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The Effects of Self-Assessment on Student Learning

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A report on an action research project submitted in partial fulfillment of the requirements for participation in the Math in the Middle Institute Partnership and the MAT degree

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The Effects of Self-Assessment on Student Learning

Abstract

In this action research study of my 7th and 8th grade mathematics classes, I investigated self-assessment and goal setting. Students set goals at the beginning of the chapter. Students rated themselves at the end of each lesson in several different areas. Those ratings were used to help students know what areas to focus on when preparing for a test. I discovered that students were realistic with their goals. I discovered that the 7th grade Pre-Algebra classes were accurate with their self-ratings and that those ratings helped students with test preparation. I also discovered that students were positive about the experience – feeling like they achieved their goals and learned more. As a result of this research, I plan to make student reflecting a normal part of my daily teaching routine. I plan to share these findings with others.

I have studied self-reflection and goal setting and their effect on student learning as my action research project. I studied the students in my math classes, which consists of two seventh grade Pre-Algebra classes and one eighth grade Math class. I have taught for ten years. I have researched self-assessment and have created materials (rubric, charts, etc.) to help students with this project. I have discussed goal setting with the students and the importance of realistic goals. I have reviewed the self-reflection chart and rubric with the students and modeled the rating process with them.

Problem of Practice

Objective cards, objective cards! Objective cards are used in my school district. After a chapter test, teachers document which skills have/have not been mastered by each student. Students then have the opportunity to re-learn and re-take the portions of the test that have not been mastered. In order to re-take the test, students first complete some type of practice assignment outside of the regular class time. The re-take is also completed outside of the regular class time. This requires a lot of time on the part of the teacher. Also, there are many students that don't make the effort to complete the re-take. Yet, I have found that many students master skills on the re-take. I believe this is in part because of narrowing the focus of their studying/preparation. I believe that many students are overwhelmed with the many skills to study for with a chapter test and others don't know how to study for a math test resulting in the non-mastered skills on chapter tests. This is one example where reflecting on past performance (on the initial chapter test) helps students with future assessments (the retake). The reflecting, though, comes from the teacher through the use of the objective card. I have found that self-reflecting done by the students is minimal. For the majority of the students, reflecting on daily homework is merely counting the number missed or noticing the percent correct. Although I am

relatively new with helping students self-reflect, it seems that, with guidance, the students seem to be fairly accurate and honest with their reflections.

Ideally, students are able to self-reflect to determine which areas are weak for them and then able to determine which areas to focus on to study. This allows them to master skills the first time in which there is little/no need for re-takes. Also, students are able to self-reflect on a daily basis which allows them to ask questions and clear up misunderstandings before continuing with the next lesson. My hope is that this could make better use of class-time and decrease the amount of time spent correcting homework since students have already thought about their progress and have an idea about the areas in which they need clarification.

Students in my classroom do not master all of the skills on the initial test. When given the areas to focus on, however, they do extremely well. Also, it is not natural for them to reflect on a regular basis to assess how they are doing. However, they seem to be accurate and honest when they are guided to reflect.

I believe this is worth knowing for many reasons. Obviously, students' learning and mastery of skills is what teaching and education is all about. Teachers want students to learn and want to know ways to improve student learning. Also, with the state of education today and with the growing importance of test performance, I believe that test preparation is extremely important. I also believe this is important because some students will not complete things that require tasks outside of the regular class time. Teachers want to provide equal opportunities for all students to learn. It is extremely important for students to master math skills since math skills build upon each other. If students learn the skills the first time, this would decrease the need for students to complete outside of class re-takes later and with the mere increase in student learning, the achievement of future math classes should also increase. I also believe that the skill of self-

reflection causes students to take more ownership with their learning and leads to more independent learners. This is an important skill that can carry over into later math classes and into other curricular areas as well.

Connecting these ideas to other readings, I believe self-reflection is important because it increases student learning and students' performance on assessments (NCTM's *Principles of Learning and Assessment*). It helped my own practice by allowing me to investigate how students learn. It helped the immediate community of teachers by investigating conceptual frameworks for teaching, learning and schooling. It helped the larger community of educators by investigating how curricula and practice are constructed, enacted, and altered.

Literature Review

The Merriam-Webster Online Thesaurus uses these words as a synonym for assessment: "an opinion on the nature, character, or quality of something" (Merriam-Webster). I think of those words when I think about the idea of self-assessment in the classroom. I think about students that are evaluating the nature or quality of their work. McDonald and Boud (2003) define self-assessment as "the involvement of students in identifying standards and/or criteria to apply to their work and making judgments about the extent to which they met these criteria and standards" (p. 209). Although the research on student self-assessment is somewhat limited, I have learned lots through readings related to this topic.

