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**An Investigation into Careless Errors Made by 7<sup>th</sup> Grade Mathematics Students**

Andrea Wiens  
Lincoln, NE

Math in the Middle Institute Partnership  
Action Research Project Report

in partial fulfillment of the MA Degree  
Department of Mathematics  
University of Nebraska-Lincoln  
July 2007

## **An Investigation into Careless Errors Made by 7<sup>th</sup> Grade Mathematics Students**

### **Abstract**

In this action research study, I investigated the careless errors made by my seventh-grade mathematics students on their homework and tests. Beyond analyzing the types of careless errors and the frequency at which they were made, I also analyzed my students' attitudes toward reviewing their work before they turn it in and self-reflection about the quality of work that they were producing. I found that many students did not know how to review their test before turning it in; no one had ever taught them how to do so. However, when students were given tools to help them with this task, they were able to make strides towards reducing the number of careless errors that they made and began to turn in high quality work that demonstrated their understanding of the content that had been taught. As a result of this research, I plan to teach my students how to go back over their homework and tests before turning them in. I also intend to continue to use the tools that I have produced to encourage students to self-reflect on the work that they have done. Assessment is such an important piece of educating my students and the careless errors made on these assessments needed to be addressed.

## **Introduction**

As a mathematics teacher, I am required to administer numerous assessments to students throughout the school year. Some of the assessments are formative (like homework assignments and quizzes) and some are summative (like chapter tests and criterion reference tests), but they all serve the same purpose; determining if students really understand the concepts that have been taught. While grading these assessments, it is very frustrating to encounter a student who obviously understands the concept, but the grade that they receive does not reflect their understanding because of careless errors or not taking pride in their work. This frustration served as the catalyst for my action research. I wanted to gain an understanding of what kinds of careless errors my students were making, why they were making them, and if there was anything that I could do to help prevent them. I also wanted to better understand why some students believe that reviewing their work before they turn it in is important and why others do not.

Over the past several years, I have tried numerous approaches to reminding students to go back over their quizzes and tests to look for mistakes; everything from verbal reminders to making students take a pledge before the test to written reminders at the end of the test. However, I can't say that any of them have made a noteworthy impact. As a matter of fact, most students work through their test and then glance at each page for a few seconds before turning it in; that is their idea of going back over their test. It did not take me long to realize that students do not go back over their tests and quizzes because they don't know how; they need to be taught some strategies for going over their assessments. Perhaps, if they were taught some strategies, they would do more than glance over each page quickly before racing to be the first one done.

This brings me to a related problem of practice; getting my students to slow down and realize that taking a quiz or test is not a race and there is not a prize waiting in the wings for the

first person that is done. It never fails that once the first person has turned in their test, the majority of the other students start to speed up, which causes more careless errors. I have also seen some of my students rush through their test and then wait for others to turn their tests in so that they don't appear to have hurried through their work. For some reason, there is a stigma placed on the person that is the last one finished with their test or quiz; that somehow they are the least intelligent person in the room because they took the longest, rather than maybe the smartest because they took their time and checked their work over before turning it in.

After passing back a quiz or test, I generally ask for a show of hands of who made a "careless error" and the vast majority of the class will raise their hands. I do this to try and drive home the idea that this is a serious problem that they should be aware of. However, when I go to grade the next test, the same frustrations continue to occur; my students have not made any changes to their test-taking strategies. I have a hard time understanding why my students do not take "pride" in their work because I was a very average student when I was in middle school, but I always went the "extra mile" to make sure that I produced quality work. One of the goals of my action research was to provide my students with some tools that might help/push them take more pride in their work.

### **Problem Statement**

I am positive that my students are not in the minority when it comes to making careless errors and not taking pride in their work. I also know that there are many teachers that, like me, become frustrated when his/her students complete an assessment and do not demonstrate their understanding of a concept, but instead demonstrate their inability to read and/or follow the directions, use basic computation skills, or show their work. Careless errors made up a large

portion of the points lost on assessments for many of my students, so I felt there was a need to investigate it further.

When asked if they had ever been taught how to go back over their tests, many students said that they had never been taught how to do this, they just thought that it meant making sure that everything was completed and done neatly. As teachers, sometimes we take certain skills for granted; we assume that our students know what we are talking about, when in actuality, they don't because they have never been taught. It did not take me long to discover that many of my seventh-grade students did not know how to look over their tests to find their mistakes. Most of them would glance at each page for a few seconds and then turn it in.

In addition to not knowing how to search for their mistakes, many students did not see the purpose of going over their tests. Their attitude about going over their tests seemed to be one of apathy; they just didn't seem to care. Now, I am not talking about all of my students, but it was a very large portion. I needed to understand where my students were coming from before I could begin to try and provide a solution for the epidemic of careless errors that we were experiencing.

By taking the time to figure out what kinds of careless errors my students were making and learning about their attitudes towards assessments and more importantly, their attitudes towards reviewing their assessments before turning them in, I was able to develop a tool that would help them combat these issues.

Making careless errors was not exclusive to tests, it flowed over into their homework as well. My students struggled with writing down the assignments correctly, skipping over problems (not because they didn't know how to do them), and forgetting to show their work on problems. I would remind them to check over their work, much like I did with their tests, but few

actually did so. For this reason, I needed to develop a template that would take some of the “work” out of organizing their homework. Again, the purpose of the homework assignments was to give the students an opportunity to practice the skills that had been taught and for me to see if they understood those concepts; instead, there were times that I was measuring their ability to pay close attention to their assignment and not their mathematical thinking. My students needed to be taught how to go that “extra mile.”

### **Literature Review**

Assessment has become a driving force in public education, due much in part to the No Child Left Behind legislation. The National Council of Teachers of Mathematics, or NCTM, deems assessment as worthy of being part of their six guiding principles for school mathematics. They state,

Good assessment can enhance students’ learning in several ways. First, the task used in an assessment can convey a message to students about what kinds of mathematical knowledge and performance are valued...Feedback from assessment tasks can also help students in setting goals, assuming responsibility for their own learning, and becoming more independent learners (NCTM, 2000, p. 22).

Teachers use assessments to gain insight into their students’ understanding of the material taught. However, sometimes it is difficult to truly determine if a student has mastered a skill or not. For instance, a student’s score on an assessment might appear to be low and one would assume that the student did not master the skills, but after closer investigation, it is easy to see that he/she understood the concepts, but made several careless errors, which lowered his/her score. Careless errors are made frequently and deserve to be investigated further. While there is little research done on careless errors exclusively, there is extensive research done on types of errors that students make on assessments.

