not the same. Assessment *for learning* is about far more than testing more frequently or providing teachers with evidence so that they can revise instruction. Assessment *for learning* must involve students in the process. When they assess for learning, teachers advance student learning by:

- Understanding and articulating in advance of teaching the achievement targets that their students are to hit.
- Informing their students about those learning goals, in terms that students understand, from the very beginning of the teaching and learning process.

- Becoming assessment literate and thus able to transform their expectations into assessment exercises and scoring procedures that accurately reflect student achievement.
- Using classroom assessments to build students' confidence in themselves as learners and help them take responsibility for their own learning, so as to lay a foundation for lifelong learning.
- Translating classroom assessment results into frequent descriptive feedback (versus judgmental feedback) for students, providing them with specific insights as to how to improve.
- Continuously adjusting instruction based on the results of classroom assessments.
- Engaging students in regular self-assessment, with standards held constant so that students can watch themselves grow over time and thus feel in charge of their own success.
- Actively involving students in communicating with their teacher and their families about their achievement status and improvement.

In reviewing the research, it is evident that summative assessments can be used to evaluate the effectiveness of curriculums and programs and progress toward standards and benchmarks whereas formative assessment is part of the instructional process. When incorporated into classroom practice, formative assessment provides the information needed to adjust teaching and learning while they are happening. In this sense, formative assessment informs both teachers and students about student understanding at a point

when timely adjustments can be made. These adjustments help to ensure students achieve, targeted standards-based learning goals within a set time frame.

Some people have used the analogy of a person who has a goal of losing weight to compare assessment strategies and improving student learning. When you step on the scale once a month, it is to help you determine whether you are meeting your weight loss goal (summative). During the month, you will measure your caloric intake, fat and sugar intake, aerobic exercise goals (formative) and adjust those things to decide if they are helping you lose weight. Stepping on the scale more often, will not help you lose weight nor will taking more summative, high stakes tests improve student learning outcomes but formative assessments and feedback along the way can have that just that effect.

Students benefit from assessment for learning because they become more confident learners. This success results in greater achievement for all students - especially low achievers or those performing below proficiency. As students learn to monitor their own success and make decisions that bring greater success, this is the foundation of lifelong learning. When we ensure the accuracy and effective use of assessments both *of* and *for* learning, then we will maximize students' confidence in themselves as learners and raise achievement levels for all students and "leave no child behind."

Visible Learning

In John Hattie's book entitled Visible Learning, Hattie synthesizes over 800 meta-analyses related to achievement. Hattie (2009) writes that the research literature is rich as to what teachers and schools should do (Hattie, 2009, p. 2) but his book aims to synthesize over 800 meta-analysis about the influences on achievement to present a more

global perspective on what are, and what are not, key influences on achievement. The effects are based on many millions of students across the main areas of influence—from the student, the home, the effects of schools, teachers, curricula, and teaching methods and strategies.

According to noted change–theory expert Michael Fullan (2003), one of the most critical problems our schools face is not the resistance to innovation, but the fragmentation, overload, and incoherence resulting from the uncritical and uncoordinated acceptance of too many different innovations (Fullan & Stiegelbauer, 1995). Hattie is cautionary in his analysis and says we have an abundance of research in the area of “what works” and that we must be careful not to confuse correlates for causes. He argues that there are thousands of studies promulgating that this method works or that innovation works but rarely is it used by teachers. In fact, the lists provide recommendations devoid of underlying theory and messages; they tend to not take into account any moderators or the “busy bustling business” of classrooms, and often appeal to claims about “common sense.” Michael Scriven (1991) has long written about mistaking correlates of learning with causes. His claim is that various correlates of school outcomes, say the use of advance organizers, the maintenance of eye contact, or high time on task, should not be confused with good teaching. He argues that while these may indeed be correlates of learning, it is still the case that good teaching may include none of these attributes. It may be that increasing these behaviors in some teachers also leads to a decline in other attributes (e.g., caring and respect for students). Correlates, therefore, are not to be confused with causes (Hattie, 2009, p. 3). By measuring the effect sizes of 0.40 or greater, Hattie provides a “standard” from which to judge effects: it is a comparison

based on typical, real-world effects rather than on the strongest cause possible or the weakest cause imaginable (Hattie, 2009, p. 17). Hattie says we have no barometers of success or failure to show what works and what does not work in education. An influence may “work”, but by how much, and how differently from other influences? In his synthesis, Hattie does not ask which innovations and actions work but instead ask which work best? Like Black and Wiliam (1998b), Hattie concludes that what teachers *do* matters. The act of teaching requires deliberate interventions to ensure that there is cognitive change in the student: the key ingredients are awareness of the learning intentions, knowing when a student is successful in attaining those intentions, having sufficient understanding of the student’s understanding as he or she comes to the task, and knowing enough about the content to provide meaningful and challenging experiences in some sort of progressive development (Hattie 2009, p. 22). He goes on to say that the teaching and the learning are visible. The teacher must know when learning is correct or incorrect; learn when to experiment and learn from the experience; learn to monitor, seek and give feedback; and know to try alternative learning strategies when others do not work.

Hattie also concludes that what students *do* matters. Students need to be involved in determining success criteria, setting higher expectations, and being open to experiences relating to differing ways of knowing and problem solving. The major argument is that when teaching and learning are visible, there is a greater likelihood of students reaching higher levels of achievement. It involves an accomplished teacher who knows a range of learning strategies to build on the students’ surface, deep knowing and understanding, and conceptual understanding. The teacher needs to provide direction and

re-direction in terms of the content being understood and thus maximize the power of feedback, and to have the skill to get out of the way when learning is progressing towards the success criteria. It also requires a commitment to seeking further challenges (for the teacher and the student) - and herein lays a major link between challenge and feedback, two of the essential ingredients of learning. The greater the challenge, the higher the probability that one seeks and needs feedback, and the more important it is that there is a teacher to ensure that the learner is on the right path to successfully meet the challenge (Hattie 2009, p.38). In Chapter 7 of his book, Hattie synthesizes the research on ways that teachers differ in their influence on student achievement. Nearly all teachers are effective (that is, if we mean having positive achievement effects, $d > 0.00$) and many have an effect above the hinge-point in the “zone of desired affects” ($d > 0.40$) (Hattie, 2009).