The first piece of information that I found interesting contained ideas related to the benefits of self-assessment. It was very clear that there are believed to be strong benefits to self-assessment and goal setting and the opinions of the different researchers were amazingly similar to one another. Brookhart, Andolina, Zuza, and Furman (2004) quoted Covington as stating, "Motivation theorists suggest that student self-assessment will contribute to feelings of control

over one's own learning, of choice and of agency, and of self-worth" (p. 214). Brookhart et al. also referred to the NCTM Assessment Standards for School Mathematics which "recommend student self-assessment as part of a total assessment plan to foster student confidence and independence in learning math (Brookhart et al., 2004, p. 214). Another researcher, Smith (1997), referred to self-assessment as "a means to enhance student empowerment" and stated that "skills learned through self-assessment are life skills, applicable to a range of situations" (p. 7). Smith quoted teachers that participated in a study with self-assessment as saying, "students become deeply self-motivated and independent learners. They become honest with themselves when goal setting. They have to learn to admit what they do not understand and to see this in itself as an important part of the learning process" (p. 7). Yet another researcher, Wells (1998), states that self-assessments "give students ownership of their own learning and provide them with a means for evaluating their growth and setting goals for the future" (p. 32). Finally, Campbell, DeWall, Roth, and Stevens (1998) stated that self-assessments "provided students with a greater sense of ownership of their work, a more enthusiastic approach to learning, and the increased use of higher-order thinking" (p. 1). There are very definite and very similar feelings about the benefits of student self-assessment.

Another interesting piece of information is found with the strategies used within the different articles/studies done. Brookhart et al. (2004) refer to a study done by Wood and Frank (2000) and their use of student graphs. Another strategy used was the use of student journals and goal setting – both individual and group goal setting as well as evaluation sheets to record the results (Smith, 1997, p. 7). Checklists and rubrics to inform the students of what was expected were also used (Gregait, Johnsen, & Nielsen, 1997). Enz and Serafini (1995) explained, ". . . to begin to help students assess their progress, performance guidelines must be made clear and

easily understood” (p. 96). Other strategies used include teacher/student conferences as well as parent/student/teacher conferences (Enz & Serafini, 1995). These examples of strategies used were very helpful to me while brainstorming ideas of strategies that I used while completing my action research project.

Although all of the information has been positive to this point, there were also some challenges discussed. Some of those challenges include: helping students decide on realistic goals, teachers being trained in how to help students with self-assessment/goal setting, and the time needed to reach a comfort level and to see results (Smith, 1997). Brookhart et al. (2004) also noted that self-assessment “needs to be taught, coached, and supported.” Reading about these things was a good reminder to me to think through these possible obstacles that may occur and to think through ways to hopefully decrease the amount of challenges these things could create.

The best part of reading through the literature was reading about the actual, specific results seen within schools that have actually used self-assessment. Brookhart et al. (2004) referred to third grade math classes in which “the rote memorization task of learning the times tables (was turned) into a deeper experience for students about monitoring their own mathematics learning” (p. 213). Students in those third grade classes set goals, made predictions on their achievement on the multiplication timed tests, and then compared their actual results with their predictions. Brookhart noted that the students “predicted their achievement very well” and that the overall averages rose and that the “range of predictions narrowed over time, demonstrating that students got more accurate in their predictions” (p. 218). A teacher with this study noted that students performed better during this particular year than in previous years (Brookhart et al., 2004). Wells noted the improvement with students’ ability to assess themselves

well with time. When students began self-assessment in the seventh grade, Wells (1998) noted that “by eighth grade, students are usually capable of completing an assessment with little or no assistance from the teacher” (p. 32). Enz and Serafini (1995) referred to a specific student who is now “assessing his own performance and setting new learning goals” (p. 97). A final example of a result is found with a study done by McDonald and Boud (2003). They note that “students with self-assessment training outperformed their peers who had been exposed to teaching without such training in all curriculum areas” (p. 209).

Although there are some challenges, there are many more benefits and positive results with the use of student self-assessment. I was really excited to use some of the strategies used by these researchers and see the results within my own classroom! I close with a quotation from Black and Wiliam (1998) in an article by McDonald and Boud (2003): “self-assessment by the student is not an interesting option or luxury; it has to be seen as essential” (p. 209). I hope to be able to show others through my project that self-assessment is just that: essential!

Purpose Statement/Research Questions

The purpose of this study was to determine the effects of goal setting and student self-reflection on student learning. Data collection took place during the spring semester of 2006 in my classroom for the three seventh and eighth grade mathematics classes I taught. This study attempted to answer these research questions:

- Will student learning increase with the use of self-reflection?
- How does the use of goal-setting affect student learning?
- How does self-reflection/self-assessment affect student learning in terms of student sub-groups?

Method

Will student learning increase with the use of self-reflection? There were several things that were used to assess this question. First of all, I compared student grades on math assessments prior to this project to the math assessment grades during this project. I also used the information from the completed student surveys. The answers students gave from the student interviews also provided information about this research question.

How does the use of goal-setting affect student learning? Information obtained from student surveys was critical to assess this question. Student responses from the student interviews also provided important information. Finally, my observations and journals helped evaluate the importance of goal-setting.