Much of the research done on the types of errors that occur in mathematics took place in the 1980's, but is still very valid for present investigation. Radatz (1979) provided a good definition of error,

First, errors in the learning of mathematics are not simply the absence of correct answers or the result of unfortunate accidents. They are the consequence of definite processes whose nature must be discovered. Second, it seems to be possible to analyze the nature and the underlying causes of errors in terms of the individual's information-processing mechanisms. Third, the analysis of errors offers a variety of points of departure for research into the processes by which children learn mathematics (p. 170).

Ivan Watson (1980) conducted research using the Newman Model, which stated that all errors could be placed in one of the following categories:

1. Reading Ability – can the pupil read the question?
2. Comprehension – can the pupil understand the question?
3. Transformation – can the pupil select the mathematical processes, which are required to obtain the solution?
4. Process Skills – can the pupil perform the mathematical operations necessary for the task?
5. Encoding – can the pupil write the answer in an acceptable form?
6. Motivation – the pupil could have correctly solved the problem had he or she tried.
7. Carelessness – the pupil could do all the steps but made a careless error, which is unlikely to be repeated.
8. Question Form – the pupil makes an error because of the way the problem has been presented. (Watson, 1980, p. 321-322)

Movshovitz-Hadar, Zaslavsky, and Inbar (1987) used a similar approach to categorizing students' mathematical errors; theirs' included the following six categories:

1. Misused Data – the examinee did not use the information in the question correctly.
2. Misinterpreted Language – the examinee incorrectly translated the mathematical facts from the written problem into symbols.
3. Logically Invalid Inference – the examinee invalidly draws new information from a piece of given information.
4. Distorted Theorem or Definition – the examinee had an incorrect perception about the definition of a principle, rule, theorem, or definition.
5. Unverified Solution – each step taken by the examinee was correct in itself, but the final presentation of the result was not a correct solution.

6. Technical Errors – the examinee made a careless error, such as incorrect computation or incorrect data extraction. (pp. 8-9)

The proposed model may help teachers foresee difficulties and obstacles and use this ability in planning their teaching so as to prevent as many of them as possible. Teachers may also use the model to identify a persistent tendency of individual students to make a certain type of error across several mathematical topics. (Movshovitz-Hadar, et al., 1987, p. 13)

Watson agrees, “Knowing the reasons for errors, the teacher can adjust the teaching to overcome the weaknesses” (1980, p. 321).

Meers, a teacher at John Greer High School in Hoopston, Illinois, described how she developed her own error checksheet for recording errors that her students made on English themes (1950). “From time to time I show each pupil his record. He can see his weaknesses at a glance, and thereafter he knows what to watch for when he proofreads his themes” (p. 161).

Providing students with knowledge about what their weaknesses are is one thing, but getting them to use that information for their benefit is harder than one might think. Many students do not want to take the time to think metacognitively (thinking about one’s own thoughts) or, quite simply, don’t know how. Van Kraayenoord and Paris (1997) communicated the importance of allowing and encouraging students to improve their metacognition skills:

Repeated opportunities to reflect on their performance in school lead students to form concepts about their own abilities, about school tasks, about the roles of teachers and peers, and about learning itself. As students gain insight into their learning, they may develop a greater sense of control and self-regulation of future learning. They may also be able to make reasonable attributions for their own performance, in terms of the effort expended, task difficulty, and strategies used, so they can retain a sense of self-efficacy and optimism when they encounter similar tasks in the future. (pp. 533-534)

“The problem then is how to get students to make a personal commitment to what they are learning...It is not surprising that people tend to avoid situations in their area(s) of weakness, thus conspiring to provide themselves with less practice in areas where it is most needed” (Brown, 1988, pp. 316, 319). Clarkson (1983) also addressed the area of attitude as it pertains to

motivation and errors on tests. He found, “There was a negative correlation between the number of careless errors and the student’s general attitude to mathematics” (Clarkson, 1983, p. 362). It is easy to see that there are connections being made between students’ attitudes/motivation/confidence/self-engagement and the types of errors that they make on tests and how they do on academic tasks in general.

Not only is a student’s attitude toward mathematics related to how well he/she performs on a mathematics assessment, but the amount of time spent on the assessment is as well.

Clements (1982) performed a research study that connected a student’s confidence and the amount of time spent on an assessment with how many errors were made.

...significantly negative correlations were obtained with two variables, total time and misplaced confidence. This suggests that students who had a sound grasp of arithmetic and mathematical language, who worked relatively quickly on mathematical problems, or who believed they knew how to obtain correct answers, tended to make a higher proportion of careless errors than slower, less confident, and mathematically weaker students. (Clements, 1982, pp. 140-141)

Clarkson also found a negative correlation with misplaced confidence and the total amount of time taken to complete a number of mathematical tasks (Clarkson, 1983). From these research studies, the conclusion is that the more confidence a student has in their abilities, the quicker they will work, and consequently, will make more errors on their assessment.

The research has shown that there are several factors that contribute to the many different types of errors that students make on assessments: attitude, self-management, motivation, confidence, and time. Blando, et al. states, “Nevertheless, not all frequent errors are common to all students. Some errors are capricious and may be attributed to lapses of attention or carelessness on the part of the student and it could be a misallocation of a teacher’s time to be too concerned with them” (Blando, et al., 1989, p. 307). However, I firmly disagree with the fact

that we should not bother to take the time to explore the careless mistakes that our students make.

As stated previously, the purpose of having students complete an assessment is to measure their understanding, not the number of questions they get incorrect. Students get incorrect answers for a large variety of reasons and my goal is to help them start to eliminate some of the careless errors that they make. My research investigates the problem of careless errors of 62 seventh-grade students and their attitudes toward metacognition (their ability to think about their thought processes).

My research will serve as an addendum to previous research because it strictly analyzed the types of careless errors that students make, as opposed to analyzing all errors. A lot of the research done previously investigated students' attitudes toward math and how well they performed on their assessments. My research also analyzed attitude, but I chose to focus on student's attitudes toward checking over their tests and what I can do to show them the importance of doing just that. Finally, in the previous research, there was never an attempt to reduce the errors made by students; it was purely an analysis of the types of errors. During my research, I attempted to develop a tool that would help my students avoid making careless errors.

