STUDENT USE OF FORMATIVE ASSESSMENTS AND PROGRESS CHARTS OF FORMATIVE ASSESSMENTS IN THE 7TH GRADE SCIENCE CLASS

by

Emily Sue McKenna

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Emily Sue McKenna

July, 2011

DEDICATION

This paper is dedicated to my husband, Leo, who allowed me time and space to work uninterrupted. This paper is also dedicated to the many teachers and administrators at Montana State University that have made this Master's Degree a wonderful experience. It is also dedicated to the wonderful teachers and administration at Belding Area Schools that truly care about the kids we teach and work hard at making improvements to the program. Lastly, I dedicate this paper to my daughter, Molly, who taught me just how "cool" Microsoft Excel can be.

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ABSTRACT

In this investigation formative assessments and a progress chart of formative assessments were implemented with the purpose of improving student engagement and learning. Formative assessments were taken the day after material was presented. Student progress was self-monitored by using the progress charts. Student scores on summative assessments improved by 3% and students were overwhelmingly positive about using the formative assessments and the progress charts to monitor their learning.

INTRODUCTION AND BACKGROUND

Project Background

Teaching and Classroom Environment

For the past seven years I have been teaching science at Belding Middle School in Belding, Michigan. We use a team approach at our school which means the students I see everyday are also taught by the same English Language Arts teacher, the same Social Studies teacher, and the same Mathematics teacher. The four core subject teachers form a team that regularly discusses the welfare of the students both academically and emotionally. We also discuss what works in our classrooms and what does not. Consequently, the time we spend talking as a team also serves as professional development. It is a very collaborative environment.

I teach four sessions of 7th grade science. My science classes contain an average of 24 students, with some classes as large as 28 students. The larger class size makes it difficult to interact with each student on a personal level. Because of the larger class size, I have difficulty knowing who is making sense of the science material and who is not. There are some students that are very adept at going unnoticed in a group setting. Even with strategies in place to acknowledge all students, such as pulling name sticks to promote random selection of students, some students get overlooked. I don't have a well-developed system for monitoring interaction between myself and each student. Consequently, I am often not aware of a student experiencing difficulty with my class until the summative assessment for the unit is taken and they have performed poorly. I

feel that I adequately cover the material and review often, so I am quite surprised when a student that I considered quite capable fails the summative assessment of a unit of study.

School Demographics

Belding Area Schools is located in Belding, Michigan. Belding is a rural community in mid-Michigan. The town has approximately 13,000 residents. We have one kindergarten through second grade building, one third through fifth grade building, one middle school and one high school. Belding Middle School has an enrollment of about 475 students this year. Approximately 93% are Caucasian, 6% are Hispanic and 1% African American. The socio-economic status of our students is determined by the number of free and reduced lunches at school. We have between 60 and 70% of our students taking free or reduced lunches. Belding is typical of the formerly industrial small towns in Michigan that are struggling during this period of economic hardship. That struggle is evident in our students' lives which affects their readiness to learn in the classroom.

Belding Middle School uses the team approach for scheduling students. We have two teams at 7th grade this year. I meet weekly with my other team members and meet twice weekly with the other science teacher at the 7th grade level. I am also the department chair for the science department at Belding Middle School and we meet monthly. At all levels of meetings we discuss how to engage students who struggle in school. As a general rule, the teachers I meet with are good at addressing various learning styles through a variety of activities. Our science department, in particular, has worked hard to provide a variety of hands-on activities to facilitate science learning. These activities include labs, projects, drawings, and science fair projects. However, my peer

teachers express some of the same frustration that I have with our lack of awareness of student achievement until several students have failed the assessment. We don't feel that we do an adequate job of monitoring student understanding of the material on a daily basis. This frustration has led me to investigate formative assessments as a method of monitoring student learning.

Focus Questions

I have been researching formative assessment use in the classroom through various authors over the past two years. I was first introduced to formative assessment through EDCI 504, Evaluation and Measurement, a required class for my Master's program at Montana State University. Since then I have been a member of a grading team formed at Belding Middle School where we studied the *7 Strategies of Assessment for Learning* by Jan Chappuis (2009). The next year some members of our team did a year-long study of *Classroom Assessment for Learning Doing it Right, Using it Well,* by Rick Stiggins, Judith Arter, Jan Chappuis, and Steve Chappuis (2006). Most recently, I've been asked to be on a formative assessment committee for our school. As a member of this committee I attended a seminar conducted by Dr. Jan Clemens and was introduced to Robert Marzano's book, *Formative Assessment and Standards-Based Grading* (2010). The main purpose of these committees and the focused book study was to make recommendations to our administration as to how to implement more rigorous methods of using formative assessment in the classrooms.

As a result of my study of formative assessments I have learned about many useful methods of formative assessment that can be used for a variety of purposes. I learned that it's easy to implement formative assessments into my classroom, but I also

wanted to know if they were an effective use of time. I mentally struggled with the idea of keeping track of student success using formative assessments. Therefore, I wanted to introduce a strategy for using formative assessments that included record keeping that was relatively unobtrusive to the functioning of my classroom. I also wanted to determine its effect upon the students and myself. By using this strategy I wanted to collect information about student learning through formative assessments in an organized manner that was useful to both the student and me. I also wanted to determine whether having students do the monitoring of their progress on formative assessments affected their performance on the summative assessment. The question I wanted to answer was: What is the impact upon middle school science students of implementing a self-monitored progress chart of formative assessments?

The sub-questions to be answered by this research are:

- What is the impact of using formative assessments and progress charts on student's attitude toward learning science?
- What is the impact of using formative assessments and progress charts on student grades?
- What is the impact of using formative assessments and progress charts on my perception of myself as a teacher?

CONCEPTUAL FRAMEWORK

Current research has influenced many of the teachers at our school to reconsider what they emphasize in the classroom and how it influences student attitude towards learning. At Belding Middle School we are making a gradual transition to grading

practices based solely upon summative assessments of the standards and benchmarks as defined by the Michigan Curriculum Framework (1996). All teachers evaluate their students and usually this evaluation is reported as grades. These grades should reflect what a student knows about the topic being taught in the classroom. O'Connor (2002) claims that using performance standards as reference points to determine grades supports learning and encourages student success by ensuring that grades depend on clear, public performance standards and the student's own achievement. Guskey (2001) reports that "Regardless of the format its [grading's] purpose is to provide high-quality information to interested persons in a form they can understand clearly and use effectively" (p. 2). Student grades are a reflection of what a student understands about the topic. If teaching of the topic has been adequate and the assessment of learning is centered on the topic, then the grade should adequately reflect what the student knows about the topic.

As flawed as traditional grading can be if not properly done (O'Connor, 2002) grading is probably not going away. It would require a huge paradigm shift for all interested parties to completely change a grading system that has been around for 120 years. It makes more sense as a classroom teacher to work within the system and make the grading process as meaningful as possible. O'Connor (2002) quotes Wiggins (1996) as saying, "grades or numbers, like all symbols, offer efficient ways of summarizing" (p. 21). He also says it's not worth fighting against the history of grading, but that it's more important to make grades meaningful and more supportive of learning. Working within the system of grading requires teachers to rethink the way they are teaching if all students aren't succeeding in the classroom. Interventions need to be in place that support students in ways that are non-threatening, self-motivating, and improves the learning process. An

effective teacher understands that some students need more time or more one-on-one teaching in order to learn the material. Therefore, an effective teacher provides interventions for struggling students in the classroom. The grade a student receives for the learning should also reflect a student's response to helpful interventions provided by the teacher or accessed independently by the student, during the learning process. When teachers do not provide adequate support for their students or students do not avail themselves of the support system, students often receive low grades.

Sometimes, a letter grade, not learning, is perceived by students as the reason for school. Teachers "give" good grades to those students they like and bad grades to those they don't like (O'Connor, 2002). O'Connor (2002) claims that overemphasis on grades has detrimental effects on student achievement, motivation, and self-concept. Assignment of grades can also damage interpersonal relationships between the student and the teacher. A good interpersonal relationship between the student and the teacher is necessary for effective teaching and learning to take place. Guskey (2009) quotes Selby and Murphy (1992) when he says, "To protect their self-images, many [students] regard the low grade as irrelevant and meaningless. Other students may blame themselves for the low grade, but feel helpless to make any improvement" (p. 14). Considering the detrimental effect of grading and low grades in particular, it is imperative that teachers provide a support system for students to improve learning and ultimately the students' grade. It is also imperative that teachers help students feel they are in control of their own learning and subsequently their grades. "Long-term retention [of learning] and motivation increase when students track, reflect on, and communicate about their learning"

(Chappuis, 2009, p. 13). A student's sense of control over their learning in the classroom provides motivation for learning and a more engaged student.

Teaching time is limited in the classroom, therefore everything teachers do needs to be supportive of learning. For those students that struggle to succeed in the classroom, systems need to be in place to help them. One of the support systems to consider for student learning is well thought out formative assessments. Formative assessments have been discussed since the late 1960's but weren't taken seriously until Black and Wiliam (1998) refined educator's understanding of formative assessments through an article entitled, "Inside the black box: Raising standards through classroom assessment." Popham (2008) explains that Black and Wiliam argued through this article "… that formative assessment, properly employed in the classroom, will help students learn what is being taught to a substantially better degree" (p. 2). In 2006, during a meeting of The Council of Chief State School Officers (CCSSO) in Austin, Texas, a definition of formative assessment was agreed upon as follows: "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" (p. 5). The key features of the FAST (Formative Assessment for Students and Teachers) SCASS (State Collaborative on Assessment and Student Standards) definition as presented by Popham are:

- "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" (p. 5).