How does self-reflection/self-assessment affect student learning in terms of student sub-groups? Student grades on math assessments – prior to and during this project – were used to analyze this research question. I also used student responses from the completed surveys and student interviews.

Analysis

Self-reflection is a tool to help students with test preparation. During this project, students reflected daily about the math skills learned and rated themselves in the following areas: understanding of the problems, understanding of the strategies and procedures used, and their ability to explain or communicate the skills. Students used a rubric to rate themselves with ratings one (low) through four (high). Students also noted if they felt they needed extra time on the section and the grade earned on that lesson's homework assignment (see Appendices A & B).

At the end of the chapter, this information determined what review assignment was assigned to each student individually.

After completing this process for the entire chapter, students were asked questions about their thoughts/reactions to this. Seventy-eight percent of the students (from all classes combined) that completed the chart felt that the self-reflecting was helpful. Students also completed surveys at the end of this project (see Appendices D & G). After analyzing the data from the surveys, I found that all three classes agreed or strongly agreed that the daily reflecting helped them know what to work on and all three classes also agreed or strongly agreed that the daily reflecting helped them know how to prepare for the end of chapter tests. (These were two of the top three questions from the survey with the strongest results.) Finally, when interviewing students at the end of this project, one student had this answer when asked if setting goals and reflecting helped with preparing for tests: “Yah, it did help me because then I knew which sections I had the most trouble on and I could go back and study them more. . . it shows you what your strongest areas were and what your weakest ones were.”

When students analyze themselves with time and effort, students are able to accurately rate their performance. The three classes that were used for this research were two seventh grade Pre-Algebra classes and one eighth grade Math class. These classes used the same textbook, were assigned the same homework and were given the same tests/quizzes. At the end of each chapter, after students had rated themselves in three areas related to their understanding and after they had recorded the actual grade earned on each homework assignment, I analyzed that data. I averaged the students’ self ratings and their actual grades earned. I plotted the two averages on a scatter plot to determine whether there was a correlation between their ratings and actual grades earned or not. I have found – with both chapters – that the two seventh grade classes had a strong

or very strong positive correlation. The eighth grade class did not have a strong correlation (See Appendix E). Through my daily observations and journaling, I have observed that the two seventh grade classes took the ratings seriously and referred to the rubric and reflected before completing the chart. The eighth grade class, however, seemed to be merely “going through the motions” and writing down numbers. They were completing the task, but not with thought or effort. I am unsure if that was due to motivation or if it was due to lack of knowledge or understanding about the chart and rubric. Therefore, when students complete this task with effort, they are able to rate themselves accurately.

Setting goals does motivate students to achieve them. At the beginning of each chapter, students set individual goals. These goals ranged from earning a particular score on homework assignments, to earning a particular score on tests/quizzes, to not having any late homework, etc. I have observed and heard student comments like, “Aw man! I don’t have all tens anymore!” This student was referring to his goal of earning all “10/10” on homework assignments and he had just earned something lower than that. Periodically, I would ask students to re-read their goal and think about what they needed to do to accomplish that and to reflect on how they were doing with the goal and what needed to change in order for them to achieve the goal. I have also heard comments like, “I didn’t do my homework yesterday. I need to do my homework every night.” Another comment was “I had an ‘A’ on the quiz. Now I just need an ‘A’ on the test and then I made my goal!” Comments like these show me that students were making an effort to achieve the goals they had set.

When students were asked (at the end of the first chapter) if they had achieved their goal, sixty-eight percent of the students that completed these questions answered “YES”. (Including the students who did not complete the questions, this consisted of 42% of the students overall.)

Ten percent answered they had somewhat met their goal and twenty-two percent answered that they did not meet their goal (See Appendix F). At the end of this project, students completed a survey. One of the questions on the survey was if they had set realistic goals. Two classes rated this as “strongly agree” and the third class rated this as “agree”. Students felt positive about the goals that they had set and generally worked hard trying to achieve them (See Appendices D & G).

When used correctly, student learning does increase when students self-reflect. At the end of the first chapter, students were asked if they felt like they had learned more during that particular chapter. Eighty-three percent of the students that completed the chart felt that they did learn more. I noted with my observation and my journaling that students seemed to take more ownership with their learning. For example, I wrote in my journal about a student from Period Seven that I heard asking the student next to her, “Why did you have that one as irrational?” The other student did not really respond and so she said, “Just tell me why that’s irrational! I don’t want to have to mark this as ‘Yes’!” (referring to the part of the chart about needing more time on that section). They really wanted to understand the lesson before moving on to the next lesson so that they could rate themselves with high ratings on their charts. I also noted that the two Pre-Algebra classes were asking more questions during the homework review time. (It was after the homework review time that students rated themselves with their self-reflection chart.) However, when looking at actual end-of-chapter test grades, the test grades remained about the same.