“Results indicated that teachers with high standards and strong beliefs about the importance of good student work habits and classroom behavior reported planning more responsively to individual student performance and effected greater student achievement” (Fuchs, Fuchs, & Phillips, 1994, p. 342). By teaching my students how to identify and eliminate careless errors and holding high expectations for them, hopefully, I will be able to better gauge my students' true understanding of the material that I have taught and not the number of errors made.

### **Purpose Statement**

The purpose of this study was essentially two-fold; I wanted to understand the types of careless errors that my students made and their attitudes towards those careless errors. Now, within these purposes there were several things that I was seeking to understand.

In order to analyze the types of careless errors that my students were making, I first had to determine my definition of “careless error” as it pertains to a math assessment. From this definition, I was able to collect data on how many careless errors each student made on tests and also which careless errors were most prominent. From my data, I was able to convey to my students what they needed to watch out for the most on their tests. Eventually, I was able to develop a checklist that they used on their tests to give them the questions they should ask themselves after each problem to help them find their errors.

When analyzing students’ attitudes towards their careless errors, there were several questions that I was attempting to gain answers to. First, why do students choose to not go over their tests? Second, why do some students rush through their tests and does the amount of time spent on their test influence the number of careless errors that were made? Third, is there anything that a teacher can do to influence their attitudes about going over their work, like providing them with a checklist of questions to ask themselves after each question on a test or a homework template for them to complete their assignments on? Finally, can a teacher make students become aware of the fact that their “behaviors” affect how they do on their tests and homework?

To help guide my study of careless errors, I developed the following research questions:

1. Will the number of careless errors that occur on tests decrease after students are using the checklist?
2. Will students spend more time on their quizzes and tests if they are effectively using the checklist?

3. Will students lose fewer points from careless errors on their assignments after using the homework template?
  - a. Will using the homework template affect the number of students who turn in their homework late or not at all?
4. Will the students have a better attitude about checking over their work by the end of the study?

### **Method**

My action research was completed during the spring semester of the 2006-2007 school year. There were a total of 62 students included in the project; 30 girls and 32 boys. I decided to use my first and second period, Pre-Algebra, classes that consisted of primarily regular education students, but also included 14 gifted students and 3 gifted special education students.

### **Definition of Careless Error**

The first thing that I had to do was define what a “careless error” is in my math classroom; this was one of the most difficult parts of my research because without a clear cut definition, I would have had trouble determining which errors were “careless” and which showed that the students didn’t understand the concept. To complete this task, I decided to have a class discussion where my students told me what sorts of errors they thought were “careless.” The following list represents the errors that would be considered careless if they were made on a test.

I have also provided an example of student work for each careless error:

- **Not following directions** – i.e. Classifying a triangle by its sides rather than its angles, like the question asked. They did this on a group of problems, showing they didn’t follow the directions given. I provided two examples of this error for the same problem.

Find the value of x. Then classify the triangle by its angles. SYW

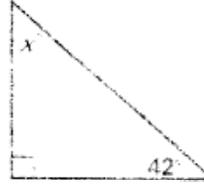
18. 19° (-)



$$\begin{array}{r} 119 \quad 138 \\ + 42 \quad - 161 \\ \hline 161 \quad 19 \end{array}$$

x = 19°

19. 48° (-)

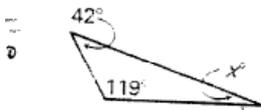


$$\begin{array}{r} 42 \quad 180 \\ + 90 \quad - 132 \\ \hline 132 \quad 48 \end{array}$$

x = 48°

Find the value of x. Then classify the triangle by its angles. SYW

18. scalene (-)



$$180 - 161 = 19^\circ$$

x = 19°

19. isosceles (-)



$$\begin{array}{l} 90 + 42 = 132^\circ \\ 180 - 132 = 48 \end{array}$$

x = 48°

- **Not reading the problem** – i.e. finding the probability of pulling a red marble out of a bag when the problem asked them to find the probability of pulling a blue marble. They read the problem and essentially did what it asked, except they missed a small piece of information that they needed.

26. 220 is decreased by 37%.

$$220 \times .37 = 81.4$$

$$220 + 81.4 = 301.4$$

301.4 (-)

- **Not showing their work** – all students in my classroom know that syw means “show your work” and that it is required, so if there was a problem that a student did not show their work, the class thought that it should be considered careless.

You randomly draw a marble from a bag of 320 marbles. You record its color and replace it. Use the results shown in the table to estimate the number of marbles in the bag that are the given color. SYW

Blue	Green	Purple
10	8	2

= 20

16. Blue  $\frac{32}{3}$  (1)  
SYW (1)

17. Purple  $\frac{40}{2}$  (1)  
SYW (1)

18. Red  $\frac{60}{2}$  (1)

- **An Incorrect Computation** – a student simply added, subtracted, multiplied, or divided wrong. In this problem, you can see that the student thought that 36 divided by 3 was 13. This was one of the easiest careless errors to identify.

15. A model car has a scale of 3 inches to 6 feet. The model car's length is 6 inches. Find the car's length using proportions. SYW

$$\frac{3}{6} = \frac{6}{x}$$

$$\frac{36}{3} = \frac{36}{3}$$

$$13 = x$$

$\frac{13}{1}$  feet (1)

- **Didn't Show All Steps** – i.e. a student wrote down the first two steps they took to solve a problem, but did not write down the steps that showed how they got their final answer.

17. A map uses a scale of 2 cm : 15 km. The distance from Hickory to Pleasantville is 17 centimeters on the map. How far apart are the two towns? Solve using proportions. SYW

$$\frac{17}{2} = \frac{x}{150}$$

$$\frac{1700}{2} = \frac{17x}{2}$$

x = 850

(1)  $\frac{127.5}{1}$  km.

Where did you get this answer?

- **Wrong Answer in Blank** – I provide a blank for all students to write their final answer for each question and occasionally a student managed to write an incorrect answer in the blank, even though they actually found the correct answer.