In an article for Phi Delta Kappan, Stiggins states that formative assessments can be used for a multitude of purposes. Teachers and school leaders use formative assessments to form conclusions about program improvements and student achievement. Students, on the other hand, can use formative assessments to change their way of thinking about the learning they undertake in the classroom (2005). Formative assessments provide another forum for discussion of the material that may not have previously existed. Sometimes it may be the case that the student simply needed to see the material again in a different way for understanding to take place. Formative assessments can help a student improve their attitude toward learning when learning is broken down into smaller, more manageable pieces. Formative assessments, if done correctly and presented to the student in the right light, can provide a continuous stream of evidence of the student's progress in mastering the knowledge and skills required by the state standards. Formative assessments can be a very effective tool to support learners in the classroom.

Students can use formative assessments to improve their performance in the classroom if effective feedback is provided to the student. This feedback is a key component of the formative assessment process. Marzano (2010) quotes researcher Shute (2008) as she defines feedback as "information communicated to the learner that is intended to modify his or her thinking or behavior for the purpose of improving learning" (p. 3). As researchers studied feedback and its effectiveness they discovered that not all feedback however provided the desired results. In one study of feedback conducted by

Kluger and DeNisi (1996) they found that in 38% of the studies they examined that feedback had a negative impact on student achievement. This caused researchers to delve deeper into the types of feedback that are the most effective. Their goal was to discover the characteristics of feedback that produce the positive effects on student achievement that all teachers want to see in their students. They found feedback that did not inform students how to get better at the assigned task, or negative feedback, caused a decrease in student achievement. This type of feedback had an ES score of 0.14. ES stands for effect size. An ES score tells you how powerful a strategy is; the larger the ES score, the more the strategy increases student learning (Marzano, 2010). The type of feedback found to provide the most effective result on student learning is the type of feedback that describes what improvement looks like for a task, a process or self-regulation. Feedback regarding the self, such as praise for doing a good job, typically does not enhance learning and achievement (Marzano, 2010). Teachers often use praise as a form of feedback and researchers have proven that praise is a form of negative feedback and it doesn't work on most students. Chappius (2009) explains that praise can have a negative effect on learning because it directs students' attention away from the learning and onto what the teacher thinks of them. "In general, praise as a motivator is unpredictable and often counterproductive" (p. 63). Therefore, a more effective form of formative assessment is one that uses positive feedback methods that demonstrate to the student what improvement looks like. Research indicates that using formative assessments and positive feedback can help students improve learning and overall performance in the classroom.

Formative assessments can also be used to inform the teacher of how much learning is taking place among students. Teachers can use this instructional feedback to help them

determine how both the class and specific students are progressing (Marzano, 2010). Popham (2008) described formative assessment as “transformative assessment.” His definition described formative assessment as a planned process in which teachers or students use assessment-based evidence to adjust what they are currently doing. Teachers that are effectively using formative assessment to truly transform how they teach use the results of the formative assessment to adjust their instructional methods and lesson plans. They can either slow down their instruction and cause students to be exposed to the same material in multiple ways or move ahead or elaborate more deeply on the topic being addressed. Given the benefits of using formative assessments effectively to both students and teachers, they should be considered for use in every classroom.

In conclusion, Stiggens, Arter, Chappuis, and Chappuis (2006) label the prescribed use of formative assessment “Assessment FOR Learning”. Assessment for learning is defined as formative assessments that happen while learning is still underway. They are used to “… diagnose student needs, plan the next steps in instruction, provide students with feedback they can use to improve the quality of their work, and to help students feel in control of their journey to success” (p. 31). Using this definition can cause teachers and students to look at learning in the classroom as a more collaborative endeavor. Stiggens et al. stresses that students must understand the achievement expectations from the beginning of the learning process. They are given examples of strong achievement and poor achievement of the standards. Students are also taught how scaffolding takes place in the classroom by explaining the purpose of the instruction and how it is built upon what they’ve already learned. Students and teachers work together to continuously monitor their current level of learning in relation to the learning goal.

Stiggins et al. also explains that when done correctly students play a special role in communicating evidence of learning to one another, to their teacher, and to their families. They do this at the same time they are learning the material and not just at the end of the learning process through a summative assessment. Stiggens et al. cites claims made by Ehrenber, Brewer, Gamoran, and Willms (2001) that the effect of assessment for learning on student achievement is four to five times greater than the effect of reduced class size. The results also show that while all students show achievement gains, the largest gains are made by the lowest achievers in class.

> When consistently carried out as a matter of routine within and across classrooms, this set of practices has been linked to achievement gains of one-half to two standard deviations on high-stakes tests, and the largest gains made are by low achievers. (2005, p. 328)

If formative assessments become an integral part of the learning process in the classroom, the ability to monitor learning, by both the teacher and the students themselves, is enhanced. If effective feedback is included in the process, the overall effect is enhanced learning in the classroom.

While most authors agree that formative assessments are useful in the classroom, some authors are proposing different uses of the results of formative assessments. Some authors believe that scores should not be taken, but only feedback given to the students on their level of success towards reaching the learning goal. Marzano (2010) however, proposes scoring formative assessments and gathering those scores over time to determine a summative score for the learning target. He believes very strongly that “a summative score should not be derived from a single final assessment” (p.27). A

summative score for a learning target should be the most reasonable representation of a student's level of learning at a particular point in time. In light of this belief, a method of keeping track of student progress is needed. Marzano proposed using a student progress chart (Appendix A) to keep track of a student's progress. Using the scores from formative assessments and taking note of the improvements in those scores, the teacher can determine a summative score for the learning. Marzano points out that this summative score is not an average of the formative scores, but the formative scores are used to help the teacher determine how much learning has taken place over time. In this way planned formative assessment directly linked to the learning target can be used to help the teacher determine a summative grade for each student.

Changing learning behavior is the key to improvement in learning. Changing behavior cannot be accomplished if a student is not aware that they are doing poorly in the classroom. Using the progress chart of formative assessments will cause the student to keep track of their performance on formative assessments. The progress chart is a very tangible reminder of how a student is doing in class for both the student and the teacher. Whether the progress chart is used exactly as Marzano (2010) proposes or not, the feedback from such a chart is useful to both the student and the teacher. The information can be used to change the learning behavior of the student or the teaching behavior of the teacher or both, making formative assessments very effective.

METHODOLOGY

Project Design

My treatment for this project was used with four units of study in four 7th grade science classrooms. The total number of students was approximately 102 students. The treatment lasted from the beginning of December through February. The learning targets for the four units of study are listed in Table 1 below.

Table 1
Treatment Summative Assessment Names and Learning Targets

Name of Summative Assessment	Learning Target
Weather Patterns Quiz	I can describe how different weather occurs due to the constant motion of the atmosphere. I can describe weather conditions associated with frontal boundaries.
Water Cycle Quiz	I can explain how water cycles through the 4 spheres of the Earth.
Watershed Quiz	I can analyze the flow of water between the components of a watershed, including surface features and groundwater.
Wetlands and Groundwater Quiz	I can explain how groundwater and surface water are connected. I can recognize various wetlands and their importance.

My treatment consisted of using formative assessments in a consistent manner and having the students keep track of their own progress on the formative assessment by logging their progress from one formative assessment to the next on a student progress chart. The formative assessments, which I called practice quizzes, were created using Windows Power point and displayed on a white screen through a projector. Students also had a printed copy of the Power point page to record their answers (Appendix B).They were given approximately five minutes at the beginning of the class to answer five questions pertaining to the material presented the previous day. I chose material that was pertinent

to the questions that would be on the summative assessment. After each student had enough time to answer the questions, I pulled name sticks in order to call on students randomly. The student then answered the question, I displayed the correct answer on the overhead, and we then had class discussion about the question and answer. During this question and answer time students could ask questions about why the answer was correct or incorrect or other pertinent questions. I also reinforced concepts learned the previous day or elaborated on the content as needed. After we answered all five questions, students scored their paper with the number of correct answers and marked their progress chart (Appendix C) with the date of the formative assessment. Students used the score on the formative assessment to fill in a data point on the line graph. Students were encouraged to restudy questions they didn't know before the summative assessment was given. We continued this procedure until the summative assessment was taken and scored. There were approximately four or five formative assessments given before each summative assessment. Students then marked the score they earned on the summative assessment on the progress chart and the progress chart was handed in to me.

The non-treatment portion of the research began at the beginning of the 2010 – 2011 school year. It lasted through five summative assessments which addressed one to two learning targets per assessment. The learning targets for these summative assessments are listed in Table 2.

Table 2
Pre-treatment Summative Assessment Names and Learning Targets

Name of Summative Assessment	Learning Target
Waves Quiz	I can identify examples of waves, including sound waves, seismic waves, and waves on water. I can describe how waves are produced by vibrations in matter.
Atmosphere Quiz	I can describe the atmosphere as a mixture of gases. I can compare and contrast the composition of the atmosphere at different elevations.
Solar Energy Quiz	I can identify that nuclear reactions take place in the sun. I can explain how much of the sun's light energy is turned into heat energy on Earth.
Air & Ocean Currents Quiz	I can explain the connection between warming of the atmosphere by the sun and convection in the atmosphere and oceans.
Water Cycle in the Atmosphere Quiz	I can demonstrate the connection between the sun's energy entering Earth's atmosphere and the water cycle.