The Period One Pre-Algebra class has had end of chapter tests average ranging from 77.6% to 90.9%. Their test averages during this project were 81.3% and 84.7%. The Period Seven Pre-Algebra class has had end of chapter test averages ranging from 75.9% to 87.6%. During this project, their test averages were 84.9% and 80.2%. The Period Four Eighth Grade

Math class has had end of chapter test averages ranging from 68.2% to 82.7%. During this project, their test averages were 69.3% and 70.2% (See Appendix H). It is difficult to compare end-of-chapter test grades since there is such a wide range with the level of difficulty with each chapter. For example, Chapter One is review and students score really well on that particular test. The chapters that include Geometry skills are usually difficult for students and students usually score lower on these tests. The chapters that were covered during the time of this project were the Geometry chapters. Therefore, it is difficult to compare test scores prior to this project and test scores during this project. It is positive, though, that there was not a decline in the test scores with these difficult chapters. The importance with the idea of student learning is that students were positive about their learning and that they felt like they had learned more.

Interpretation

This action research project has taught me many things about my teaching and about student learning, student attitudes, and student motivation. I have realized that it is very important for students to think about their learning on a regular basis – and if possible, immediately after learning a new skill. This kind of information is very helpful for students – especially when preparing for tests/quizzes. By the end of the chapter, many students forget the sections that they struggled with earlier. Also, it is helpful for students to have fewer skills to focus on when preparing for a test. Some students are overwhelmed when there are so many skills to review and some students just need fewer skills so that they can review those skills more in-depth. When using some kind of rating system, students need to understand the rubric and the rating system being used. I have realized that motivated students ask questions about these things because they want to rate themselves and want to see improvement and high, positive ratings. The less motivated students don't ask questions and, instead, just write things down

without much thought. That may be because the ratings would be low if they were honest and accurate with the ratings or may be because of apathy and because it seems easier to write down some numbers rather than put forth the time and effort to try to understand the system better.

In the future, I would simplify the rating system in an effort to decrease the number of students that merely write down numbers. An example of a simplified daily chart is found in the Appendices. I also think that I would need to make it more important for students to complete the charts. At the beginning of this project students were excited and interested in this. As time went on, more and more students lost their charts and by the end many students handed in incomplete charts.

In the future, I would like to meet with a few students daily as they are completing their charts to hear their thoughts and reasons for their ratings. I think this would keep students thinking about the rating system and keep their ratings accurate. Because of the success with the accurate ratings with the two Pre-Algebra classes, I know that it is possible for middle-school students to rate themselves accurately.

I was also pleased with the number of students that were motivated to achieve the goal that they had set. In the future, I would like to make the goals a bigger part of my classroom. That may mean a bulletin board dedicated to setting goals or it could mean some kind of recognition of the students that did achieve their chapter goal. This could help recognize the “average” or “below average” students that don’t earn honor roll or those sorts of recognitions. If the goal setting is done with every chapter, students that achieved their goal could continue making their goals more challenging. This could help prevent students just “settling” with their performance and keep them striving to reach new and higher levels. The thing that I am the most

pleased with is that students were positive, trying to achieve their goals and were pleased, feeling like they had learned more – things all teachers want from their students!

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Appendix A – Example of Student Rubric used for Self-Assessing

Student Self-Assessment Rubric

Level	Understanding	Strategies, Reasoning, Procedures	Communication
1 - Novice	I did not understand the problem.	I was not sure how to do it.	I have no explanation. I am not sure how to draw the problem.
2 - Apprentice	I got started. I have part of the problem.	I am still thinking. It would help me to work with somebody. My answer doesn't look right to me.	I can explain some of what I did. I tried to use pictures, numbers, graphs, and words.
3 - Practitioner	I understood the problem, including all of the math required to solve it. I have the right answer.	I used a plan to solve the problem. I can tell you how I got the answer.	I used mathematical terms, pictures, graphs, numbers, and words to tell you how I solved the problem.
4 - Expert	I got it. I used important math ideas to solve the problem. I have the right answer.	I had a very efficient way of solving the problem. I checked to make sure my answer was right. I showed you some other ways that you can use the same plan to solve new problems, or I made a connection to another problem.	I showed you how I know my answer is right step by step. I clearly used words, pictures, numbers, graphs, and/or models to show my solution and mathematical thinking.

Appendix B – Example of Abbreviated Daily Chart used with Chapter 7

Name _____

My Chapter 7 Goal: _____ Things I need to do so that I can achieve my goal: _____ _____

Lesson	Understanding of the Problems	Strategies, Reasoning, and Procedures	Ability to Explain and Communicate	Extra Time Needed Before A Test???	Grade Earned

As I prepare for the Chapter Test, I need to focus my studying on: _____

After taking the Chapter Test, reflect on your work during this chapter and answer the following questions:

1. Did you achieve your goals for Chapter 7? Why or why not were you able to achieve the goals?
2. How did this chart help you?
3. How did this chart help you with studying for the test?
4. Have your grades for this chapter been better, worse, or about the same as before?
5. Do you feel like you have learned more in this chapter than before?