26. 220 is decreased by 37%.

$$\underline{130 \overset{(-)}{6}}$$

$$220 \times .37 =$$

$$220 - 81.40 =$$

$$138.60$$

- **Incorrect Label** – i.e. writing down centimeters, when the dimensions were in inches or writing down square feet instead of feet. In this case, the student wrote their answer as a percent rather than a whole number. (I was the one who had crossed it out)

21. 25% of 36 is what number?

$$\underline{9\%}$$

$$\frac{x}{36} = \frac{25}{100}$$

$$\frac{100x}{100} = \frac{900}{100}$$

$$x = 9$$

- **No Label** – A student found an answer to the problem, but did not include the label that helps to explain the answer in the context of the problem. (I was the one who wrote the percent sign in)

**For problems 18-21: Solve using the PART/WHOLE PROPORTION METHOD. SYW**

18. 90 is what percent of 120?

$$\frac{90}{120} = \frac{x}{100}$$

$$\frac{9000}{120} = \frac{120x}{120}$$

$$75 = x$$

$$\underline{x = 75\%} \text{ } \textcircled{-1/2}$$

- **No Name on Paper** – A student was rushing to the point that he/she did not write his/her own name on the paper.
- **Carrying Down Wrong Number** – i.e. while working through the problem, the student wrote down a 4 instead of a 9 from the previous step (this often is the result from less than stellar penmanship).

29. There are 160 calories per serving in an unpopped bag of popcorn. There are 140 calories per serving in a popped bag of popcorn. **What is the percent decrease** in the calories from an unpopped bag to a popped bag of popcorn? **SYW**

$$\frac{160 - 140}{160} = \frac{20}{160} = 33.3\%$$

$$\frac{32}{33.3\%} \text{ } \textcircled{-1}$$

- **Skipped Problem** – The student did not do a problem; he/she skipped the problem completely.

- A 35. A sweater originally cost \$40. On sale, it costs \$30. **What is the percent of decrease for the sweater? SYW**

Start Time: 8:08

Stop Time: 8:47

Total Time: 39min.

$\textcircled{-1}$

$\textcircled{-1}$

- **No Answer in Blank** – The students worked through the problem, but did not put his/her answer in the blank provided. The reason that I require my students to do this is because they will have to put their answer in a blank when they take the Graduation Demonstration Exam as freshmen or they will not get full credit for the problem, even if they got a correct answer.

20. A container has 7 green buttons, 3 yellow buttons, and 4 blue buttons. You reach in and randomly draw out a blue button. Without replacing the blue button, you reach in again and randomly draw out a second blue button.

$$\frac{1}{14} \cdot \frac{1}{13} = \frac{1}{182}$$

Independent

Dependent

Probability =

$$\frac{1}{182}$$

- **Other** – I included this category for careless errors that rarely occur, but are careless nonetheless. Some of the errors that I included in this category were: writing down the wrong number from the original problem (not from their own work), forgetting a negative sign, and missing a title or label on a graph. In this example, the student wrote down 30 in her work, instead of 36 from the original problem.

21. (25% of 36 is what number?)

$$x = 30$$

$$25\% \times 36 = x$$

$$.25 \cdot 36 = x$$

$$9 = x$$

or

$$\frac{x}{30} = \frac{25}{100} \quad *$$

$$\frac{100x}{100} = \frac{750}{100}$$

$$x = 7.5$$

Once we had determined the types of errors that would be considered “careless” on tests, we needed to repeat this process for homework. This could end up being a very daunting task if we included as many careless errors as we had for tests because I assign homework on an almost daily basis. For purely managerial purposes, we decided that not putting your name on the paper, not reading/following the directions, skipping problems and not showing your work were considered careless errors because all of my students know that my expectations for homework

are very simple; they are to attempt every problem and they are to show their work on the problems where they are instructed to do so. At one point, the students thought that turning in your homework late (or not at all) should be considered a careless error, but then they realized that it would be hard for me to know if the student was truly careless or just lazy/unmotivated. I have provided examples of student work that demonstrate some of the careless errors.

- **Skipping Problems** – This example will show that the student wrote down the assignment correctly, but skipped a problem that he/she should have done (#22).

HW pg. 324-325  
 (8-23, 25, 29-31) SYW on all

21.  $h = 240$   
 $\frac{240}{20} = 120$  inches

~~22.  $h = 240$~~

23.  $h = 545$  ft

$\frac{545}{20} = 27.25$

- **Not Showing Your Work** – This example will again show you that the student wrote down the assignment correctly, but did not show their work on all of the problems that they were supposed to.

pg 378-379 (1-18)  
 SYW on 3-4, 6-11, 14-18

~~10.  $x = 5; m\angle 1 = 40^\circ, m\angle 2 = 140^\circ$~~

~~11.  $y = 2, m\angle 6 = 90^\circ, m\angle 3 = 90^\circ$~~

~~12.  $n = 13, m\angle 4 = 130^\circ, m\angle 5 = 130^\circ$~~

} SYW ①

- **Not Reading or Following The Directions** – This example demonstrates that the worksheet told the student to find the area based on the radius that they have found and the student only found the radius, not the area.

**Write and solve an equation to find the radius of the circle given its circumference  $C$ . Use the radius to find the area of the circle. Use 3.14 for  $\pi$ .**

<p>#21 SYW</p> $\frac{37.68}{3.14} = \frac{\cancel{3.14}r}{\cancel{3.14}}$ $12 \text{ in} = r$ <p style="text-align: right;"><u>12 in</u></p>	<p>#22 SYW</p> $\frac{43.96}{3.14} = \frac{\cancel{3.14}r}{\cancel{3.14}}$ $14 \text{ m} = r$ <p style="text-align: right;"><u>14 m</u></p>
<p>#23 SYW</p> $\frac{69.08}{3.14} = \frac{\cancel{3.14}r}{\cancel{3.14}}$ $22 \text{ cm} = r$ <p style="text-align: right;"><u>22 cm</u></p>	<p>#24 SYW</p> $\frac{36}{3.14} = \frac{\cancel{3.14}r}{\cancel{3.14}}$ $11.46 \text{ yd} = r$ <p style="text-align: right;"><u>11.46 yd</u></p>

### Test Data

The purpose for collecting data on my students' tests was to determine if the test checklist would have any affect on the amount of time they took on their tests, the number and type of careless errors made, the letter grade that they received, and their overall attitude about checking their own work. For this reason, I had my students take the first three tests (chapters 7-9) as they normally would and then had them use the test checklist (Please see Appendix A for an example of the test checklist) for the last three tests (chapters 10-12).