Also aligned to formative assessment strategies is what Hattie refers to as “Contributions from Teaching Approaches.” This includes a closer examination of goals, success criteria, and fostering student involvement. It follows a model of teaching and learning based on Clarke (Clarke, Timperley, & Hattie, 2003), where the learning intentions and success criteria frame the challenge and purpose of the lesson. If such goal orientated lessons are to be successful, they must also use appropriate feedback, take into account students’ views of the process of learning, and ensure students are actively involved in monitoring their own learning and developing their own metacognitive skills. (Hattie 2009, p. 161)

Feedback

Locke and Latham (1990) have provided a compelling set of evidence, including many meta-analyses that indicate how critical goals are for enhancing performance. A major finding of their book is that achievement is enhanced to the degree that students and teachers set challenging rather than “do your best” goals, relative to the students’ present competencies. The performances of the students who have the most challenging goals are over 250 percent higher than the performances of the subjects with the easiest goals (Wood & Locke, 1987). Hattie identifies the feedback that teachers receive from students as the most powerful. When teachers seek, or are at least open to, feedback from students as to what students know, what they understand, where they make errors, when they have misconceptions, when they are not engaged- then teaching and learning can be synchronized and powerful. Feedback to teachers helps make learning visible. Feedback is information provided by an agent (e.g., teacher, peer, book, parent, or one’s own experience) about aspects of one’s performance or understanding. For example, a teacher or parent can provide corrective information; a peer can provide an alternative strategy, a book can provide information to clarify ideas, a parent can provide encouragement, and a learner can look up the answer to evaluate the correctness of a response. Feedback is a consequence of performance and the main purpose of feedback is to reduce discrepancies between current understandings and performance and a learning intention or goal. The “effect sizes” reported in the feedback meta-analyses show considerable variability, which indicates that some types of feedback are more powerful than others. The most effective forms of feedback provide cues or reinforcement to the learner, are in the form of video, audio or computer-assisted instruction feedback, or relate feedback to learning

goals (Hattie, 2009, p. 173-174). Programmed instruction, praise, punishment, and extrinsic rewards were the least effective forms for enhancing achievement. Kluger and DeNisi (1996) found in their meta-analysis on feedback specifically, that feedback is more effective when it provides information on correct rather than incorrect responses and when it builds on changes from previous trials. The main purpose of feedback is to reduce discrepancies between current understandings and performance and a learning intention or goal. The major feedback questions are “Where am I going?” (learning intentions/goals/success criteria), “How am I doing?” (self-assessment and self-evaluation), and “Where to next?” (progression, new goals). An ideal learning environment or experience is when both teachers and students seek answers to each of these questions. Sadler (1989) argued it is in closing the gap between where the student is and where they are aiming to be that leads to the power of feedback. In Hattie’s synthesis of the meta- analyses, the effect of feedback was very positive ($d= 0.73$).

Effective Lessons

Effective teaching can alter the academic trajectory of low achieving students – vaulting them from the lowest to the highest quartile in three years. Teaching quality – the what and the how of instruction – is the most important factor that affects student learning (DuFour & Marzano, 2011). The requirements of the Every Student Succeeds Act (ESSA) of 2015, directs that teacher training be based on evidence of effectiveness. Effective lessons share the same, widely recognized structure. It is arguably thousands of years old – as old as teaching itself (e.g. Popham, 2008). In his 2018 book, *Focus: Elevating the Essentials to Radically Improve Student Learning*, Mike Schmoker says

effective lessons share the same, widely recognized structure. The structure consists of the following: a clear learning objective or target, accompanied (usually) by an attempt to create interest in the topic (think “anticipatory set”); teaching and modeling in small, “scaffolded” steps, each of which is followed by practice or “guided practice” for each step; checks for understanding (“formative assessment”) during and after each practice attempt; and, finally, independent practice/assessment (which can be one and the same). All of these must occur in a classroom in which steps are taken to ensure that students are attentive and engaged.

Formative Evaluation of Programs

A major argument in Hattie’s book, is the power of feedback to teachers on what is happening in their classroom so that they can ascertain, “How am I doing?” in achieving the learning intentions they have set for their students, such that they can decide “Where to next?” for the students. Formative evaluation provides one such form of feedback. Fuchs and Fuchs (2002) examined the effects of systematic formative evaluation by the teachers and found that this technique increased achievement for students with a mild learning disability ($d=0.70$). The formative evaluations were effective across student age, treatment duration, frequency of measurement, and special needs status. When teachers were required to use data and evidenced based models, “effect sizes” were higher than when data were evaluated by teacher judgment. The formative evaluation of programs effect ($d=0.90$) in Hattie’s synthesis was much higher than what has been termed the “typical teacher effects” of $d= 0.25$ to 0.40 . It is the attention to the purposes of innovations, the willingness to seek negative evidence (i.e.,

seeking evidence on where students are not doing well) to improve the teaching innovation, the keenness to see the effects on all students, and the openness to new experiences that make the difference. The major message is for teachers to pay attention to the formative effects of their teaching, as it is these attributes of seeking formative evaluation of the effects (intended and unintended) of their programs that makes for excellence in teaching (Hattie 2009, p.181).

Summary and Conclusions

In the research reviewed for this study, there is strong evidence and consensus that the formative assessment process used by teachers and students during instruction has very powerful and positive effects on student achievement. On the other hand, there is little evidence that externally imposed high stake tests have improved school quality or reduced achievement score gaps. In their research review, Black and Wiliam (1998b) examined the research literature on assessment worldwide, asking if there is evidence that improving the quality and effectiveness of use of student-involved formative assessments raises student achievement as reflected in summative assessments. The estimated effects of student-involved classroom assessment on summative test scores reported effect sizes of a half to a full standard deviation higher. Black and Wiliam (1998b) report that “improved (student-involved) formative assessment helps low achievers more than other students and so reduces the range of achievement while raising achievement overall.”

The evidence in the research, taken together suggests that achievement gains and reductions in score gaps are within reach if classroom assessments (1) focus on clear purposes, (2) provide accurate reflections of achievement, (3) provide students with

continuous access to descriptive feedback on improvement in their work (versus infrequent judgmental feedback), and (4) bring students into the classroom assessment processes (Stiggins, Arter, Chappuis, & Chappuis 2005).

All of this is important because the research indicates that a teacher's classroom use of formative assessments strategies will have a positive effect on student achievement (Hattie, 2009, 2012). Some interventions have a larger impact than others but the findings from this multitude of educational research on "what works" indicates that what "works best" is that teachers see learning occurring or not occurring (formative assessment), and intervene in calculated meaningful ways to alter the direction of learning to attain various shared, specific, and challenging goals (Hattie, 2009: 22-4). In his book, *Visible Learning for Teachers*, Hattie says, "the key ingredients in teaching is knowing the learning intentions, knowing when a student is successful in attaining those intentions, having sufficient understanding of the student's prior understanding as he or she comes to the task, and knowing enough about the content to provide meaningful and challenging experiences so that there is some sort of progressive development. What matters most is that teachers have an appropriate mind frame relating to the impact of what they do – they must be able to evaluate their effect on learning. An appropriate mind frame combined with appropriate actions work together to achieve a positive learning effect" (Hattie, 2012).

CHAPTER THREE METHODOLOGY

Rationale

Following the review of related literature on formative assessment, the researcher set out to determine the relation, if any, between “end of year” student growth on the Northwest Evaluation Association/Measures of Academic Performance (NWEA/MAP) reading assessment and individual teachers classroom formative assessment practices. For the purpose of this study, each teacher’s end of year classroom assessment results were matched and compared to the same teachers formative assessment survey results. For convenience, the teachers were grade 2 through 5 classroom teachers in Hudson Public Schools where the researcher is a principal. This area of study was also chosen because staff in the Hudson Public School District have been participating in staff development in the area of formative assessment strategies and there is an opportunity to provide results to principals and teachers, impacting about 2500 students in the Hudson Public School District.