Appendix C – Example of Revised and Abbreviated Daily Chart for Future Use

Name _____

My chapter 10 goal: <hr style="border: 0; border-top: 1px solid black; margin-top: 10px;"/>
Things I need to do so that I can achieve my goal: <hr style="border: 0; border-top: 1px solid black; margin-top: 10px;"/>

Lesson	Rating (1 - 4)	Why you chose the rating you did	More time Needed?	Grade Earned

As I prepare for the test, I need to focus my studying on: <hr style="border: 0; border-top: 1px solid black; margin-top: 10px;"/>

After taking the Chapter Test, reflect on your work during this chapter and answer the following questions:

1. Did you achieve your goals for this chapter? Why or why not were you able to achieve the goals?
2. How did this chart help you?
3. How did this chart help you with studying for the test?
4. Have your grades for this chapter been better, worse, or the same as before?
5. Do you feel like you have learned a lot in this chapter?

Appendix D - Example of End of Project Survey

Name _____

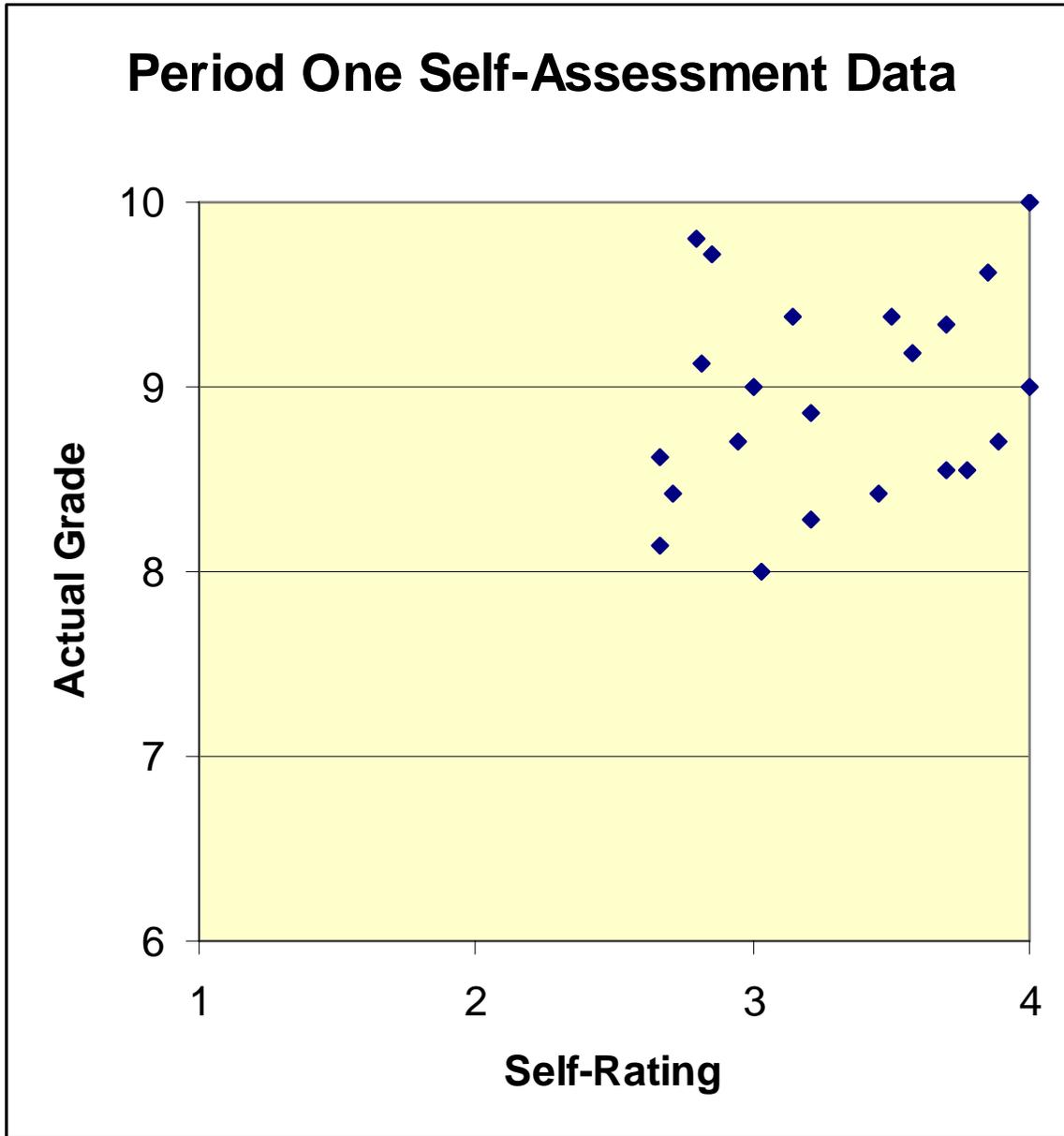
End-of-project Survey

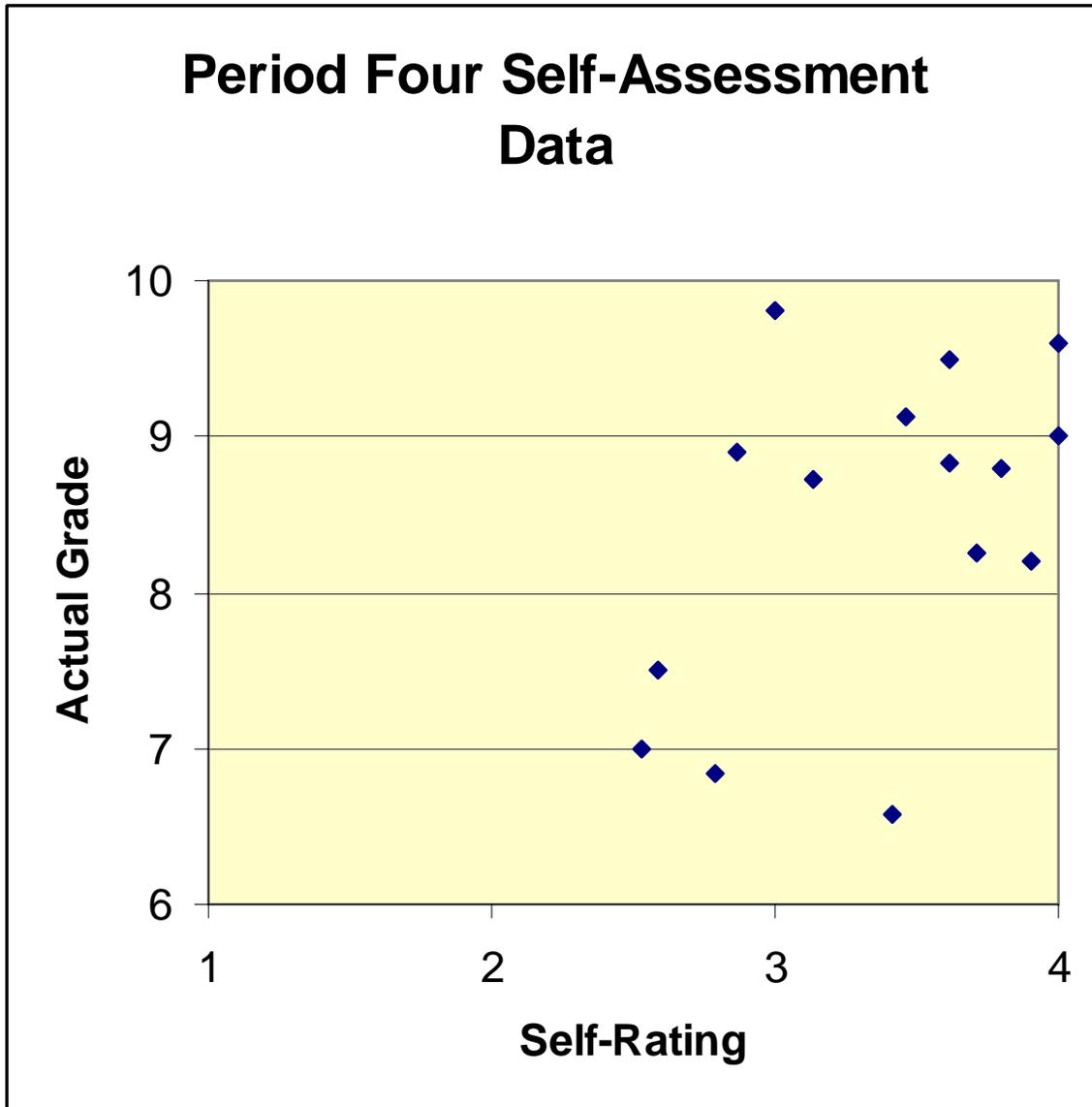
Please use the following scale to respond to the following statements.