These five units took approximately twelve weeks, from the beginning of September through the end of November. The number of students I taught during this period of time also averaged around 102. My non-treatment methodology consisted of teaching science units using a variety of methods which included reading from the text and completing reading guides, lab activities, class discussion, kinesthetic activities when appropriate, vocabulary activities and drawing of pictures. My intention was to provide a variety of activities in order to address different learning styles during each unit. The common feature of my instructional program was that a summative assessment was given directly after one or two learning targets were taught. The summative assessments took place approximately once every two weeks. Before the summative assessment, students were given a review sheet to complete using the materials they had collected during the unit. The next day the review sheet was discussed and I gave all students the correct answers.

During this time students had the opportunity to ask questions if they didn't understand something. My intention was for the review sheet to be taken home and studied in depth that night. The very next day I began class by asking if there were any questions. When the students were done asking questions, I then asked a few to fill in with material they may have missed during their question and answer time. Then the quiz was given. It consisted of ten to twenty multiple choice, matching, or short answer questions. The quizzes were designed to be short and to question students only about the learning targets. The method of instruction that I have just described for the pre-treatment portion of my research is what I have consistently done for the past couple of years of my teaching career.

The portion of the treatment that was intentionally different from the non-treatment was the use of a formative assessment in a consistent format on a nearly daily basis. The formative assessments were called "practice quizzes" so the students were discouraged from looking up answers, but the quiz was just for practice and did not affect their grade in any way. My intention was to create a relaxed atmosphere surrounding the formative assessments with very little pressure on the students in case they didn't get all the answers correct. I encouraged each student to try them as they didn't count towards their grade and in trying them, they would be able to find out what they didn't understand before the summative assessment was given. The formative assessments were designed to cause the students to recall the previous day's learning. They were given at the beginning of class before any new teaching had begun. Sometimes it was a matching exercise for vocabulary words and sometimes it was determining to which category something belonged. I felt more comfortable designing my research around only one form of

formative assessment in order to collect data. Other techniques I use in the classroom reflect a truer definition of formative assessment, that of being a process, but for the purposes of this paper I will use the term “formative assessment” to mean the practice quizzes given in my classroom.

Study Participants

The participants in the study were the 102 7th grade science students that I teach every day. There are 55 girls and 47 boys distributed over four classes. Two of the classes I see in the morning hours and two of the classes I see in the afternoon. The afternoon classes come to science class after they have had lunch and two non-academic classes such as physical education or band. The afternoon classes are not different in composition from the morning classes, but their behavior is livelier and sometimes difficult to control. Of the 102 science students, 13 of them receive special services for learning disabilities.

Of the 102 students I teach, 64 of them returned permission slips in order to take surveys or to be interviewed (Appendix D). I had 38 girls and 26 boys able to take the surveys and be interviewed. I used all 102 students’ tests scores to compare pre-treatment to treatment in order to increase the reliability of the results. Over the course of the school year, which includes the time of pre-treatment and treatment data collection, there have been approximately nine students move out of my classroom due to moving out of the district, and approximately four students move into my classroom due to moving into the district. My team receives all the students that need special services, so if they move into the district needing services, they are assigned to our team. We have between 60 and 70% of our students taking free or reduced lunches district-wide so approximately 66 of

my 102 students live in poverty as defined by the free and reduced lunch program. Overall, the number of students remain about the same throughout the year and the ratio of boys to girls also remains about the same. The research methodology for this project received an exemption by Montana State University's Institutional Review Board and compliance for working with human subjects was maintained.

Data Collection Techniques

One of the first methods of collecting data I used was to survey the students. I surveyed students before the treatment asking questions about their feelings towards their ability to learn science and whether they knew how well they were doing in class. I also asked if they would use a tool to help them in the classroom if one were available to them. My intention was to group students according to the level of importance that school played in their life in order to determine the effectiveness of my treatment. My second survey was administered during the treatment and was designed to ask about student perception of the formative assessments. My third survey served as a post-treatment survey of the students to determine whether student attitude had changed and whether the treatment had an impact on their attitude. The last survey also served to determine the impact my teaching methods, more specifically the formative assessments, had on student attitudes. I followed these surveys with an interview of a random sample of students. Another method of data collection I used was to keep a journal of specific events and my feelings towards those events throughout the period of treatment. I noted any feelings of frustration and feelings of accomplishment that I experienced directly related to the formative assessments. Lastly, I compared the summative assessment scores pre-treatment and post treatment to see if there was improvement in their unit assessment

scores. The application of these methods attempted to adequately answer the question, "What is the impact upon middle school science students of implementing a self-monitored progress chart of formative assessments?" It was also an attempt at answering the sub-questions of:

- What is the impact of using formative assessments and progress charts on student's attitude toward learning science?
- What is the impact of using formative assessments and progress charts on student grades?
- What is the impact of using formative assessments and progress charts on my perception of myself as a teacher?

The variety of data sources described above was needed to effectively triangulate data and make valid conclusions (Table 3). By combining qualitative and quantitative data sources, data relevant for each specific focus question could be carefully analyzed and examined for meaningful patterns.

Table 3
Data Collection Matrix

Data Collection Techniques				
Literature Review	Surveys	Interview	Teacher Journal	Comparison of Summative Assessment Scores Pre-treatment to Treatment
Primary question: What is the impact upon middle school science students of implementing a self-monitored progress chart of formative assessments?				
X	X	X	X	X
Sub-question #1: What is the impact of using progress charts on student's attitude toward learning science?				
X	X	X	X	
Sub-question #2: What is the impact of using progress charts on student grades?				
X		X	X	X
Sub-question #3: What is the impact of using progress charts on my perception of myself as a teacher?				
	X	X	X	

Survey

I chose the survey as a method of data collection because I wanted to know about student attitude towards science learning in my classroom, student attitude towards their capacity to learn, and student attitude towards the treatment. The survey seemed like the most efficient method of gathering data for these multiple purposes. I was required by Belding Area Schools to obtain parental permission to survey or interview their students (Appendix D). I received 64 permission slips. I received 38 permission slips from female students and 26 permission slips from male students. The first survey (Appendix E) was given before the treatment and consisted of seven questions with response choices of strongly agree, agree, undecided, disagree, and strongly disagree. The first three questions attempted to evaluate the student's attitude toward their capacity to control their learning and to do well in school. The next two questions attempted to determine if a student was aware of their level of success during the learning process and whether the student felt responsible for their own learning while in science class. The last two questions requiring a response from strongly agree to strongly disagree were an attempt to determine the willingness of students to use a method of tracking their performance in science class and whether that self-knowledge would spur change in their study habits. I left the last question on the survey open ended by asking if there was anything else the student would like me to know.

The second survey (Appendix F) was given during the treatment and focused on the treatment of formative assessments. I asked six questions specifically about whether the formative assessments were helping the student learn science and whether keeping track of their score helped them to know how well they were learning science. One

question asked if the formative assessments prompted the student to restudy the material in order to score higher on the next summative assessment.

The third survey (Appendix G) was meant to re-survey the students using the same questions as Survey #1 however, due to the results of the first survey I changed the questions to survey the student's attitude towards continuing with formative assessments in the classroom along with charting of their progress on the formative assessments. I included two questions about how students felt about formative assessments administered at the beginning of class, again using the format of strongly agree to strongly disagree mentioned above. I also included three questions concerning their attitude towards my performance as a teacher helping them to learn science and how I conducted the activities in my classroom, specifically formative assessments. There was one question about how students felt about how well they were learning science so far this year. Lastly, there were two open ended questions: one asking for changes the student would like to see in my classroom and one asking if there was anything else they would like me to know. I wanted to check the validity of student answers on their surveys by focusing on questions related to their attitude towards science class and their impression of how effective formative assessments were for them. Students were given ample opportunity to disagree to my claims based on their answers to the survey questions. I also surveyed as many students as possible in order to increase the reliability of the data, given the restriction of having to obtain a permission slip from their parents or guardians.

Interview

For the interview portion of my data collection I chose an informal format. I chose eleven boys and nine girls to interview, for a total of 20 students. I selected five

from each of my four classes and interviewed them in a room adjoining my classroom while the other students were working on an assignment. The students were chosen according to their level of accomplishment in my class. I used a stratified random sampling technique in that I took care to select a balanced number of high, medium-level, and low achievers in my class as well as a relatively equal mix of boys and girls. I also chose a combination of students that regularly speak up in class and some students that seldom volunteer to speak in class. I did this to increase the reliability and validity of their answers. The interview only lasted about ten minutes and I recorded the conversation on a portable recorder for the sake of accuracy. I began the conversation by telling them how the interview would work and then I reminded them of the process of putting formative assessments on the projector while they answered the formative assessment questions on their own piece of paper. My question for them was, "Did the practice quizzes help you?" I then recorded their responses and transcribed them to paper for analysis (Appendix H).

Teacher Journal

Another method of data collection was to keep a teacher journal recording my thoughts about the day's events and specifically my thoughts about the formative assessments and student response to them. I used a form with blanks to fill in such as the date, a section for my impression of the day as far as students being engaged, whether there was more positive or negative feedback from the students, what successes and what challenges I encountered that day, what would I do differently next time, and how would I close the loop (Appendix I). The purpose of the journal entries was to record my

feelings towards the day's events in order to determine any change in my attitude towards the treatment.