Delimitations and Limitations

1. This study involves six public elementary schools in the Hudson Public School District in Hudson, Wisconsin. Therefore, the findings are applicable only to the Hudson School District.
2. The researcher compiled and designed the teacher survey using multiple research findings and multiple researchers, who studied the effect of formative strategies

on student learning. The study was therefore limited to the particular formative assessment strategies that the researcher included in the survey.

3. The survey was completed by 49 teachers of a possible 75 teachers in grades two through five in six elementary schools. The corresponding data is limited to 65% of the possible teachers who chose to fill out the survey in the Hudson School District. The correlational findings between a teacher's use of formative assessment strategies and student learning in that teacher's classroom may not generalize to other teachers or situations.
4. In order to obtain honest and truthful responses on the survey, participants were told that their identities would be concealed and confidentiality preserved. Honest responses are therefore assumed but cannot be proven.

Research Questions

Each of the following questions were answered using the methodology described below. Each question required a separate data analysis.

1. What is the relationship between teacher assessment strategies and end of year student growth results on the NWEA "Measures of Academic Performance" (MAP)?
2. Are those teacher assessment strategies consistent from classroom to classroom and which teacher assessment practices demonstrate a greater effect on student growth results?
3. In high growth classrooms (those that demonstrate higher student growth reading results), what formative assessment strategies may have influenced student achievement results? (as identified in the teacher survey)

Project Methodology

1) The researcher compiled a list of formative assessment strategies that teachers could potentially use in their classrooms to improve students' achievement of intended instructional outcomes. Some questions were intentionally asked to guide and inform the Hudson School District leadership team about future staff development needs.

Prior to and during learning, I continually communicate the intended learning targets or objectives to my students.	Chappuis, Chappuis & Stiggins, 2009; DuFour & Marzano, 2011
To further clarify learning targets, I provide opportunities for students to analyze models of strong and weak work as it relates to the intended learning.	DuFour & Marzano, 2011
At the end of a lesson, I have more information regarding students' understanding/misunderstandings of the content I taught.	DuFour & Marzano, 2011
Prior to beginning a lesson, I gain perspective on current levels of student performance in relation to the learning objectives by asking myself, "What do students already know? What misconceptions are present?"	DuFour & Marzano, 2011
I can articulate learning objectives and understand how the objectives link to state standards or the district's guaranteed curriculum.	DuFour & Marzano, 2011
The students in my class can communicate what they are learning and what steps they need to take to reach their learning goals.	Stiggins, 2002; DuFour & Marzano, 2011
As a teacher, I have opportunities to talk about students' progress with colleagues.	DuFour & Marzano, 2011; For Hudson Public Schools
I incorporate feedback and/or coaching for students that is descriptive and interactive.	Hattie, 2009; Fuchs & Fuchs, 2005; Stiggins, 2002
The students in my class are involved in determining their learning goals and objectives.	Shepard, 2001; DuFour & Marzano, 2011
I use the students' NWEA/MAP results to inform my instruction.	For Hudson Public Schools
I use formative assessment strategies to inform my instruction.	Popham, 2008; Black & Wiliam, 1998b; Stiggins, 2002; Hattie, 2009
I am comfortable looking at student data in order to make instructional decisions.	DuFour & Marzano, 2011; For Hudson Public Schools

2) This list was compiled into a survey (Appendix A) and the researcher completed the application to the Institutional Review Board (IRB). It was determined that the research was on educational practices and did not include personal, sensitive data and the research qualified as exempt and was coded as such (1609E94782).

3) While the research did not require individual teachers consent, the principals in all six elementary schools in the Hudson Public School District were provided an explanation of the research and provided a copy of the teacher consent form for review (Appendix G).

4) At the building staff development/late start sessions in October of 2016, elementary principals in each of the six buildings were asked to explain the purpose of the study prior to its administration and review the confidentiality of the survey results. Teachers in grades two through five in their respective buildings were asked to complete the survey once within a two-week window immediately following the meeting. There were a total of seventy-five classroom teachers in grades two through five in the fall of 2016. Surveys were completed, on-line, using "Google Forms."

The following explanation was at the top of the survey for participants to review:

The purpose of this study is to determine the relationship between 2nd through 5th grade classroom teachers' use of formative assessment strategies and the "end of year" student growth on the Northwest Evaluation Association Measures of Academic Progress (NWEA/MAP) reading assessments.

You were selected as a possible participant because you are a grade 2-5 elementary teacher in the Hudson School District. This research is being conducted by Amy Hamborg, OLPD student, at the University of Minnesota. If you have any questions you may contact her at 715.377.3783 or Dr. Neal Nickerson, the student's faculty advisor, at 612.624.0815 or nicke001@umn.edu

Your participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of

Minnesota or the Hudson School District. All results will be aggregated and all identifiable data will be removed before summarizing the results. If you decide to participate, you will receive a written summary of the findings.

If you agree to participate in the study, please answer the following questions and thank you for your participation. (The complete survey is found in Appendix A).

5) The teacher survey responses regarding the use of formative assessment strategies and the frequency of use in their respective classrooms was compiled from Google forms using the teachers e-mail address into an excel spreadsheet for comparison and analysis. The responses were self reported by the teachers and therefore the researcher is not assessing for “truth” but practice. The teacher’s survey responses could then be matched to the individual teacher’s NWEA reading results.

6) Data from the Northwest Evaluation Association/Measures of Academic Performance (NWEA/MAP) student growth reading results in Hudson Public Schools, grades two through five, were collected for two consecutive years for each of the teachers’ classrooms that completed the survey. Teachers were excluded from the research if they did not complete two consecutive years of teaching in the Hudson School District or if they did not complete the entire year with the same students. The “spring-to-spring” NWEA/MAP results in reading were used for comparison purposes and both probationary and non-probationary classroom teacher results were included. The reading results are available at the end of each year as a report at the NWEA website with a secure login. The report is called “Achievement Status and Growth Summary Report.” Teacher demographic information was included in the teacher survey and student results were acquired through the NWEA/MAP testing site (<http://www.nwea.org>) using a

secure login. The study included reading results by teacher from 2015-2016 and 2016-2017.

Evaluation Criteria

1. What is the relationship between teacher assessment strategies and end of year student growth results on the NWEA “Measures of Academic Performance” (MAP)?

To answer this question, each formative assessment strategy used by a teacher and its corresponding frequency of use will be assigned a point value from 1-4 with strategies being implemented by a teacher more often being assigned a four. For example a strategy used:

- 1-3 times a day would be assigned four points
- 1-3 times a week would be assigned three points
- 1-3 times a month would be assigned two points
- less than once a month would be assigned one point

Each teacher would then have a corresponding average of up to 4 points for survey questions 4 through 15. These averages will then be analyzed to see if there is a significant statistical relationship between the frequency of use of each strategy and the classroom teachers reading results on the NWEA/MAP assessment.

2. Are those teacher assessment strategies consistent from classroom to classroom and which teacher assessment practices demonstrate a greater effect on student growth results?

To answer this question, the researcher will individually analyze each formative assessment strategy by frequency of use and compare that to the teachers average MAP score. In the analysis, we will reject the hypothesis that the frequency of use has no relationship to the average MAP score and determine if, in fact, some formative assessment strategies do result in a higher MAP average score. A particular strategy with a P value of less than .05, will determine for the researcher if that strategy has a significant difference on the end of year MAP scores and also which strategies do not show a significant difference.