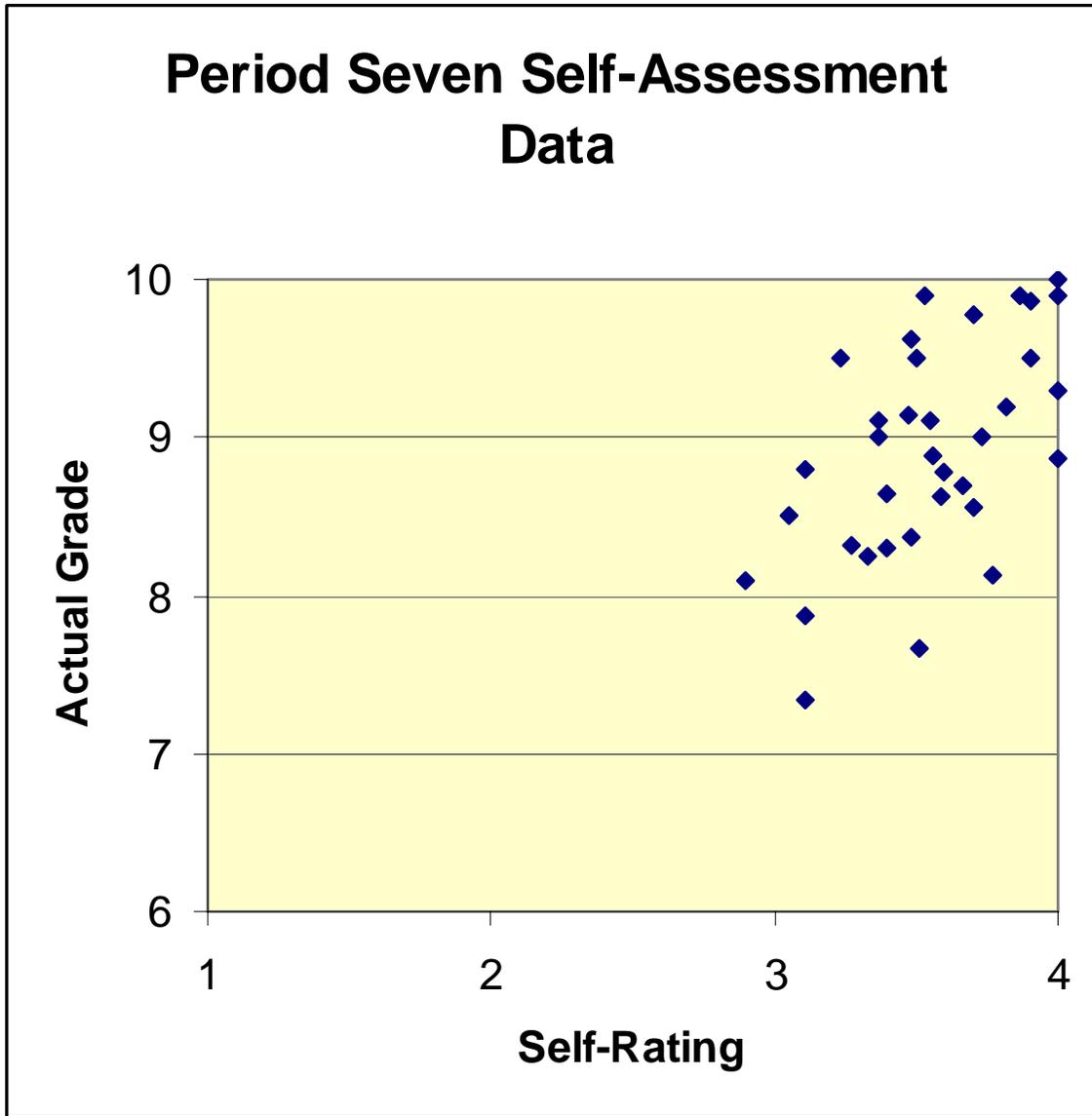
- 1: strongly disagree
- 2: disagree
- 3: neutral
- 4: agree
- 5: strongly agree

- _____ 1. Setting goals has helped me keep a focus.
- _____ 2. Reflecting at the end of each lesson has helped me realize what I need to work on.
- _____ 3. We have done an appropriate amount of reflecting.
- _____ 4. The reflecting has helped me.
- _____ 5. This project has been a good experience for me so far.
- _____ 6. I have been doing well reaching my goals.
- _____ 7. My goals were realistic.
- _____ 8. Reflecting has helped me know what to study for tests.
- _____ 9. My grades have improved.
- _____ 10. I feel like I have been learning more in math class.