Comparison of Pre-treatment and Treatment Summative Assessment Scores

The last portion of my data collection is a comparison of the summative assessment scores for each learning target pre-treatment and summative assessment scores for each learning target post treatment. Belding Area Schools Assistant Superintendent, Mike Burde used the Statistical Package for the Social Sciences (SPSS) program to analyze the summative assessment scores I obtained pre-treatment and post treatment in order to compare them. The SPSS program is a powerful statistical analysis program. Its primary use is for doing advanced statistical analysis of data for research and other projects. The most notable feature of the SPSS system is its ability to allow users to validate assumptions in an efficient manner. My study utilized SPSS capabilities in calculating bivariate statistics, specifically a two sample t-test. Using this program allowed me to perceive significant changes in the data that may have been difficult to discern without the program and increased the validity of my project. I used the test scores from all my students in order to have the largest sample size possible and increase the reliability of the outcome. I was not restricted from using all test scores because of a permission slip and the student names were omitted from the records for privacy reasons.

I also used Belding Area School's on-line grading program to look at the mean of summative assessment scores pre-treatment as compared to the class average. I then compared them to the mean of the summative assessment scores post treatment as compared to the class average. It is interesting to note that all four class averages declined from the pre-treatment to post-treatment time periods. When I considered the difficulty of

the units we were addressing, I decided that the mean summative assessment scores should be compared to the class average in each group in order to determine if there had been improvement in the individual student's mean summative assessment scores. I reported this as either a negative number or a positive number of percentage points away from the class average (Appendix J) in order to determine whether there had been improved learning for individual students.

Purposes of Data Collection Techniques

The data collected during this project was both quantitative and qualitative in nature. The Statistical Package for the Social Sciences (SPSS) program was used to make comparisons of summative assessment scores pre-treatment to treatment of the entire population in order to determine the effectiveness of the treatment. I also compared the summative assessment scores for individuals in order to help triangulate data. Surveys were used and the data was quantified according to the number of responses to each question, even though it was more of a qualitative survey of student attitude and performance in class.

The qualitative data was collected through interviews and the teacher's reflective journal entries. This data helped to validate the quantitative data. All questions proposed in this study were answered using more than one method of data collection in order to triangulate the data, increasing the reliability and validity of the project. Additionally, I sought the opinions of colleagues at Belding Middle School and Montana State University concerning my data collection methods and my conclusions. The data presented is the result of these efforts.

DATA AND ANALYSIS

This study yielded an abundance of qualitative and quantitative data that was analyzed to determine whether the treatment of formative assessments and the progress chart of formative assessments were worth the time it took to implement and to answer the four focus questions. The surveys, interviews, journal entries, and comparison of summative assessment scores all provided a different type of evidence that, when analyzed together, highlighted interesting patterns and led to several different meaningful conclusions. One of my original concerns surrounding the project was whether students were intrinsically motivated to work at learning in order to earn higher grades. Without this drive to learn in school, I predicted that my treatment would be meaningless to them. Through the first survey I found that, overwhelmingly, students desired to do well in school and felt that it was their responsibility to do so. This did not differ significantly from girls to boys (Figure 1).

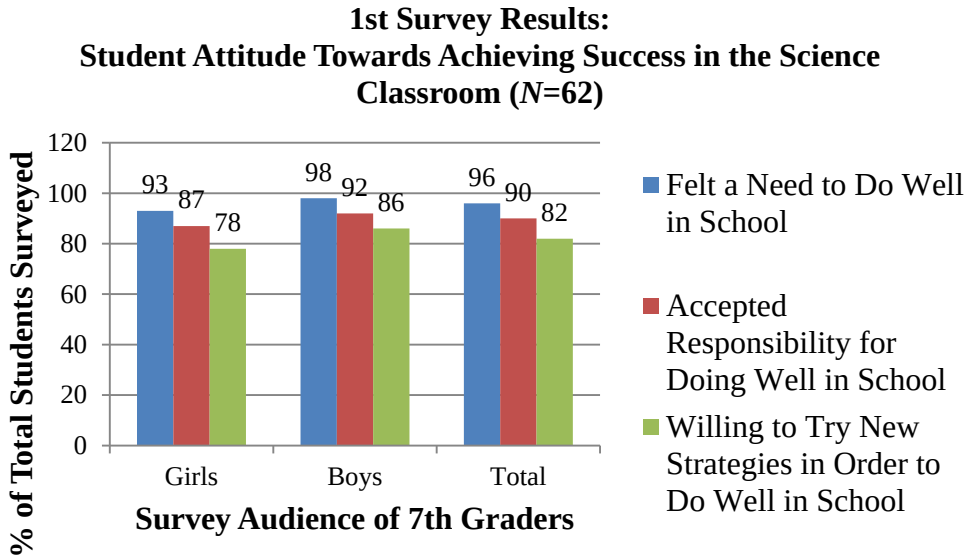

Figure 1. Student Attitude toward Achieving Success in Science Class, (*N*=62).

93% of girls and 98% of boys surveyed in my science classes felt a need to do well in school. 87% of girls and 92% of boys also accepted the responsibility for doing well in school. In preparation for the introduction of formative assessments and the student progress chart, I asked students about trying new strategies in class. 82% of the students surveyed were also willing to try a new strategy in order to help them learn in the science classroom. This set the stage for introduction of the formative assessments and keeping track of their progress on the student progress chart.

I wanted to gauge whether formative assessments and the progress charts were having an impact on my students' attitude towards learning science so about mid-way through the eleven weeks of treatment I again surveyed the students to get their opinion as to whether both instruments were helping them learn science content. 96% of the 63 students surveyed felt that the formative assessments were helpful to them (Figure 2).

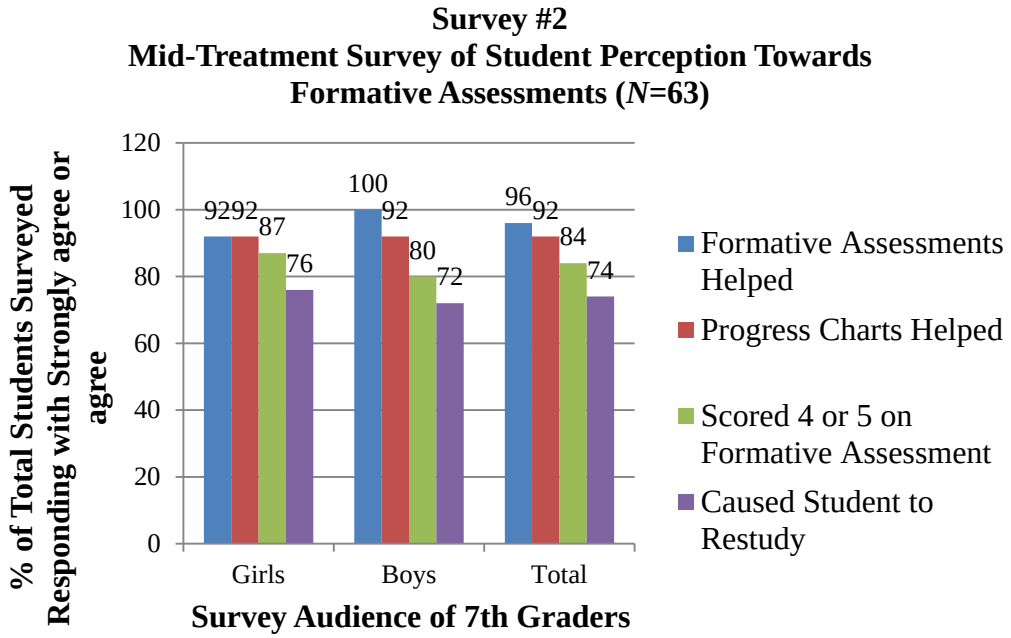

Figure 2. Student Perception of Formative Assessments and Progress Charts Mid-Treatment, (*N*=63).

During the interviews (Appendix H) conducted post-treatment, students claimed that the formative assessment was helpful because “I had to use my memory to answer the questions.” Other students commented that the formative assessments helped them study and to review the material before it became a summative assessment score that counted towards a grade in the class. One student said, “It helped me understand it more than I thought it would.” Mid-survey results indicated an overwhelming acceptance of the formative assessments. Pre-treatment survey results indicated only 82% would try a new strategy, yet 96% of the students mid-treatment felt the formative assessments were helping them. Students became more accepting of the formative assessments as a useful tool as the treatment progressed.

Student participation in the process increased during the formative assessments. In past years I needed to walk around the room and encourage participation in any warm up activity I presented to the students. I didn’t find this to be true during this project. As the teacher, I felt as if the students were more engaged in the formative assessments during this project than they have been in the past with warm up activities and some of my journal entries support this. One entry noted that a student “…said her score went from 3 to 5.” (Jan. 28, 2011) The progress chart helped students and I to be aware at any given point in time how the student was progressing in their learning of the subject matter. Students knew whether they understood the material and could recall it the next day or not based on their formative assessment scores as recorded on the progress chart. These recorded scores indicated to me that the students actively participated in the process. In the journal I kept for this project (Appendix I), I made comments about students being engaged with the formative assessment and some students even yelling

"yeah" when they found they had the correct answer. Of the 17 comments directly related to formative assessments in my journal, 8 of them refer to student engagement in the process and the outcomes of the activity. I saw an increased level of engagement from all the students that I hadn't seen at the beginning of the school year. In general, the students that were resistant to doing school work were just as receptive to the formative assessments as the students that were more compliant in school.