3. In high growth classrooms (those that demonstrate higher student growth reading results), what formative assessment strategies may have influenced student achievement results? (as identified in the teacher survey)

To answer this question, the researcher will determine the highest growth classrooms by using the top 25% as the cut score for identification. Once that cut score has been determined and the “high growth classroom teachers” have been identified in the data, the average frequency of their use of formative assessment strategies will be compared to all teachers’ use of formative assessment strategies. Question one and question three must compare the frequency of teachers’ use of formative assessment strategies to each of the same teachers end of year reading growth results.

CHAPTER FOUR RESULTS

Results

The purpose of this study was to determine the relation between “end of year” student growth on the Northwest Evaluation Association/Measures of Academic Performance (NWEA/MAP) reading assessments and teachers’ classroom formative assessment practices. For the purpose of this study, end of year classroom assessment results were compared to teacher formative assessment survey results.

Of the seventy-five teachers surveyed in grades two through five in the Hudson Public School District, forty-nine completed the survey about classroom assessment strategies (65% of the teachers). Of those teachers, 26.5% had completed two - nine years of teaching and 73.5% had completed ten or more years of teaching.

Survey results were analyzed by Nadeesha Lihinikadu Arachchige, Assistant Professor of Statistics at St. Cloud University. On the survey, teachers were asked to self identify the frequency of use for each of the formative assessment strategies. Each of the survey results for each teacher was then assigned a point value.

- 1-3 times a day was assigned four points
- 1-3 times a week was assigned three points
- 1-3 times a month was assigned two points
- less than once a month was assigned one point

Each teacher had an average score, from a minimum of one point and a maximum of four points, depending on the frequency of use. This could then be compared to student learning results for that teacher. For example, teacher X had a frequency of use of 3.2 compared to 58.6% NWEA reading growth results. This was statistically analyzed for each of the twelve strategies:

1. Prior to and during learning, I continually communicate the intended learning targets or objectives to my students.
2. To further clarify learning targets, I provide opportunities for students to analyze models of strong and weak work as it relates to the intended learning.
3. At the end of a lesson, I have more information regarding students' understanding/misunderstandings of the content I taught.
4. Prior to beginning a lesson, I gain perspective on current levels of student performance in relation to the learning objectives by asking myself, "What do students already know? What misconceptions are present?"
5. I can articulate learning objectives and understand how the objectives link to state standards or the district's guaranteed curriculum.
6. The students in my class can communicate what they are learning and what steps they need to take to reach their learning goals.
7. As a teacher, I have opportunities to talk about students' progress with colleagues.
8. I incorporate feedback and/or coaching for students that is descriptive and interactive.
9. The students in my class are involved in determining their learning goals and objectives.
10. I use the students' NWEA/MAP results to inform my instruction.
11. I use formative assessment strategies to inform my instruction.

12. I am comfortable looking at student data in order to make instructional decisions.

Question One Analysis

What is the relationship between teacher assessment strategies and end of year student growth results on the NWEA “Measures of Academic Performance” (MAP)?

Using the bivariate of fit data analysis, teachers who engage in more frequent use (1-3 times a day) of formative assessment strategies compared to teachers who engage in less frequent use (1-3 times a week) of these strategies, realized a significant, positive effect of plus sixteen (+16%) on the end of year classroom reading results as measured by the NWEA/MAP assessment (Figure 1 and Appendix C).

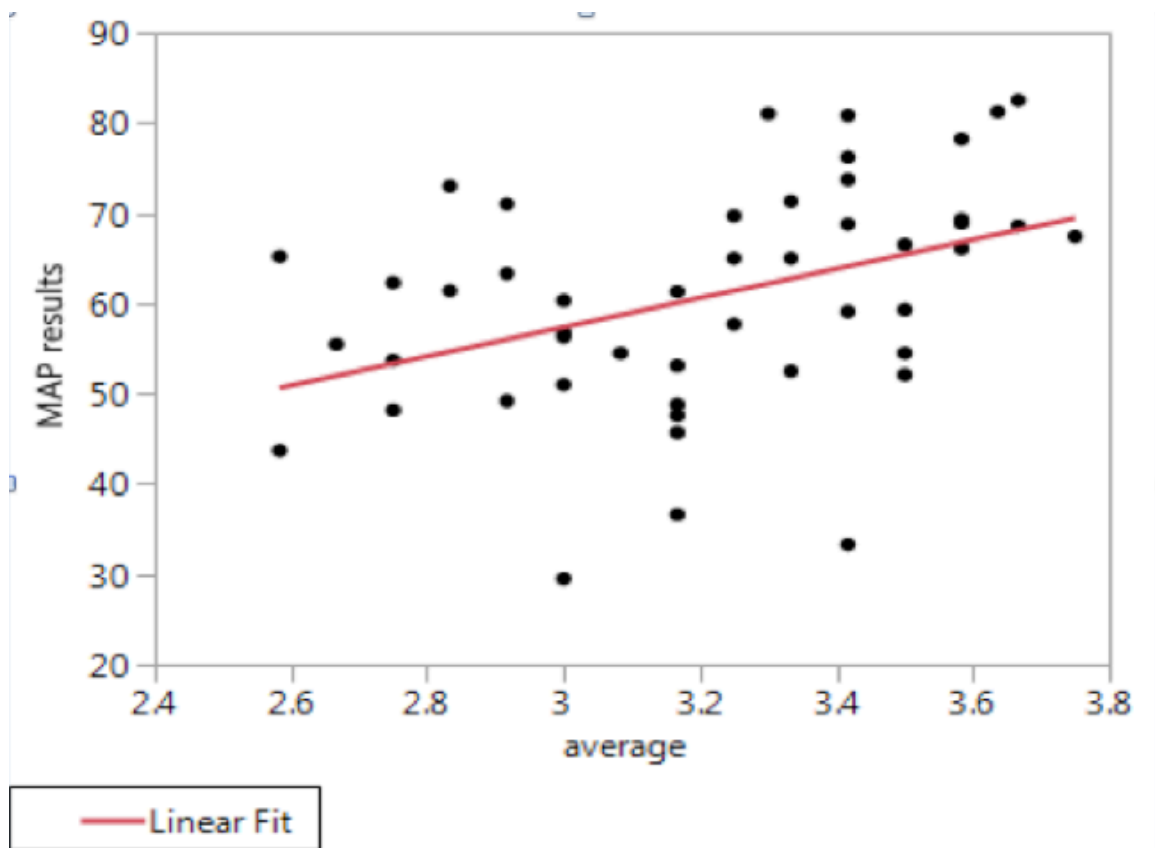
The positive effect on student learning results can be viewed as a plus 16% difference based on the frequency of use of formative assessments. For example, a teacher who averaged 3.0 or 1-3 times a week averaged student-learning results on average of 56% whereas a teacher who averaged 4.0 or 1-3 times a day averaged student-learning results of 72%.