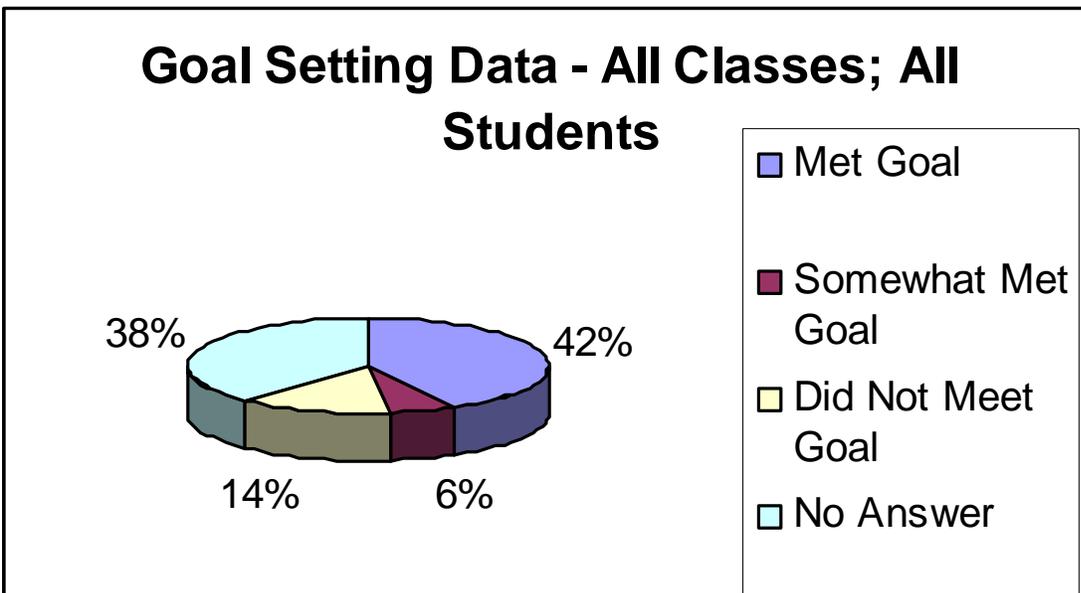
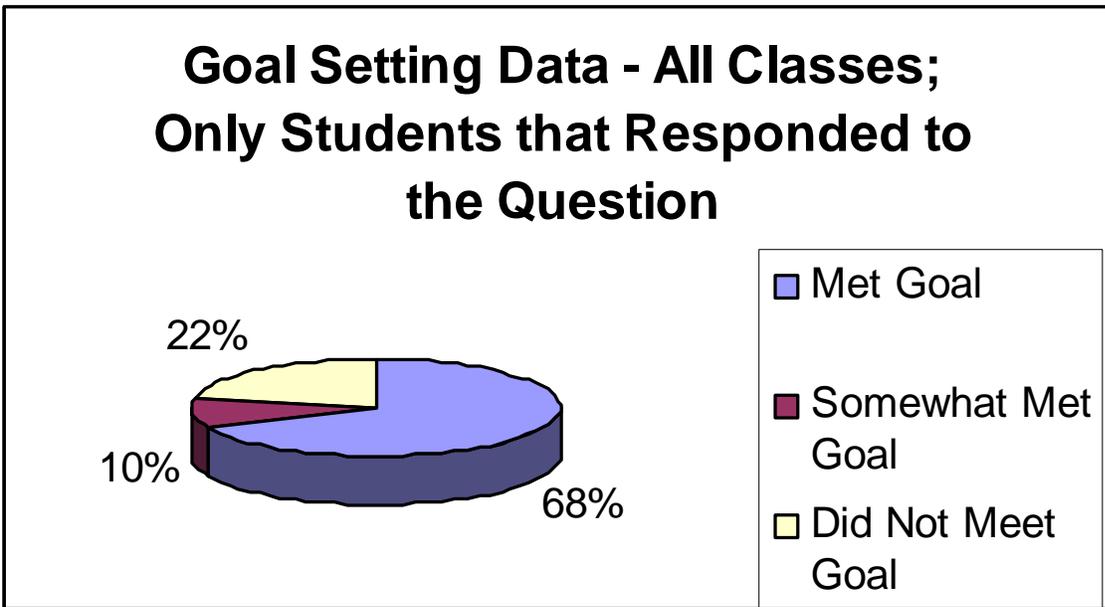
Appendix E – Graphs of Student Accuracy with Self-Rating







Appendix F – Goal Setting Graphs



Appendix G – Results of End-of-Project Surveys

While analyzing the End-of-Project Surveys, I found the averages for each question for each class. I then looked at the three questions that had the highest score for each class. The following are the questions with the top scores for each class.

	Period 1	Period 4	Period 7
Question 1			
Question 2	2 nd Place	3 rd Place	3 rd Place
Question 3			
Question 4	3 rd Place		
Question 5			
Question 6			2 nd Place
Question 7	3 rd Place	1 st Place	1 st Place
Question 8	1 st Place	2 nd Place	2 nd Place
Question 9			
Question 10			

Questions students were asked to respond to:

1. Setting goals has helped me keep a focus.
2. Reflecting at the end of each lesson has helped me realize what I need to work on.
3. We have done an appropriate amount of reflecting.
4. The reflecting has helped me.
5. This project has been a good experience for me so far.
6. I have been doing well reaching my goals.
7. My goals were realistic.
8. Reflecting has helped me know what to study for tests.
9. My grades have improved.
10. I feel like I have been learning more in math class.

Appendix H – Chapter Test Averages by Class Period

TEST	Period 1 Pre-Algebra	Period 4 Math 8	Period 7 Pre-Algebra	Overall
Chapter 1	90.9	80.5	86.8	86.06
Chapter 2	86.7	82.7	82.8	84.06
Chapter 3	86.5	72.2	83.1	80.6
Chapter 4	82	68.2	80.9	77.03
Chapter 5	82.5	69.8	84.3	78.86
Chapter 6	86.2	80.5	87.6	84.76
Chapter 7 **	81.3	69.3	84.9	78.5
Chapter 8/9 **	84.7	70.2	80.2	78.36
Chapter 10	80.5	71.5	75.9	75.96
Chapter 11	77.6	70.7	78.8	75.7

** These chapters were covered during this project.

Appendix I – Student Responses about Learning More