I also tried to determine student perception of the progress charts of formative assessments by asking on Survey #2 (Appendix F) whether the progress chart helped the students in class. Even though 96% of the students surveyed agreed or strongly agreed that the progress charts helped them, the interview answers did not unanimously support that sentiment. During the interview, the students were asked whether graphing their grades was beneficial. About 50% of the respondents claimed it didn't make a difference and 50% felt it did. One student commented, "It didn't make a difference." While another claimed, "It kind of did." One student did say, "I like putting the numbers on the chart so that I could see if I did better or worse [from time to time]."

During the post treatment survey I asked students to reflect on their use of formative assessments and the progress chart. I specifically asked them whether the treatment helped the students perform better on the summative assessment. Of the 45 students surveyed, 73% agreed or strongly agreed that the formative assessments helped them learn science (Figure 3).

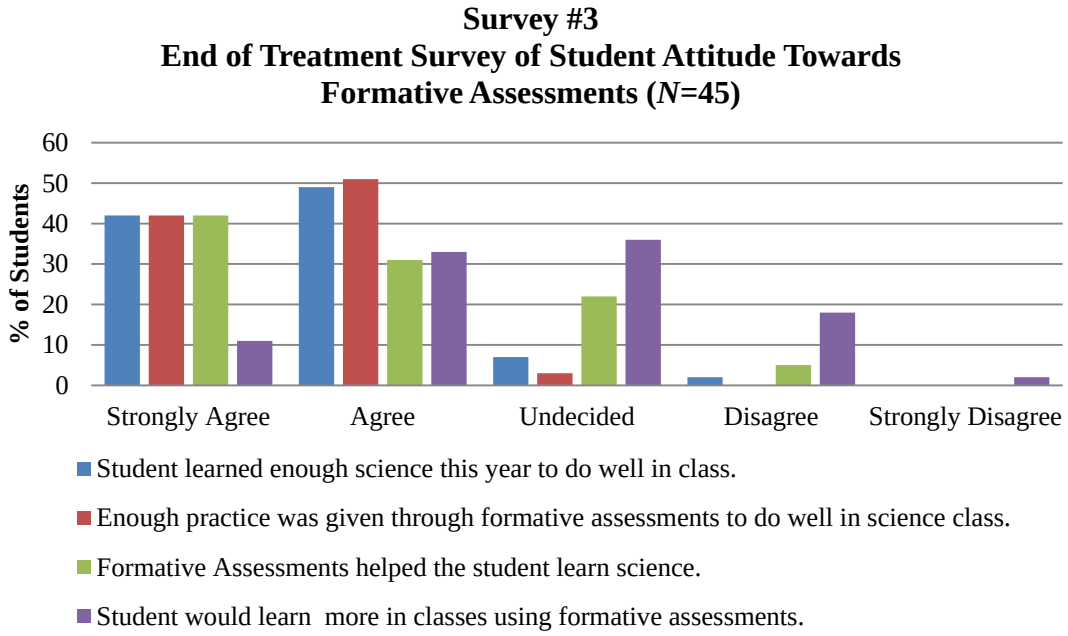

Figure 3. Student Attitude toward Formative Assessment at End of Treatment, *(N=45).*

Some of the comments from the interviews were very specific. One student commented, "[They] helped me. I remembered what I did wrong in order to choose the correct answer on the [summative] test." Another student's comment was, "I got a better score on the test because of the practice quizzes." This student in particular was a concern to me because of very low scores in my class and a general apathy towards school. He has since been referred to our child study team for evaluation and qualifies for special services. The fact that he felt the formative assessments helped him earn higher scores on the summative assessments was encouraging. The comments students made about improved grades on the summative assessments was supported when the pre-treatment summative assessment scores were compared to the post treatment summative assessment scores using the Statistical Package for the Social Sciences (SPSS) program. The post treatment mean assessment score significantly differed from the pre-treatment mean assessment score. The average assessment scores pre-treatment were 79.83% and post-treatment they

were 82.88%, for an increase of approximately 3%. In fact the data suggests that the post treatment mean score is statistically significantly higher with a 95% confidence (Table 4).

Table 4
Mean Summative Assessment Scores Pre-treatment (N=500) and Post-treatment, (N=403)

Group Statistics					
	Treatment Group	*N*	Mean % of Summative Test Score	Standard Deviation	Standard Error Mean
Test Statistic	Pre-Treatment	500	79.83	19.13	.86
	Post-Treatment	403	82.88	17.13	.85

The comparison of the mean test scores pre-treatment to post-treatment indicates improvement in the student's comprehension of the science material which can be attributed to the consistent use of formative assessments.

When the mean of the summative assessment scores pre-treatment and post-treatment were compared to the class average, I could determine if there had been significant improvement in the individual summative assessment scores (Table 5) based on how many percentage points they were above or below the class average. There was improvement in summative assessment scores for 50% of the total population of students. One student in the first class of the day had a mean summative assessment score of 0.76% below the class average. Post-treatment, this student's mean summative assessment score was 6.73% above the class average. Another student in the second hour of the day improved their assessment scores from 1.51% below the class average pre-treatment to 7.85% above the class average post-treatment. 29 of the 53 students that showed improvement in their mean summative assessment scores were below the class

average pre-treatment. This data supports the assertion by researchers (Stiggens, 2001) that formative assessments help the low achievers make the largest gains.

Table 5
Individual Mean Summative Assessment Scores Pre-treatment and Post-treatment, (N=97)

	Number of Student Mean Summative Assessment Scores Total	# of Mean Summative Assessment Scores Improving Post-Treatment	% of Class Showing Improvement in Mean Summative Assessment Scores Post-Treatment
1st Hour Class	*n* = 27	15	56%
2nd Hour Class	*n* = 22	11	50%
3rd Hour Class	*n* = 24	12	50%
4th Hour Class	*n* = 24	15	63%
All Classes	*N* = 97	53	55%

The evidence that the formative assessments were having a positive effect on my students was also reflected in my journal entries. One early journal entry was “heard positive comments about what they [students] got right [on the formative assessment]. [They] seemed excited when they were right.” (January 1, 2011) Out of the seventeen journal entries specifically mentioning the formative assessments used that day in class, fourteen of the entries were positive. Seeing students engaged in the activity I provided as a formative assessment encouraged me to continue creating opportunities for students to feel successful. One journal entry mentioned that the formative assessment was a little harder that day because I hadn’t provided a word list from which to choose answers. All of the students struggled a little with this formative assessment. My journal entry indicated that I had discovered which students had really listened to me the day before.

(Feb. 2, 2011) One reflection I had concerning this day was to consider whether only showing the formative assessment once had as much of a positive effect on students as showing the same formative assessment multiple times, especially if that formative assessment was judged difficult by the students. Therefore, the next day I used the same formative assessment. My journal entries indicated the students felt it was easier to complete the second day (Feb. 10, 2011). Because of repeating this formative assessment, one student labeled as emotionally impaired volunteered a correct answer that day. Until this day, this student had refused to participate in class. Another female student who chose to avoid interaction with me and only had negative things to say about science class came to me to ask for clarification on one of the questions on the formative assessment (Feb. 10, 2011). These two incidences made it clear to me that providing formative assessments as a learning tool helped students feel safe while learning and provided an opportunity for them to feel successful. They also provided opportunities for me to discuss curriculum with individual students that may not have approached me before. Increased student engagement in the formative assessment process was also evident from the number of students keeping track of their scores and turning in the progress chart after taking the summative assessment (Table 6).

Table 6
Students Returning Formative Assessment Progress Charts

Class	Total Number of Students	Average Number of Students Returning Progress Chart	% of Students Actively using Progress Chart
Core A	27	20	74%
Core B	26	17	65%
Core C	24	19	79%
Core D	25	20	80%

With all the data previously mentioned and the fact that 93% of students surveyed felt enough practice was given through formative assessments in order to do well in science class (Figure 3), I feel that using formative assessments and the progress charts of formative assessments is worth the time spent on them.

INTERPRETATION AND CONCLUSION

This investigation provides evidence that using formative assessments and the progress chart of formative assessments can contribute to more learning in the science classroom. My initial question was about the impact of formative assessments and the progress chart of formative assessments on the student. One sub-question was whether this treatment would affect students' attitude towards science class. Another sub-question was whether this treatment would affect students' summative assessment scores and ultimately their science grade. I also wanted to determine the effect of this treatment on my perception of myself as a teacher.

The impact upon the students was an increased engagement in the process of learning (Table 6) and increased summative test scores (Table 4). Increased engagement

in the formative assessment activities in my science class was also evident from the anecdotal statements in my journal, such as, “[I] walked around [room} and checked on [formative assessment] activity [and the] majority [of students] were finished and waiting.” (Feb. 9, 2011) I feel that student attitude towards science class improved because they understood what was expected of them and were given multiple opportunities to check their learning through the formative assessments. Improvement of student attitude towards science class was further supported by a survey of students concerning the use of the progress charts of formative assessments (Appendix F). An average of 92% of the students surveyed agreed or strongly agreed to the statement: “Keeping my practice quiz [formative assessments] scores recorded on a graph has helped me know how well I am learning science.” Another question on the same survey (Appendix F) asked students if they scored low on a practice quiz, would they restudy the material until they had learned it. 74% of those students surveyed agreed or strongly agreed that they would restudy the material. Overall, 73% of the students surveyed felt the formative assessments helped them learn science and 44% of those students would like to see formative assessments used in other classes. These results along with my first survey results (Appendix E) indicating a majority of students (96%) want to be successful in school, 90% of the students will accept the personal responsibility of doing well in school, and 82% of the students would try something new in order to achieve success in school indicated to me that very often students have the will and drive to be successful but they often don’t know how to achieve it. Formative assessments and the student progress chart of formative assessments are tools to help students stay engaged in the learning process in the science classroom.