Before the students started taking their test, I had everyone write down the same starting time on their test; I had placed a sticker for the information at the bottom of their test. Once a student was completely finished with their test, they brought it up to me and I wrote in the "stop time" and calculated the total amount of time that was spent on the test. Once I was done collecting my time data, I realized that it was hard to see if anything had really changed because

the test times on some tests were longer simply because the test was much longer. Eventually, I decided to calculate the number of minutes spent per problem so that I would be able to compare one test to another, no matter how long the test might have been. When doing this, I had to take the type of problem into consideration. For instance, I decided that a true/false or fill-in-the-blank question would be worth one point and a problem that required the student to show some work to determine the answer would be worth two points. I then found the sum of all of the points on the test and divided the number of minutes the student spent on the test by the number of points to produce the number of minutes spent per problem. I then found the average number of minutes spent per problem for each test and then proceeded to find the average number of minutes spent per problem on tests completed without the checklist vs. completed with the checklist.

In addition to collecting data on the amount of time the students spent on their tests, I also recorded the number and type of careless errors made (based on the list from above), the student's percentage and letter grade on the test. By collecting all of this data, I was able to see if there was a correlation between the letter grade that a student received and the number of careless errors that he/she made or the amount of time spent on a test and the number of careless errors that were made. Beyond making correlations between the number of careless errors and other variables, I was also able to determine the frequency at which each careless error was made. By knowing which careless errors are made most frequently, I can hopefully begin to teach my students some strategies to help prevent them from continuing to make them.

To make my record-keeping easier, I highlighted careless errors as I was grading the tests, so that I would not have to go back and look to see if the students had made a careless error or simply did not understand the concept or problem. I also wanted my students to become more aware of the types of careless errors that they were making. By the end of the project, the first thing that many of the students looked for was if there were any highlighter marks on their papers.

### **Homework Assignments**

The purpose for collecting data on my students' homework assignments was to see if the homework template (see Appendix B for an example of a homework template) would help them to reduce the number of careless errors (as listed above) that they make. I recorded the data on a spreadsheet, so that I could see if there were any patterns that emerged and because I wanted to

know how many students actually turned in their homework when it came time to analyze my data. While the students determined (and I agreed) that late and missing assignments should not be considered “careless”, I still kept track of how many students turned in their assignment late or not at all because I wanted to see if the homework template might have any affect on this phenomenon as well. Perhaps students would be more motivated to turn in their homework if some of the “work” of setting up the paper was done for them.

### **Students’ Attitudes**

The final area that I attempted to collect data on was my students’ attitudes towards the careless errors that they make and going over their tests before they turn them in. To do this, I conducted pre-project and post-project surveys, as well as group student interviews. Before I began my action research, which was the end of March, I had all of my students take a pre-project survey, which was the same as the post-project survey, (see Appendix C) that had them rate themselves on different areas, such as effort, attitude, and how often they make careless errors on homework assignments and tests. Within the same week, I had a group of four boys and four girls take part in a student interview where I asked them more detailed questions about their attitudes towards tests and homework and more importantly about going over their work (See Appendix D for a list of interview questions).

Finally, in mid-May, I gave my students the same survey a second time to see if their attitudes had changed at all or if they had seen a change in the frequency of how often they were making careless errors. I also interviewed the same group of students to ask them about their attitudes at the end of the project and if they thought the test checklist and homework template were beneficial and/or effective (Please see Appendix E for a list of interview questions).

### **Challenges of Data Collection**

Throughout my data collection, there were several situations that may have influenced the results that I received. The timing of this action research was not necessarily ideal because my data was collected during the third and fourth quarters of the school year, which historically is a period of time when students’ work habits tend to decrease. So, the number of late or missing assignments may have been greater than during first semester.

When I began to use the test checklist, there were numerous students who did not follow the directions and rushed through the test checklist or did not use it in the manner that it was intended. I wanted students to use the checklist on each problem that they completed on a test and keep a running tally of how many times they used it as well as how many errors they were able to fix while using it. However, I got several reports from various students who some of their classmates were just doing their test and then making up the tallies at the end. This did not surprise me, but I did not end up using the data from the tally marks in my findings.

When I was grading homework, I noticed there were a few assignments that large portions of my students did not read or follow the directions, which produced extreme pieces of data for those few assignments. I did, however, decide to include those assignments when analyzing my data because I had such a large amount of data, I did not think it would adversely affect my final data calculations.

### **Findings**

Before I present the data that I have collected and analyzed, you should know something about the attitudes of my students. During a student interview before the project began, I asked my students if they thought there was anything that a teacher can do to encourage or push them to check over their work and here is what they shared with me:

“I don’t think that teachers can make you do something, it’s just how you view yourself and how you want to do.”

“I think you have to have the desire to do it, and nobody can really tell you what to do because it’s your life and you have to make your own decisions.”

“I think that teachers can encourage us by offering extra-credit or candy.”

“I think if teachers do give a reward it should be extra-credit, but they shouldn’t have to because it is kind of your responsibility.”

“I’m not quite sure how a teacher could know for sure if every single student has checked over their work or not. If he/she asks them, they could just say yes and be lying.”

“You can never force it. Sometimes when a teacher tries to force something, the students start to get sick of it and they don’t want to do what you are asking them to do.”

“If their friends tell them to do something, it might have more of an impact than if a teacher tells them to do it.”

Knowing how my students felt about me trying to influence their opinions about checking over their work, I proceeded cautiously with collecting and analyzing my data.

### **Homework Data**

As I have said before, my students did three chapters of homework as they normally would; where they set up their papers and they were responsible for writing down the assignment correctly, putting their name on their paper, reading and following the directions, attempting all of the problems, and showing their work on all problems that were instructed to do so. The last three chapters of the school year, I provided them with a homework template, which already had the assignment written down for them, numbered boxes for them to show their work, as well as the abbreviation “SYW” (show your work) for all problems where it was required. The students then just had to write their name on their paper and complete the correct problems that were already set up on their paper for them and show their work on the problems that were designated with “SYW.” My goal was for my students’ homework scores to increase because they were making fewer careless errors and for them to learn more mathematics because some of the “work” of setting up their papers was done for them.