Figure 1 represents each of the forty-nine teachers – one dot for each teacher. The X-axis represents the average teacher use of formative assessment strategies for each teacher. The Y-axis represents each teacher’s MAP summative reading results by class in a percentage. As the average use of strategies increases, the end of year reading scores increase (the red line below). The significance here is that the more often a teacher uses

formative assessment strategies in a day, s/he will have a significantly higher percentage of students reaching their end of year growth reading growth targets.

Figure 1

Relation of Student MAP Reading Results by Class to Teachers' Average Daily Use of Formative Assessment Strategies



Linear Fit

$$\text{MAP results} = 8.93254 + 16.143353 * \text{average}$$

Summary of Fit

$$\text{RSquare} = 0.165867$$

Observations = 49

Analysis of Variance

$$\text{Probability} > F = 0.0037$$

Question Two Analysis

2. Are those teacher assessment strategies consistent from classroom to classroom and which teacher assessment practices demonstrate a greater effect on student growth results?

For each of the survey questions 4-15, the analysis of variance test was used to determine if there was a significant difference (.05 or less) in the use of formative assessment strategies compared to end of year reading results. Three strategies (identified below*) resulted in a significant difference (Prob>F in Appendix D, E, and F).

Prior to and during learning, I continually communicate the intended learning targets or objectives to my students.	
To further clarify learning targets, I provide opportunities for students to analyze models of strong and weak work as it relates to the intended learning.	*Significant effect (0.0087) Appendix D
At the end of a lesson, I have more information regarding students' understanding/misunderstandings of the content I taught.	
Prior to beginning a lesson, I gain perspective on current levels of student performance in relation to the learning objectives by asking myself, "What do students already know? What misconceptions are present?"	
I can articulate learning objectives and understand how the objectives link to state standards or the district's guaranteed curriculum.	
The students in my class can communicate what they are learning and what steps they need to take to reach their learning goals.	*Significant effect (0.0292) Appendix E
As a teacher, I have opportunities to talk about students' progress with colleagues.	
I incorporate feedback and/or coaching for students that is descriptive and interactive.	*Significant effect (0.0454) Appendix F
The students in my class are involved in determining their learning goals and objectives.	
I use the students' NWEA/MAP results to inform my instruction.	
I use formative assessment strategies to inform my instruction.	

I am comfortable looking at student data in order to make instructional decisions.	
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Question Three Analysis

3. In high growth classrooms (those that demonstrate higher student growth reading results), what formative assessment strategies may have influenced student achievement results? (as identified in the teacher survey)

The MAP reading results data ranged from 29.5% to 82.5% with a mean of 60.8%. These numbers represent the percent of students in a teacher's classroom that met their end of year reading growth target. The upper quartile score was identified as above 69.1% which was then used to compare high growth teachers to other teachers.

Since each assessment strategy was analyzed independently, comparing frequency of use and high growth classrooms, this question was answered in the analysis of question one and two. The classroom teachers with the highest end of year reading growth results used, on average, formative strategies more frequently. In this analysis, we rejected the hypothesis that all means are the same and found that there was a significant difference for the three strategies listed previously. The three strategies outlined below have the most significance in the study as they have a significant correlation to end of year reading results for students and they are noted below:

1) To further clarify learning targets, I provide opportunities for students to analyze models of strong and weak work as it relates to the intended learning (0.0087). We are

95% confident that the average end of year MAP score of teachers who use this strategy 1-3 times a day is between 60.6 and 80.7.

2) The students in my class can communicate what they are learning and what steps they need to take to reach their learning goals (0.0292). We are 95% confident that the average end of year MAP score of teachers who use this strategy 1-3 times a day is between 60.3 and 69.5.

3) I incorporate feedback and/or coaching for students that is descriptive and interactive (0.0454). We are 95% confident that the average end of year MAP score of teachers who use this strategy 1-3 times a day is between 58.7 and 69.1.

Survey questions 16-32 (Appendix A), were included to determine if different methods of “checking for understanding” were used more frequently in classrooms that demonstrated higher end of year reading results but there were no items yielding significant differences in the end of year reading results. Of the specific formative assessment strategies listed in the survey (definitions are in Appendix E), those being used more frequently by all teachers were:

- turn and talk
- think, pair, share
- white board/ slate assessments
- oral questioning/ raise hands or cold call

Teachers were also asked to identify any other formative assessment strategies they used during instruction and they identified:

- anecdotal notes
- reading response journals
- peer assessment
- conferring
- running records

CHAPTER FIVE SUMMARY AND IMPLICATIONS

Summary and Implications

Results of this study revealed an overall significant, positive effect on reading achievement in classrooms where teachers engage in more frequent use of formative assessment strategies. On average, teachers who engage in more frequent use (1-3 times a day) of formative assessment strategies compared to teachers who engage in less frequent use (1-3 times a week) of these strategies, realized a significant, positive effect of plus sixteen percent (+16%) on the end of year classroom reading results as measured by the NWEA/MAP assessment. The positive effect on student learning results can be viewed as a plus 16% difference based on the frequency of use of formative assessments. For example, a teacher who averaged 3.0 (1-3 times a week) averaged student-learning results of 56% whereas a teacher who averaged 4.0 (1-3 times a day) averaged student-learning results of 72%.

Of the teachers in this study who were identified with higher end of year reading growth and achievement results, three of twelve formative assessment strategies were used significantly more often by these teachers. These three strategies were:

- 1) To further clarify learning targets, I provide opportunities for students to analyze models of strong and weak work as it relates to the intended learning. This would include students self-assessing themselves using a student friendly rubric. When students

can see what strong work looks like they can more easily identify what they need to do to get there.

2) The students in my class can communicate what they are learning and what steps they need to take to reach their learning goals. This can be done by students sharing their thinking aloud in a “turn and talk” or a “think pair share” (Appendix B).

3) I incorporate feedback and/or coaching for students that is descriptive and interactive. This would include conferring, response clickers, white boards, and response journals.

This study revealed three specific high impact strategies that could significantly improve reading results if used daily in the classroom. The implications from the study indicate that teachers who clarify learning targets, provide feedback to students that is descriptive and interactive, and involve students in this reciprocal process so they understand what to do to reach their learning goals, will have students that achieve more. The research and this study would suggest that teachers could benefit from staff development in the area the frequent use of checking for understanding or formative assessment strategies.

Discussion

There is remarkable convergence among researchers on the primacy and power of the fundamental elements of good instruction beginning with Madeline Hunter. Hunter helped formalize the essential parts of an effective lesson: “learning objective,” “anticipatory set,” “scaffolded” instruction, “guided practice,” “check for understanding,” and independent practice.” Hunter’s whole-class instructional methods are built around

the “checking for understanding” that allows the teacher to make informed adjustments to their teaching during the lesson – so as to maximize student success at each stage of instruction.

In his research, James Popham (2008) also supports the use of formative assessment or “checking for understanding” and adds that effective teaching requires that we collect formal or informal assessment evidence to make informed adjustments.