During the interviews some negative comments did occur. One such negative comment was, “I don’t think they [formative assessments] helped that much because some people cheated by not doing the quiz, just writing down the correct answer and then claiming they got all 5 points.” I recognized this comment as a student more concerned with how their fellow students were using the strategy and not an interpretation of their own behavior. After we discussed the abuse of trust and how much the students I interviewed were bothered by other students cheating during the formative assessment, another statement was made that helped students focus on the purpose of the formative assessments: “… you stand at the front of the room and teach us. That helps us too”. The students all agreed that my discussion of the formative assessment while going over the answers really helped them to understand the material. I think this review portion of the formative assessments was the key to improved learning among the students. When students had specific questions about the material they were given immediate feedback through the class discussion. The review portion of the formative assessment reinforced which material was important to learn. Students were interested in what the correct answer was on the formative assessment and because of this interest they listened as I explained which answer was correct and why. This often caused other students to ask questions which allowed a forum for elaboration of the science material. I believe the formative assessments provided students a purpose for listening to my explanation. Marzano (2010) explains this as an approach to teaching where “…assessments used for instructional feedback are scaffolds that gradually increase the knowledge level of the class as a whole” (p. 32). The overwhelmingly positive response to formative assessment

use from my students has convinced me to incorporate them into my classroom methodology almost daily.

Scoring of the formative assessments and keeping track of this score on the progress chart was well received by students. 92% of the students surveyed felt that progress charts helped them in science class (Appendix F). Keeping progress charts of formative assessments provided a venue for discussion with each student about their progress in learning the material. Even though my adaptation of the progress chart (Appendix C) was different from Marzano's (Appendix A), the progress chart could still be used to consult with each student during review time before a summative assessment was given. During this one-on-one time the student was provided time to ask a question in private. The student and I were able to determine which material needed further study by the student before the summative assessment. This process provided individualized attention to each student and allowed me to differentiate the material for each student. I was able to use both the formative assessment and the progress chart of formative assessment as teachable moments. Marzano (2010) explains that one of the defining features of the process of formative assessment is that it provides information to students and teachers regarding adaptations they might make to improve performances. Students were able to identify specific content they must improve on and things they might do to improve. This placed the control of learning back on the students and I feel that over time the process could empower students to become more active learners. Changing learning behavior is the key to improvement in learning. Using formative assessments and progress charts of formative assessments provided a focal point for both the student and I to effect change in learning behavior.

Another question I wanted answered by this research was whether incorporating the formative assessments and progress chart in my daily routines had an effect on summative grades. As a result of using formative assessments and the progress chart, the average of summative test scores for the entire population of students increased by 3% as calculated by the Statistical Package for the Social Sciences Program (SPSS) (Table 3). I used the entire population of my students to determine the change in summative assessment scores to increase the reliability of the calculations. By analyzing individual summative assessment scores I found that the increase in assessment scores was predominantly among the lower achievers in class. Interviews with students also support the claim of improved summative assessment scores. Approximately 50% of the students in each class improved their test scores as compared to the class average. Those that were below the class average pre-treatment, narrowed that gap post-treatment. Those students that scored above the class average pre-treatment, increased their score even more post-treatment (Appendix J). My initial use of timely formative assessments and the record keeping process of using the progress chart of formative assessments increased summative test scores among a substantial portion of my students.

My final sub-question addressed whether this action research would affect my perception of myself as a teacher. I feel I'm a better teacher because of what I have learned about formative assessments and engaging the students in the process to improve learning. This research caused me to think about what the students needed to know in order to demonstrate mastery of the learning targets. I adapted the pedagogy of formative assessment to meet my level of comfort using them. I developed the formative assessments using Power point and these documents can be used year after year

(Appendix B). Having a formative assessment document allowed me to modify it if it didn't address the learning target as well as it could. The formative assessments could also be evaluated by comparing them to the summative assessments to be sure they were addressing the important details of the learning targets. The progress chart provided a method of record keeping that I could easily refer to and didn't have to recall information from memory (Appendix C). Also the students were in control of that record keeping which placed the responsibility on them. My teacher journal indicated 14 out of 17 times that the students were receiving the formative assessments in a positive way. Finally, the increase in summative test scores (Table 4) encourages me to use formative assessments daily.

VALUE

The experience of conducting this research has led me to clarify my thinking about formative assessment and its use in my classroom. Because of this experience I feel more confident in promoting the use of formative assessments and the progress chart of formative assessments to other teachers. Formative assessments can not only be used by the teacher to assess the effectiveness of their teaching methods, but can also be used by the students to self-monitor their progress. In both instances, decisions can be made about what should be done next to promote learning. I have come to the conclusion that formative assessments should be used daily as much as possible. This project has also inspired me to look more closely at the different forms of formative assessments and their uses in the classroom. Our district is on the verge of leaping into assessments-only grading practices and formative assessment use will be vital to the success of that

practice. I will use my experience with this research project to support other teachers in their process of learning about formative assessments and I will volunteer to present the findings of this research during professional development meetings of our staff.

Another effect of this project is that I have more confidence in speaking out in support of formative assessment use in the classroom. I support formative assessment use in the classroom, if for no other reason, than the fact that it gives students more control over their learning. When students have more control, they are more engaged in the process. Middle school is also a transition period from being the young child in elementary school to the young adult in high school. New ways of thinking and doing are needed by students to make this transition. Many of these strategies can be learned in middle school. As a middle school teacher, I feel I should be helping my students learn these strategies. Learning to monitor their own progress in learning science is a vital skill to have in order to be a successful student. Formative assessment use and progress chart use will help my students learn to monitor their progress. I feel this is a very tangible way to help students become better learners.

Through this project I've realized the many benefits of using formative assessments and progress charts of formative assessments. Those benefits include more clear and concise learning targets, more frequent and proficient use of technology in my classroom, a forum for discussing the topics in an interesting and non-confrontational way, and most importantly a method of individualizing the instruction I deliver based on student need. Because of the progress charts I can pinpoint where a student is having difficulty and provide individualized or small group instruction that benefits specific students. I can differentiate my curriculum in a meaningful way that provides successful

results for my students. Formative assessments can be used in so many ways to benefit the students and the teacher that they should be considered an invaluable part of the day's schedule.

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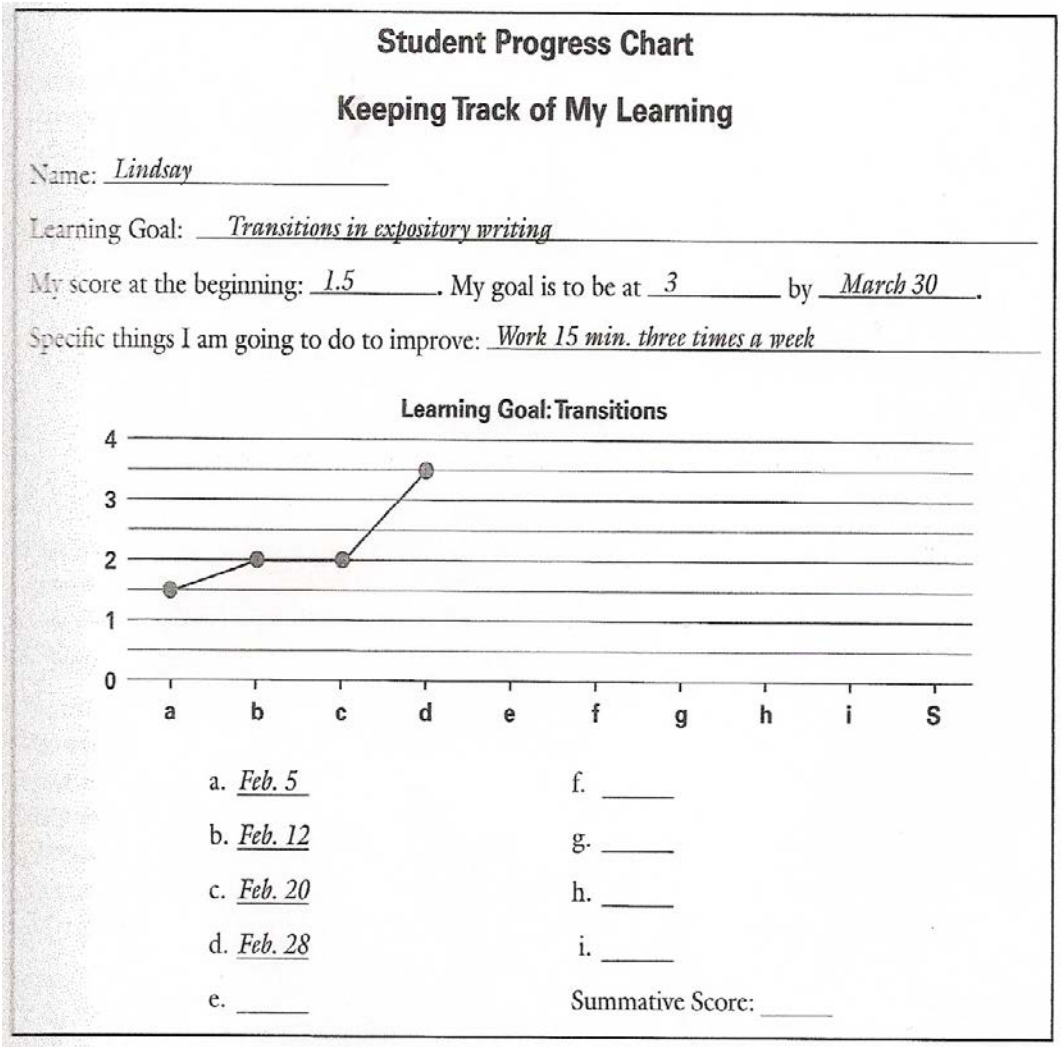
APPENDICES

APPENDIX A

MARZANO'S STUDENT PROGRESS CHART



Student Progress Chart

Keeping Track of My Learning

Name: *Lindsay*

Learning Goal: *Transitions in expository writing*

My score at the beginning: *1.5*. My goal is to be at *3* by *March 30*.