The data that was collected and analyzed showed that the homework template did lead to improvements in some areas. The following table depicts the percentage of students who lost points due to careless errors:

<b>Careless Error</b>	<b>Chapters 7-9</b>	<b>Chapters 10-12</b>
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	<b>(Completed without Homework Template)</b>	<b>(Completed with Homework Template)</b>
<b>Problems Skipped</b>	7.5%	5.95%
<b>Did Not Show Work</b>	9.05%	12.45%
<b>Did Not Follow Directions</b>	.65%	6%
<b>Name Not On Paper</b>	1.75%	1.5%
<b>No Loss of Points</b>	81.05%	83.27%

When the students used the homework template, there were 1.55% fewer students who skipped problems and .25% fewer students who forgot to write their name on their paper. The homework template made it much easier for the students to see that they had forgotten to complete a problem because there was an empty box on their paper. From past experience, I have noticed that students will remember to write their name on a worksheet more often than an assignment from the textbook; I have yet to come up with a reason for this phenomenon, but it might explain the slight increase of students remembering to put their name on their paper. There were increases in the percentages of students who did not show their work or did not follow directions. I believe that the increase of students who did not follow directions may have come from several assignments in chapters ten and eleven where there were large portions of students who did not read and follow the directions. On a positive note, over 80% of my students did not lose points on their homework for careless errors.

Beyond seeing the percent of students who were making each type of careless error, I was also able to analyze which type of error was made most frequently. The following table represents the percentage of each type of error in relation to the total number of errors made:

<b>Careless Error</b>	<b>Chapters 7-9 (Completed without Homework Template)</b>	<b>Chapters 10-12 (Completed with Homework Template)</b>
<b>Problem Skipped</b>	40.4%	35%
<b>Did Not Show Work</b>	47.6%	20%
<b>Name Not On Paper</b>	8.9%	9%
<b>Did Not Follow Directions</b>	3.1%	36%

The data indicates that skipping problems and not showing their work are the more troublesome areas for my students. However, by looking at the previous table it is obvious that the homework template was not the “solution” for this problem, if there is one at all. There was a significant increase in the number of students who did not follow the directions on their assignment when using the homework template. However, I believe the increase stems from the assignments themselves rather than from the homework template.

While the purpose of my action research was not to investigate late and missing assignments, there were some extraneous data that developed throughout the project related to it. I kept track of the number of students who either turned in their assignment late or did not turn it in at all, so that I would know how many students turned in their assignment when calculating the percentage of students who were making (or not making) careless errors and by doing so, I was able to see if the homework template had any effect on the number of students who turned their assignment in late or not at all. The following table presents the percent of students who turned in their assignment late or not at all:

	<b>Chapters 7-9 (Completed without Homework Template)</b>	<b>Chapters 10-12 (Completed with Homework Template)</b>
<b>Late Assignment</b>	2.95%	4.32%
<b>Missing Assignment</b>	4.15%	3.77%

There was a decrease in the number of students who did not turn in their assignment at all and the number of late assignments increased when using the homework template. I would assume that some of the students who normally would have not turned in their assignment at all, turned it in late and that would account for the increase in late assignments and the decrease in missing assignments.

I collected some valuable data about the attitudes of my students towards the effort that they put into their homework and if they review their homework before turning it in. The surveys required the students to give an answer of 1 to 5, where 1 represented never and 5 represented always. The following are the average scores before and after the action research project was completed:

<b>Survey Question</b>	<b>Pre-Project</b>	<b>Post-Project</b>
<b>I review my homework after I get done with it.</b>	2.95	2.9
<b>I lose points on my homework for not showing my work.</b>	2.22	2.07
<b>I lose points on my homework for not doing all of the problems.</b>	2.12	2.13
<b>I put my best effort into my homework.</b>	4.32	4.29

It is apparent that there were not drastic changes made in my students' attitudes, but I did gain some more information about my students' attitudes from the student interviews that I completed. When I asked the students how long they thought it would take them to look over their homework, I received the following comments:

“Hardly any time and it might help improve your score.”

“5-10 minutes.”

“It depends on the assignment and how hard it is.”

I then asked them if they thought the 5-10 minutes that it would take them to look over their work was worthwhile; here are some of their reactions:

“It depends on if you got anything wrong in the first place.”

“It depends on if you are bad at the subject then it might help you, but if you are really good at the subject then it wouldn't help you because you probably got them all right.”

“A lot of times when I do check over my homework, I find mistakes, so yes it is worth my time.”

“It is only worthwhile if you find errors, if you don’t it was a waste of time.”

“On homework, I am pretty confident with what I am doing, so I don’t feel the need to go back over it.”

I also questioned my students about the homework template, if they thought it was beneficial, what they liked about it or did not like about it and they said:

“I liked the homework templates, it made me manage my space better.”

“Well, I’m a really organized person, so I like everything to be on a certain line. When we got the boxes, I didn’t really like them and I still kind of don’t, but that’s because there aren’t any lines. I have to go in order and there wasn’t room and now my homework has gotten really sloppy.”

“Well for me, it’s kind of different because I am a very messy person. It doesn’t really matter to me that there weren’t any lines. It was really nice having it all set up for us. The period, name, and date were written for you at the top of the paper.”

“One thing that I did like about the homework template was when we had assignments out of the book, it had the numbers written down for you because there were two times in the past that I wrote down the wrong number and I did too many problems, so that was a plus.”

“I liked it because it gave you limited space for doing your work. If I didn’t have the boxes to write in, I would just put my problems wherever and now I am more organized and the teacher can read it better.”

“When we would check the regular homework, I would have to ask the person where their answers were at, but with the homework template, you know exactly where their answers should be.”

“I write big and I actually found that it wouldn’t give me enough space.”

From the student interviews, it was evident that a majority of my students preferred the homework template to having to set up their own paper and I must admit that I agreed. It was much easier to read their work, see if they had shown their work when they were supposed to, and see if they had completed all of the problems. The homework template served as my attempt

to remedy the problem of students making careless errors on homework assignments and the test checklist was my attempt to remedy the problem of students making careless errors on tests.

**Test Data**

There were three variables that I was investigating during my action research concerning tests: time, careless errors, and attitude toward checking over work. Before I could begin to analyze data from the tests, I wanted to have an understanding of my students’ attitudes toward checking over their tests. I gained some of my information from the student surveys that they completed before and after the project was completed. Again, the surveys required the students to give an answer of 1 to 5, where 1 represented never and 5 represented always. The following are the average scores for the survey questions that pertained to attitude towards taking tests and checking them over:

<b>Survey Question</b>	<b>Pre-Project</b>	<b>Post-Project</b>
<b>I want to do my best on my quizzes and tests.</b>	4.93	4.93
<b>I feel confident that I have done the best that I can do when I turn in my tests and quizzes.</b>	3.4	3.68
<b>I think it’s important to look over my quizzes/tests before I turn them in.</b>	3.9	4.31
<b>When I look over my tests and quizzes, I find the errors that I have made.</b>	3.07	3.53
<b>I go back over my quizzes and tests before I turn them in.</b>	3.4	3.68

While there was not a significant change in any of the attitudes, I was encouraged to see that all of the averages increased. This means that the students’ began to see the importance of checking over their tests and felt more confident that they did well on their test when they went

to turn it in. I was also encouraged by the fact that almost all of my students say that they always want to do their best on their quizzes and tests; sometimes I wondered.