William and Thompson (2007) and Popham (2008) advocate using the same procedures such as checking for understanding by using dry-erase boards or hand signals to let teachers know whether they are or aren’t ready to move on to the next step or progression in the lesson. Marilyn Burns (2007) advocates for lessons taught according to the “gradual release of responsibility” model, which gives students increasing amounts of responsibility to complete assignments independently on the basis of multiple iterations of “guided instruction” informed by checking for understanding and adjustments to instruction. Burns also insists that lessons include frequent opportunities for “think-pair-share” as the teacher notes the students’ progress and adjusts instruction accordingly (pp. 18-19).

In his book *The Art and Science of Teaching* (2017), Robert Marzano gives credit to the influence of Madeline Hunter – as he makes a case for learning goals and the need to segment the lesson into small, manageable chunks of instruction, each one followed immediately by “guided practice” – wherein students process or apply new learning.

Doug Lemov’s (2015) *Teach Like A Champion 2.0* is equally emphatic about the need for explicit instruction. Checking for understanding (“CFU,” as he calls it) was the primary factor that accounted for the success of the highest-performing teacher in his

network of charter schools. CFU has to be done both frequently and quickly. When quick, efficient CFU reveals a pattern of weakness or misunderstanding, we must “act on the data” for the entire class by “immediately changing the course of the lesson to respond to the lack of mastery.” He also prescribes cold calling, the use of whiteboards, and circulating to quickly assess a meaningful sample of students to determine whether we must reteach or can now move on to the next step of instruction (p. 27).

In two of Hattie’s recent books, *Visible Learning for Teachers* (2012) and *10 Mindframes for Visible Learning* (2018), Hattie describes the importance of teachers being evaluators of their impact on student learning. He goes on to say that it is “more about how they think about what they do that matters most, how they understand their impact, and their search for feedback to improve the positive impact they have on their students” (p. xv).

Implications for Further Research

A further study that examines the use of classroom formative assessment strategies in a larger district or in different areas of the country could further the research and expertise of teachers since what they do in their classrooms is of great value to students.

Researchers have determined that one of the most important factors to improving student learning is the student and teacher relationship and what happens in the classroom. Doug Lemov’s books, *Teach Like a Champion* (2015) and Lemov, Hernandez, & Kim, *Teach Like a Champion Field Guide 2.0* (2016) and Dylan Wiliam and Siobhan Leahy’s (2015) book, as well as others referenced in this study, can provide practical strategies for embedding formative assessment into the classroom. Lessons built

around same-day formative assessment or checks for understanding produce student learning effects that are “among the largest ever reported” (Popham 2008, p. 2). Paul Black and Dylan Wiliam (1998b), whose research was based on more than 250 studies, found that lessons that include effective use of formative assessment or checks for understanding produced these results:

- They would have 20 to 30 times as much positive effect on learning as the most popular current initiatives.
- They are about 10 times as cost-effective as reducing class size.
- They would add between 6 to 9 months of learning growth per school year, per child.
- They account for as much as 400 percent “speed of learning differences”; that is, in some classrooms, students would learn four times as fast as a result of its consistent use (Wiliam & Thompson, 2007, p. 186).
- The results of such teaching would vault the United States from approximately number 18 into the top 5 in international rankings in mathematics.
- They could possibly have more upward effects on school outcomes than any other instructional change.

Outcomes such as these help explain the following findings:

- Only three years of effective teaching will catapult students in the lowest quartiles into the second or even the first/highest quartile (Marzano, 2006, p. 2).
- Effective teaching could eliminate the achievement gap in about five years (Schmoker, 2006).

- The result of formative assessment is comparable with the results achieved through on-on-one tutoring (Stiggins, 2005).
- The highest-performing teachers ensure that students learn about twice as much material in the same amount of time as their peers do.

As a current elementary principal, it is critical that teachers see themselves as evaluators of their effects on students. Large-scale research, as well as the findings in this study, would suggest that investing in professional development in the frequent and targeted use of formative assessment strategies can improve student learning, especially for struggling learners.

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APPENDIX A

Teacher Survey

1) How many years have you taught at the elementary level?

- 1-4 years
- 5-9 years
- 10-20 years
- 21+ years

2) Gender:

- male female

3) Age:

- 21-30 years old
- 31-40 years old
- 41-50 years old
- 51+ years old

In answering the following questions, please think about them in terms of your reading and language arts instruction.

4) Prior to and during learning, I continually communicate the intended learning targets or objectives to my students.

- Less than once a month
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

5) To further clarify learning targets, I provide opportunities for students to analyze models of strong and weak work as it relates to the intended learning.

- Less than once a month
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

6) At the end of a lesson, I have more information regarding students' understanding/misunderstandings of the content I taught.

- Less than once a month
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

7) Prior to beginning a lesson, I gain perspective on current levels of student performance in relation to the learning objectives by asking myself, “What do students already know? What misconceptions are present?”

- Less than once a month
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

8) I can articulate learning objectives and understand how the objectives link to state standards or the district’s guaranteed curriculum.

- Less than once a month
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

9) The students in my class can communicate what they are learning and what steps they need to take to reach their learning goals.

- Less than once a month
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

10) As a teacher, I have opportunities to talk about students’ progress with colleagues.

- Less than once a month
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

11) I incorporate feedback and/or coaching for students that is descriptive and interactive.

- Less than once a month
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

12) The students in my class are involved in determining their learning goals and objectives.

- Less than once a month
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

13) I use the students' NWEA/MAP results to inform my instruction.

- Not at all
- 1-3 times a year
- 1-3 times a month
- 1-3 times a week

14) I use formative assessment strategies to inform my instruction.

- Less than once a month
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

15) I am comfortable looking at student data in order to make instructional decisions.

- Less than once a month
- Sometimes
- Most of the time
- Always

I use a variety of formative assessment strategies:

16) Fist to 5/ thumbs up or thumbs down.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

17) Post-its.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

18) Students draw or write what they understand.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

19) Exit slips.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

20) Oral Questioning/ raise hands or cold call.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

21) White boards/slate assessments.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

22) Turn and talk.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

23) Think-pair-share.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

24) Red, Yellow, Green card for understanding.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

25) Graphic organizers.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

26) Conferring.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

27) Quizzes.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

28) Student self-assessment using rubrics.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

29) Running records.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

30) Making predictions.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

31) Google Forms.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

32) Response clickers, polls, or Twitter.