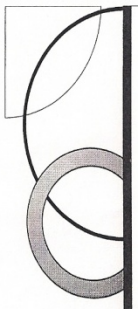
Specific things I am going to do to improve: *Work 15 min. three times a week*

a. *Feb. 5*
b. *Feb. 12*
c. *Feb. 20*
d. *Feb. 28*
e. _____
f. _____
g. _____
h. _____
i. _____
Summative Score: _____

Figure 2.1 Line graph depicting formative scores.

APPENDIX B

SAMPLE STUDENT PAGE FROM FORMATIVE ASSESSMENT



Characteristics of Wetlands

Label each statement as true or false. Make it true if you believe it is false by changing a word or two.

_____ 1. Wetland wildlife is very different from lakes and ponds.

_____ 2. Wetlands have sheltered waters for migrating birds.

_____ 3. Wetlands supply a poor supply of nutrients to organisms.

_____ 4. Wetlands act like sponges and absorb a lot of water.

_____ 5. Wetlands are considered a natural filter because they filter out pollutants and silt (sand).

APPENDIX C

STUDENT PROGRESS CHART OF FORMATIVE ASSESSMENTS

Student Progress Chart

Keeping Track of My Learning

Name _____ Core _____

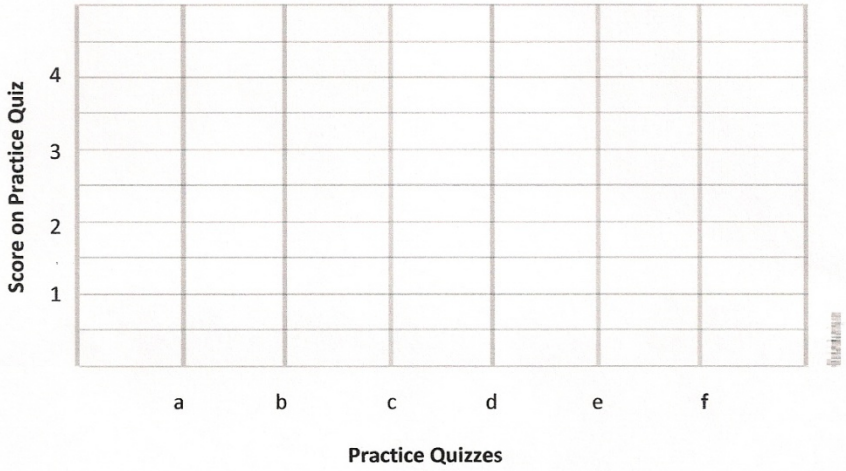
Learning Goal: _____

My score at the beginning: _____. My goal is to be at _____ by _____.

Specific things I am going to do to improve: _____

_____

Progress on Learning Goal



Practice Quiz Dates

a. _____
b. _____
c. _____
d. _____
e. _____
f. _____

Final Quiz Score _____

Adapted from *Formative Assessment and Standards Based Grading* by Robert J. Marzano

APPENDIX D

PERMISSION SLIP TO TAKE RESEARCH SURVEYS

Belding Middle School
Emily McKenna
Science Teacher

10-15-10

Dear Parents,

Your child is invited to participate in a research project that I am conducting this school year as partial fulfillment of my Master's degree in the teaching of science.

The purpose of the study is to determine the impact of students keeping track of their own success in science class through the use of a progress chart of practice quizzes. I will be looking at the impact on the student's attitude towards learning science, the impact on their grades in science and the impact on my attitude towards the process.

Your permission for your child to participate in this research means that your child will be given approximately four or five surveys throughout the school year where they indicate whether they agree or disagree with statements about science class and their learning. In addition, based on these surveys, I will select students to interview with questions more specifically aimed at difficulty they experience in science class.

Your child is free at anytime to withdraw from the research and their results will not be used in the final paper. If your student refuses or quits the study, there will be no negative effects on their time or work at school. At no time will your student's name be used in the written reports.

The only risks anticipated for your student is the discomfort of taking a pencil and paper survey. The benefits of the study are in providing a method of tracking learning in the science classroom that will benefit your student's ability to assess how they are doing in a class. All students will be tracking their progress on the progress chart whether they chose to participate in the research or not. This is an instructional strategy that will be used in my classroom.

You may withdraw your child from this study at any time without any negative effect on services to your child. If you have any questions or concerns about this study, you may contact Mrs. McKenna at mckennae@bas-k12.org (794-4485).

Your signature below indicates that you, as parent or guardian, can and do give your permission for _____ *(child's name)* to be surveyed about their attitude towards science class and possibly interviewed about their difficulties with science class.

Parent Signature: _____ Date: _____

Student Signature: _____ Date: _____

Mrs. McKenna's Initials: _____ Date: _____

APPENDIX E

1ST SURVEY OF STUDENT ATTITUDE

1ST Survey – Action Research for Mrs. McKenna

Participation is voluntary and participation or non-participation will not affect student's grade or class standing.

Please circle your response to the following statements.

Student Name: Core:

1. **It is important to me to do well in school.**

   strongly agree agree undecided disagree strongly disagree

2. **I am capable of learning enough science to do well in science class.**

   strongly agree agree undecided disagree strongly disagree

3. **I feel like I have control over how well I do in science class.**

   strongly agree agree undecided disagree strongly disagree

   Please explain your response to #2:

4. **I always know how well I am doing in science class.**

   strongly agree agree undecided disagree strongly disagree

5. **I feel it's my responsibility to know how well I'm doing in science class.**

   strongly agree agree undecided disagree strongly disagree

   Please explain your response to #4:

6. **I would use a method of tracking how well I'm doing in class if provided with one.**

   strongly agree agree undecided disagree strongly disagree

7. **If I found out I wasn't doing well in science class I would choose different strategies to help myself learn the science material.**

   strongly agree agree undecided disagree strongly disagree

   Please explain your response to #7:

8. **Is there anything else you would like Mrs. McKenna to know about your learning in science class?**

APPENDIX F

2ND SURVEY OF STUDENT ATTITUDE

2nd Student Survey

1. The practice quizzes help me learn science.

   Strongly agree agree disagree strongly disagree

2. Keeping my practice quiz scores recorded on a graph has helped me know how well I am learning science.

   Strongly agree agree disagree strongly disagree

3. I usually score 4 or 5 on the practice quizzes.

   Strongly agree agree disagree strongly disagree

4. I usually score less than 4 on practice quizzes.

   Strongly agree agree disagree strongly disagree

5. If I score low on a practice quiz, I restudy the material until I learn it.

   Strongly agree agree disagree strongly disagree

6. Mrs. McKenna should repeat the same practice quiz more than once to help me learn.

   Strongly agree agree disagree strongly disagree

7. Is there anything else you would like Mrs. McKenna to know?

APPENDIX G

3RD SURVEY OF STUDENT ATTITUDE

3rd Survey – Action Research

Please circle your response to the following statements.

1. **I have learned enough science this year to do well in class.**

Strongly agree agree undecided disagree strongly disagree

2. **Mrs. McKenna gives me enough practice with science concepts that I feel I have control over how well I do in science class.**

Strongly agree agree undecided disagree strongly disagree

3. **Short practice quizzes given over the projector helped me learn the science material.**

Strongly agree agree undecided disagree strongly disagree

4. **I feel I would learn more in a classroom that used practice quizzes at the beginning of each hour.**

Strongly agree agree undecided disagree strongly disagree

5. **Mrs. McKenna has helped me learn science this year by the way she conducts the classroom.**

Strongly agree agree undecided disagree strongly disagree

6. **There are things I would like Mrs. McKenna to do differently in the classroom.**

Strongly agree agree undecided disagree strongly disagree

7. **Please write down what you would like to see changed in Mrs. McKenna's classroom.**

8. **Please write down anything else you would like Mrs. McKenna to know at this time.**

APPENDIX H

INTERVIEW TRANSCRIPTS

INTERVIEW TRANSCRIPTS

Teacher: The purpose of this interview is to ask you about how I operate my classroom and very specifically, about the practice quizzes you have been taking at the beginning of the class.

NB: Yes the practice quizzes helped.

The practice quizzes helped because at first I wasn't doing well and then when you started putting the practice quizzes on the projector, I started doing better. We had to use our memory and I actually had to remember stuff from the day before and write it down. I liked the practice quizzes.

AW: It helps people because it actually shows us how we are doing. If you don't memorize things, you don't do well on the tests.

ZM: It's easier to remember stuff when you have a review every morning.

UI: It helps me study. It helps me study too.