I found some of the most valuable information during the student interviews that I conducted before the project began. When I asked the students why they thought it might be important to look over their tests, they replied:

“To find careless errors.”

“So you can improve your grade. Tests are a big part of your overall grade, so if you get a good grade on your test, it will make your overall grade get higher.”

“Unless you are 100% sure that you’ve done the problem right, you should look back over the problem because you will be glad that you did when you get your score back.”

I also asked them why they think students do not take the time to check over their tests; their responses were:

“They’re lazy.”

“Sometimes you just really want to get done.”

“When you see the first person done, you try and hurry up because you don’t want to be the person that has to stay after class and finish.”

“I feel like when I go over my tests, I don’t really see anything different.”

“If you did really good on the homework, you might not choose to look over it because you feel more confident. But if you didn’t do well on the homework, you might be more aware of going back over your work.”

“We just did the whole test and don’t want to do it all over again.”

“I don’t know.”

Once I had a good idea of where my students were coming from, I was able to gather data based on what they had been doing and then on what I would like them to do. I separated much of the data that I collected into two categories: tests taken prior to using the test checklist

(chapters 7-9) and tests taken using the test checklist (chapters 10-12). However, I used all of the test data for comparing letter grades received on the test and the average number of careless errors made per student that had received that letter grade. Please see the following table:

<b>Letter Grade Received</b>	<b>Average Number of Careless Errors Made Per Student</b>
<b>A</b>	.87
<b>B+</b>	1.69
<b>B</b>	1.79
<b>C+</b>	2.39
<b>C</b>	3.88
<b>D+</b>	3.24
<b>D</b>	2.67
<b>F</b>	4.25

As you can see from the table, there does appear to be a correlation between the number of careless errors that a student made and the letter grade that a student received. This should seem rather logical because if they made careless errors they obviously lost points on their test, which then lowered their test score. I was particularly interested in the fact that students who received an “A” on their test made, on average, less than one careless error per test. This indicates to me that not only do they understand the material, but they are also working slowly and meticulously to ensure that they are not making careless errors. On the other hand, the students who had received an “F” on their test made more than four careless errors per test. However, there were only three students who received “F”s during the course of this study, so the data could be considered invalid. Also, many times if a student receives a failing grade it is likely due to the student not doing well on an entire section of the test, which might lead us to believe that either he/she did not understand the material or didn’t read/follow the directions (a careless error in itself) and lost many points all at once.

I also analyzed the types of careless errors that were made on tests before and after the checklist was introduced. The following table represents the prominence of each careless error made on tests by the percentage of the total number of careless errors:

<b>Careless Error</b>	<b>Chapters 7-9 (Completed without Test Checklist)</b>	<b>Chapters 10-12 (Completed with Test Checklist)</b>
<b>Not Following Directions</b>	26%	7%
<b>Not Reading the Problem</b>	3%	18%
<b>Did Not Show Their Work</b>	6%	5%
<b>Incorrect Computation</b>	18%	30%
<b>Did Not Show All Steps</b>	4%	1%
<b>Wrong Answer in the Blank</b>	3%	1%
<b>Incorrect Label</b>	6%	5%
<b>No Label</b>	24%	20%
<b>No Name on Paper</b>	0%	.2%
<b>Carrying Down Wrong Number</b>	2%	2%
<b>Skipped Problem</b>	4%	3%
<b>No Answer in Blank</b>	0%	1%
<b>Other</b>	4%	7%

After looking at the table, it became apparent that the careless errors that were most prominent were: reading/following directions, incorrect computation, and putting a correct label with the final answer. If I desire for my students to begin to check over their work, these are the errors that I need to focus on and teach them how to identify and correct them. The other careless errors are not as prevalent, so there is little need to address them because so few students are making them. Another skill that I believe my students were lacking was the ability to slow down and not rush through their tests.

The student survey that was administered provided me with some data about how the students felt about the amount of time they were spending on their tests, both before and after the checklist was utilized. Again, the surveys required the students to give an answer of 1 to 5, where 1 represented never and 5 represented always.

<b>Survey Question</b>	<b>Pre-Project</b>	<b>Post-Project</b>
<b>I feel rushed while taking quizzes and tests.</b>	2.42	2.2
<b>I want to be the first one done with my quiz or test.</b>	1.58	1.44
<b>I take my time on quizzes and tests.</b>	4.27	4.22
<b>The smartest students are the ones that turn in their quizzes and tests first.</b>	2.13	1.98

From the data, I can assume that most students do not feel rushed during their quizzes and tests and they seem to think that they are taking their time. It does not appear that the students believe there is a correlation between how smart someone is and how quickly he/she finishes a quiz or test; which in my opinion is a mature observation for seventh-grade students. When I conducted a group student interview before the test checklist was implemented, I asked the students if they felt rushed while they were taking quizzes and tests and I received a wide range of responses, including:

“No, because I am almost always the last one done.”

“A lot of times I do because everyone is getting up and I don’t want to be the one that everyone is waiting on because that is really uncomfortable.”

“No, because I work fast and I always make careless mistakes and it’s bad and then I wait for someone else to turn in their paper first so that I don’t look like I made those mistakes.”

When I introduced the test checklist, I was hoping that my students would spend more time on their tests, particularly more time reviewing their test before they turned it in. I kept data on the average number of minutes that each student was spending per problem throughout the study and then compared the data from chapters 7-9 to chapters 10-12.

<b>Test</b>	<b>Average Number Of Minutes Spent Per Problem Per Student</b>
<b>Chapter 7</b>	.53

<b>Chapter 8</b>	.36
<b>Chapter 9</b>	.49
<b>AVERAGE FOR CHAPTERS 7-9 (Completed without the checklist)</b>	<b>.46</b>
<b>Chapter 10</b>	.82
<b>Chapter 11</b>	.52
<b>Chapter 12</b>	.67
<b>AVERAGE FOR CHAPTERS 10-12 (Completed with the checklist)</b>	<b>.67</b>

It was easy for me to see that students were spending more time on their tests using the checklist. As a matter of fact, they were spending about 15 seconds more on each problem when they were using the checklist. This may not sound like a significant increase, but on a 25-question test, a student would spend about 6.25 minutes more to complete their test and considering that most of my students spent at most about 30 seconds to go over their tests before this study was done, that is a significant difference.