- Not at all
- 1-3 times a month
- 1-3 times a week
- 1-3 times a day

33) Are there any other formative assessment strategies you use? Please list:

APPENDIX B

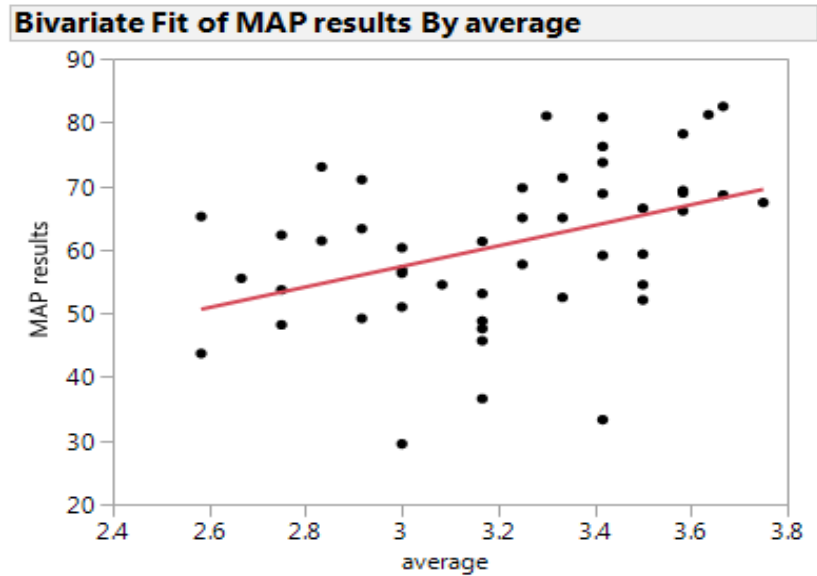
In the survey teachers were asked to identify how frequently they used the following formative assessment strategies during reading instruction. Definitions are included below and they are different ways students demonstrate their understanding of the learning target, allowing for adjustments in instruction during the lesson:

1. Fist to 5/ thumbs up or thumbs down- the teacher asks to how well the students understand the learning target by using hand signals. All students respond at the same time so the teachers can see if adjustments are needed. (fist is no understanding and 5 fingers is complete understanding; thumbs up is understanding and thumbs down is a lack of understanding).
2. Post-its- students answer a question related to the learning on a post it and leave it in on their desk or in a special location before transitioning to another activity.
3. Students draw or write what they understand- students answer a question related to the learning and draw or write on a piece of paper or in a journal.
4. Exit slips- the teacher requires students to answer a question related to the lesson (similar to a post it) before moving on to another activity.
5. Oral Questioning/ raise hands or cold call- the teacher calls on students to give answers to questions orally but calls on students randomly in order to insure that everyone understands.
6. White boards/slate assessments- the teacher asks student to quickly jot an answer down in the large group and hold up their answers so the teacher can visually see who is understanding.
7. Turn and talk- students are asked a question and then asked to talk to another student who is sitting by them. The teacher listens to hear understanding.
8. Think-pair-share- The teacher ask the students a question and they think briefly about the answer, pair up with a partner, and tell the partner what they thought the answer was and then one pair responds orally in the large group.
9. Red, Yellow, Green card for understanding- the teacher asks a question and the students each hold up a red, yellow, or green card which signifies understanding during the lesson (red is a lack of understanding, green is understanding, yellow is partial understanding).

10. Graphic organizers- students demonstrate their understanding by filling in a graphic organizer of the teachers choosing depending on the learning target.
11. Conferring- teachers confer with individual students to assess whether or not students understand the learning target.
12. Quizzes- students are asked to respond to questions related to the learning target during or immediately following instruction.
13. Student self-assessment using rubrics- students are asked to compare their work to a student friendly or teacher made rubric. This is often given to them prior to learning so students can identify and assess their own learning.
14. Running records- students read aloud a passage to the teacher and feedback mistakes are recorded while the student is reading. Following the reading, the teacher often asks comprehension questions.
15. Making predictions- students are asked to orally make predictions during the lesson or reading of a story to check for understanding.
16. Google Forms- teachers who use Google classroom can ask students to respond to the lesson on a chrome book and the teacher immediately can see if students understand the learning target (similar to an exit ticket).
17. Response clickers, polls, or Twitter- the students are asked a short question and give quick responses – short answer or multiple choice – and the teacher can see immediately whether the students understand the learning target (similar to an exit ticket).

APPENDIX C

Relation of Student MAP Reading Results by Class to Teachers' Average Daily Use of Formative Assessment Strategies



— Linear Fit

Linear Fit

MAP results = 8.93254 + 16.143353*average

Summary of Fit

RSquare	0.165867
RSquare Adj	0.148119
Root Mean Square Error	11.33314
Mean of Response	60.77347
Observations (or Sum Wgts)	49

Analysis of Variance

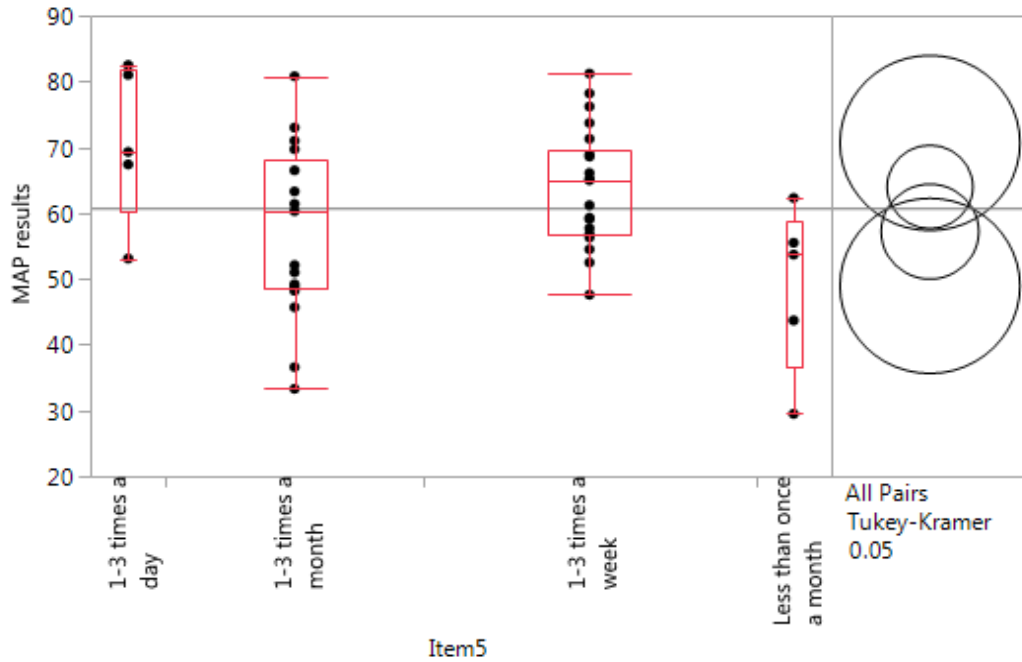
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	1200.3900	1200.39	9.3459
Error	47	6036.6855	128.44	Prob > F
C. Total	48	7237.0755		0.0037*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	8.93254	17.03462	0.52	0.6025
average	16.143353	5.280596	3.06	0.0037*

APPENDIX D

Oneway Analysis of MAP results By Item5



Quantiles							
Level	Minimum	10%	25%	Median	75%	90%	Maximum
1-3 times a day	53.1	53.1	60.25	69.3	81.75	82.5	82.5
1-3 times a month	33.3	35.94	48.5	60.3	68.1	74.56	80.8
1-3 times a week	47.6	53.1	56.675	65	69.5	77.6	81.2
Less than once a month	29.5	29.5	36.6	53.7	58.9	62.3	62.3

Oneway Anova

Summary of Fit	
Rsquare	0.225849
Adj Rsquare	0.174239
Root Mean Square Error	11.15804
Mean of Response	60.77347
Observations (or Sum Wgts)	49