NB: Most of my mistakes were simple mistakes on the practice quizzes.

It helped because some of the answers that were on the practice quizzes were on the test.

HB: We got to practice.

ZM: It gave me more time to practice.

CS: I got a better score on the test because of the practice quizzes.

I say a little bit.

EV: It helped me because I thought my answer was wrong, it was wrong, but it helped me remember the correct answer for the test.

LT: It helped me study the definitions.

SC: It helped me understand it when we went over it more after the practice quiz.

A: It helped me understand science better than I thought it would.

BH: Do you think we should save the practice quizzes in order to study from them for the test?

EV: I like graphing my results because I liked seeing whether I got better or worse.

LT: Doing the same FA over and over again helps us form a visual picture in our head.

UI: I feel that they helped us a lot because we got to study and review to do better on the tests.

KM: I think they helped us because if we didn't know it, we got the right answers and that helped us learn it.

NS: I don't think they helped that much because some people would wait and right down the right answer to get the 5 points.

CE: That's what I feel too.

SM: I feel the same as _____ and _____.

KH: I think you standing up in front of the classroom and teaching us helps. Some teachers just give you an assignment and then go have you do it.

CE: If I just had to do the practice quizzes and didn't go over them, I wouldn't learn all the material.

NS: It bothers me when other students cheat.

APPENDIX I

SAMPLE OF TEACHER JOURNAL

Emily McKenna's Journal

Date: 1-27-11

Impressions of the day as far as students being engaged and aware of what they know and what they don't know (list names or initials and class):

Complete Reading Guide on Surface Water
Complete Review Sheet for Water Cycle Quiz on Monday

More positive or more negative feedback from students? Give examples:

F.A - heard positive comments about what they got right
Seemed excited when they were right.

What successes did you encounter, please be specific and include examples.

Well-written (precise enough) F.A.

What challenges did you face, please be specific giving specific examples, plus list your feelings and thoughts.

Keeping the FA simple enough (-)

What would you do differently next time?

How will you close the loop – short term and long term? (*)

Long term - consistantly give F. Assessments a beginning of class.

Date: 1-28-11 Go over Surface Water WS. Labeling of Watershed Diagram

Impressions of the day as far as students being engaged and aware of what they know and what they don't know (list names or initials and class):

Not overly engaged. Liked labeling the diagram.

More positive or more negative feedback from students? Give examples:

More Positive / F.A - Kids felt was easy
M.J (D) - said her score went from 3 to 5.

What successes did you encounter, please be specific and include examples.

Students insist they know this material.
They haven't heard "Watershed."

What challenges did you face, please be specific giving specific examples, plus list your feelings and thoughts.

It was difficult to keep students engaged.

What would you do differently next time?

Not Sure

How will you close the loop – short term and long term?

APPENDIX J

INDIVIDUAL MEAN SUMMATIVE ASSESSMENT SCORES

PRE-TREATMENT AND POST-TREATMENT

INDIVIDUAL MEAN SUMMATIVE ASSESSMENT SCORES PRE-TREAMENT & POST-TREATMENT IN COMPARISON TO THE CLASS AVERAGE							
Student ID	Average of Summative Test Scores Pre-Treatment	Class Average of Summative Test Scores Pre-Treatment	Difference from Average	Average of Summative Test Scores Post-Treatment	Class Average of Summative Test Scores Pre-Treatment	Difference From Average	Showed an increase in their differences from average
ama	88.41	87.08	+1.33	90.16	81.79	+8.37	yes
acb	96.84		+9.76	85.25		+3.46	
Anb	93.68		+6.60	79.51		-2.28	
Asb	98.95		+11.87	95.90		+14.11	Yes
Abb	87.37		+0.29	88.52		+6.73	Yes
Adf	73.16		-13.92	68.03		-13.76	Yes – slight
Amf	95.79		+8.71	88.11		+6.32	
Aag	93.68		+6.60	77.85		-3.94	
Ang	76.84		-10.24	79.10		-2.69	Yes
Aag	86.84		-0.24	83.61		+1.82	Yes
Ath	87.37		+0.29	82.79		+1.00	Yes
Alh	98.95		+11.87	97.54		+15.75	Yes
Abh	96.84		+9.76	81.15		-0.64	
Abh	73.68		-13.04	70.08		-11.71	Yes
Aej	87.08		0	93.44		+11.65	
Aal	82.11		-4.97	59.84		-21.95	
Azm	88.42		+1.34	90.16		+8.37	Yes
Abm	85.26		-1.82	81.15		-0.64	Yes
Asm	68.42		-18.66	62.30		-19.49	
Asn	94.74		+7.66	88.52		+6.73	
Atp	62.11		-24.97	71.72		-10.07	Yes
Amp	85.26		-1.82	72.13		-9.66	
Abr	85.26		-1.82	66.39		-15.40	
Acs	96.32		+9.24	90.16		+8.37	
Aas	98.95		+11.92	95.90		+14.11	yes
Adt	80.53		-6.55	80.33		-1.46	yes
aaw	86.32		-0.76	88.52		6.73	Yes
Bhb	87.37	83.09	+4.28	74.18	79.85	-5.67	
Bsb	89.47		+6.38	81.97		+2.12	
Bkb	81.58		-1.51	87.70		+7.85	Yes
Bmc	77.89		-5.20	69.67		-10.18	
Bvd	75.26		-7.83	80.33		+0.48	Yes
Bld	67.37		-15.72	69.67		-10.18	Yes
Bae	93.75		+10.66	78.69		-1.16	
Bkh	89.47		+6.38	73.77		-6.08	
Bkeh	91.58		+8.49	93.44		+13.59	Yes
Baj	71.05		-12.04	74.59		-5.26	Yes
Bdj	88.42		+5.33	84.43		+4.58	
Bsk	87.37		+4.28	87.70		+7.85	Yes
Bjl	91.05		+7.96	81.15		+1.30	
Brl	93.68		+13.59	94.26		+14.41	Yes
Blm	85.26		+2.17	88.52		+8.67	Yes
Bzm	85.26		+2.17	78.28		-1.57	

Bam	87.37		+4.28	81.97		+2.12	
Bsm	75.79		-7.30	67.21		-12.64	
Bcn	96.84		+13.75	85.25		+5.40	
Bco	81.58		-1.51	79.51		-0.34	Yes
Bksw	88.95		+5.86	92.62		+12.77	Yes
Bcs	64.74		-18.35	66.39		-13.46	Yes
Cta	76.84	83.28	-6.44	81.15	81.90	-0.75	Yes
Ctan	96.84		+13.56	96.72		+14.82	Yes
Crb	76.84		-6.44	66.39		-15.51	
Cjb	94.74		+11.46	93.44		+11.54	Yes – slight
Cac	98.95		+15.37	95.08		+13.18	
Ckc	78.95		-4.33	84.43		+2.53	Yes
Cfc	87.37		+4.10	82.79		+0.89	
Cjg	94.74		+11.46	91.8		+9.90	
Cag	66.32		-16.96	56.97		-24.93	
Cbh	74.21		-9.07	65.16		-16.74	
Cmh	81.05		-2.23	87.70		+5.80	Yes
Cjk	80.00		-3.28	77.05		-4.85	
Col	87.89		+4.31	80.33		-1.57	
Csm	73.16		-10.12	67.62		-14.28	
Cpm	64.21		-19.07	68.44		-13.46	Yes
Cap	74.74		-8.54	90.16		+8.26	Yes
Cdp	88.42		+5.14	86.07		+4.17	
Caq	91.05		+7.77	93.44		+11.54	Yes
Ckst	91.58		+8.30	97.54		+15.64	Yes
Ccs	97.37		+14.09	96.72		+14.82	Yes – slight
Cjt	67.89		-15.39	51.64		-30.25	
Clt	89.47		+6.19	95.08		+13.18	Yes
Cev	87.37		+4.09	91.80		+9.90	Yes
Csw	87.37		+4.09	81.15		-0.17	
Dta	95.26	82.52	+12.74	93.44	81.73	+11.71	
Dmb	80.00		-2.52	79.10		-2.63	
Dsb	90.00		+7.48	92.62		+10.89	Yes
Dmc	100.00		+17.48	99.18		+17.45	
Djc	78.95		-3.57	89.34		+7.61	Yes
Dbd	76.84		-5.68	81.97		+0.24	Yes
Djd	76.84		-5.68	84.43		+2.70	Yes
Dme	67.89		-13.63	72.13		-9.60	Yes
Dce	89.47		+6.95	88.11		+6.38	
Ddf	88.42		+5.90	91.80		+10.07	Yes
Drg	76.84		-5.68	91.80		+10.07	Yes
Dcg	70.53		-11.99	59.02		-22.71	
Dkh	81.05		-1.47	73.77		-7.96	
Dmj	92.63		+10.11	94.26		+12.53	Yes
Dkm	73.68		-8.84	75.41		-6.32	Yes
Dsm	85.79		+3.27	85.25		+3.52	Yes-slight
Dkm	85.79		+3.27	81.56		-0.17	
Dho	70.53		-11.99	79.51		-2.22	Yes
Dmp	71.58		-10.94	77.46		-4.27	Yes
Djs	97.89		+15.37	98.36		+16.63	Yes
Dns	83.16		+0.64	77.05		-4.68	
Dcs	84.21		+1.69	62.30		-19.43	
Dct	82.11		-0.41	86.89		+5.16	Yes
dkw	81.05		-1.47	81.15		-0.58	Yes