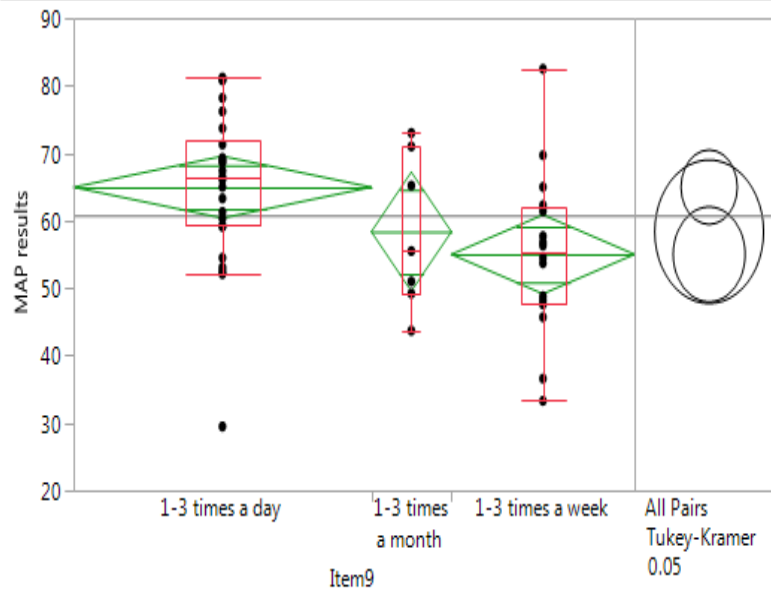
Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Item5	3	1634.4880	544.829	4.3761	0.0087*
Error	45	5602.5876	124.502		
C. Total	48	7237.0755			

Means for Oneway Anova					
Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-3 times a day	5	70.6600	4.9900	60.610	80.710
1-3 times a month	17	57.1882	2.7062	51.738	62.639
1-3 times a week	22	63.9864	2.3789	59.195	68.778
Less than once a month	5	48.9400	4.9900	38.890	58.990

Std Error uses a pooled estimate of error variance

APPENDIX E

Oneway Analysis of MAP results By Item9



Quantiles

Level	Minimum	10%	25%	Median	75%	90%	Maximum
1-3 times a day	29.5	52.38	59.25	66.3	71.9	80.86	81.2
1-3 times a month	43.7	43.7	49.2	55.5	71	73	73
1-3 times a week	33.3	35.61	47.75	55.4	62.075	73.54	82.5

Oneway Anova

Summary of Fit

Rsquare	0.142361
Adj Rsquare	0.105072
Root Mean Square Error	11.61596
Mean of Response	60.77347
Observations (or Sum Wgts)	49

Analysis of Variance

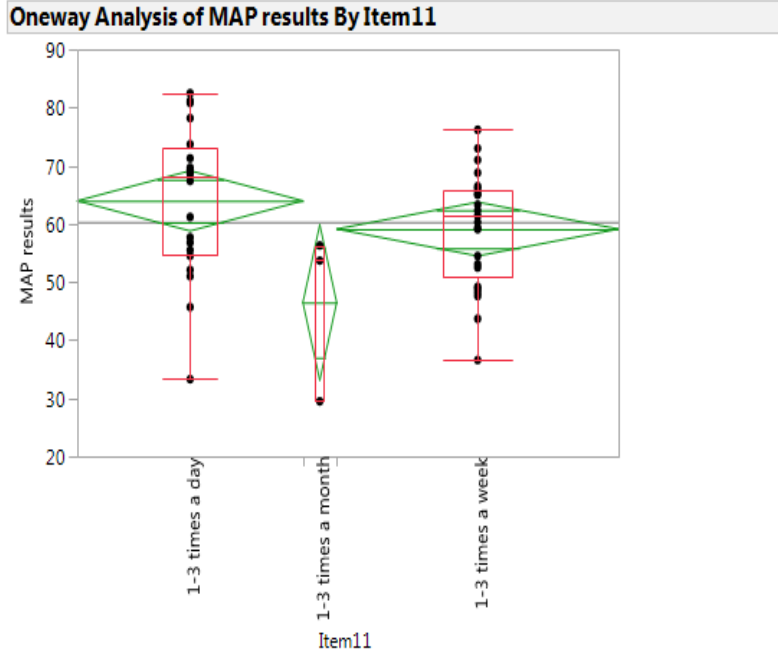
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Item9	2	1030.2765	515.138	3.8178	0.0292*
Error	46	6206.7990	134.930		
C. Total	48	7237.0755			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-3 times a day	26	64.9692	2.2781	60.384	69.555
1-3 times a month	7	58.3714	4.3904	49.534	67.209
1-3 times a week	16	55.0063	2.9040	49.161	60.852

Std Error uses a pooled estimate of error variance

APPENDIX F



Quantiles							
Level	Minimum	10%	25%	Median	75%	90%	Maximum
1-3 times a day	33.3	46.23	54.75	68	73.1	81.16	82.5
1-3 times a month	29.5	29.5	29.5	53.7	56.3	56.3	56.3
1-3 times a week	36.6	46.04	50.85	61.3	65.65	71.8	76.2

Oneway Anova

Summary of Fit

Rsquare	0.128365
Adj Rsquare	0.089626
Root Mean Square Error	11.49305
Mean of Response	60.35208
Observations (or Sum Wgts)	48

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Item11	2	875.3778	437.689	3.3136	0.0454*
Error	45	5944.0620	132.090		
C. Total	47	6819.4398			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1-3 times a day	20	63.9700	2.5699	58.794	69.146
1-3 times a month	3	46.5000	6.6355	33.135	59.865
1-3 times a week	25	59.1200	2.2986	54.490	63.750

Std Error uses a pooled estimate of error variance

Missing Rows 1

APPENDIX G

TEACHER CONSENT FORM
The Relation of Teachers' Use of Classroom Formative Assessment Strategies
to Summative Reading Results

You are invited to be in a research study about the use of formative assessment strategies in the classroom. You were selected as a possible participant because you are a grade 2-5 elementary teacher in Hudson School District. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by: Amy Hamborg, OLPD student, University of Minnesota

Background Information

The purpose of this study is to determine the relationship between 2nd through 5th grade classrooms that demonstrate high “end of year” student growth on the Northwest Evaluation Association Measures of Academic Progress (NWEA/MAP) reading assessments and classroom teachers’ use of formative assessment strategies.

Procedures:

If you agree to be in this study, we would ask you to do the following:
Complete/submit the Google Survey on Formative Assessment Strategies.

Risks and Benefits of being in the Study

The study inherently has risks. In this the primary risk is fear that answers to survey questions could be linked to classroom teachers reading data. In order to reduce risks, all steps will be taken to aggregate results and remove identifiable data before summarizing results.

The benefits to participation are: There are no benefits for participation.

Compensation:

You will not be compensated but you will receive a written report summarizing the finding of the study.

Confidentiality:

The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records. Study data will be encrypted according to current University policy for protection of confidentiality.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota or the Hudson School District. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:

The researcher conducting this study is: Amy Hamborg. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact Neal Nickerson at 612.624.0815, nicke001@umn.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), **you are encouraged** to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

You will be given a copy of this information to keep for your records.

Statement of Consent:

I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

Signature: _____ Date: _____

Signature of Investigator: _____ Date: _____