I also wanted to see if there was a correlation between the average number of minutes spent per problem and the letter grade that the student received. The following table depicts my findings:

<b>Letter Grade</b>	<b>Average Number Of Minutes Spent Per Problem Per Student (W/o Using The Checklist)</b>	<b>Average Number Of Minutes Spent Per Problem Per Student (Using the Checklist)</b>
<b>A</b>	.376	.691
<b>B+</b>	.489	.624
<b>B</b>	.455	.677
<b>C+</b>	.398	.679
<b>C</b>	.522	.604
<b>D+</b>	.504	.602
<b>D</b>	.38	.763
<b>F</b>	.383	0 (n = 0)

Based on the data that I collected, it did not appear as though the number of minutes spent per problem had a significant impact on the letter grade that a student received. I found it interesting

that the students who earned As, Ds, and Fs actually spent less time per problem than the other students who received more median grades. This might indicate that the students who earned an A truly knew and understood the material and were able to work faster and the students who earned Ds and Fs probably did not understand the material and simply rushed through it to get the test over with. I was encouraged by the fact that all of the students, no matter what letter grade they earned, spent more time per problem when they completed the test with the checklist, which again indicates that the checklist helped the students slow down while taking their tests.

Once I had implemented the test checklist, I asked the students to complete a very short survey, after each checklist, about how much effort they put into using the test checklist, how confident they felt that they had found all of their careless errors, and if they thought it was beneficial. The survey required the students to rank their effort and confidence on a 1 to 5 scale, where 1 is the lowest and 5 is the highest. I found the average score for each category and separated the data by chapter so that I could see if the students had “grown” over time.

	<b>Chapter 10 Test Checklist</b>	<b>Chapter 11 Test Checklist</b>	<b>Chapter 12 Test Checklist</b>
<b>Effort Given on the Checklist</b>	<b>4.15</b>	<b>3.98</b>	<b>3.85</b>
<b>Confidence That All Careless Errors Were Found</b>	<b>4.16</b>	<b>4.38</b>	<b>4.11</b>

It appears as though the students’ effort actually decreased over time, but it also looks like the students’ gained some confidence in finding their careless errors.

I also wanted to see if the students found the test checklist to be beneficial to them and why, so I had them write a short statement at the end of their checklist. Some of the students who believed the test checklist to be beneficial, wrote:

“Yes, it helped me look through to make sure everything was right.”

“Yes, I found lots of labels missing when I went over my test.”

“Yes, because when I went back to check calculations, not all of them were correct the first time.”

“I did find it beneficial, but it made the test a lot longer.”

“Yes because it makes me think if I am doing the problem correctly.”

“Yes, because it helped me with which questions I needed to ask myself.”

On the other hand, there were some students who did not find the test checklist to be beneficial and there were others that were undecided about the test checklist. Here is what they had to say:

“Not really because I have my own method of checking that works fine.”

“No because I didn’t find any careless errors.”

“No, because you have to go back and forth and it takes forever and then I can’t concentrate on the test.”

“Not that much, after a while it’s just a habit to check over your test.”

“Yes because it makes you think about your mistakes and no because you have to go back over every problem and that takes a lot of time.”

Overall, the test checklist has proven to be of use to most students and it met its purposes; give the students a list of questions for them to use to go over their work and make them spend more time on their tests.

To complete my action research, I completed one more student interview where I asked the students to convey what they had learned over the course of the project. Here is what a few of them expressed to me:

“I think I make less careless errors because I am wanting to go over it more because I know that it will make my test grade go up.”

“I think that once we started doing the checksheet and stuff, I’ve become more attentive and started to think about not making as many errors and it’s basically just a habit now to double check my work.”

“Once I saw that the checklist was actually helping me find the careless errors, I began to realize how many I was actually making and that made me want to check over my tests more and more.”

“Before I didn’t go over my work unless I was really unsure about a problem because I thought it was kind of silly and a waste of time, but now I have figured out that it isn’t and I found a bunch of my errors.”

### **Conclusions**

The first conclusion that I was able to draw from my action research was that my students truly do want to do their best on their tests and most of them do not intentionally rush through their tests just to get them done. I also found that they didn’t spend as much time reviewing their tests as I would like them to because they had never been taught how to check over their work; they thought they were doing what I was asking them to do just by looking over their test for neatness.

Second, I found that students do not check over their homework and the homework template did not necessarily aid in that process. However, many students did appreciate that the homework template helped them to organize their paper and make it more obvious if they forgot to do a problem. It also made grading their homework much easier for the other students, as well as me; their work was much more organized, neater, and easier to read. My research also helped me to realize that a large portion of my students were not making careless errors on their homework, so it is really more of an issue of helping a few students who need to pay more attention to what they are doing while completing their homework.

Finally, I found that the test checklist may not have decreased the number of careless errors that my students made, but it did force them to spend a little extra time on their test.

Because my students had never been taught how to check over their work, the checklist provided them with a list of questions to ask themselves while taking a test. Based on the comments made by my students, I feel that they were able to walk away from my classroom with a “toolbox” of strategies to help them identify and correct their careless errors on future tests.

I know that the problem of careless errors is not unique to my students or my classroom; it is a dilemma that many teachers in many classrooms face. I think that the biggest service that teachers can provide for their students in defense of careless errors is to teach them how to find their careless errors and how to take their time on their tests. Help students identify their problematic areas and develop their own strategies that help them find their errors. I believe that I was trying to control my students and how they went about completing their tests and homework when I should have been helping them solve the problem in their own way.

### **Implications**

My first course of action, in regards to my students’ careless errors, is to teach my students what to look for when they go over their tests. Many of my students thought that all they needed to do was make sure that each problem was completed and done neatly. I need to teach them how to examine their work for accuracy and I plan to do that by providing them with a list of questions that they can ask themselves as they look over their tests. I do believe that the test checklist provided that list of questions, so I plan to continue to use the test checklist in the future. However, I do not plan on using the tally system or the survey at the end of it. As a matter of fact, my plan is to put only the questions on a piece of cardstock paper and laminate it as a coversheet for my students. By doing this, my students will not only have the list of questions that they need to find their careless errors, but also something to shield their test from wandering eyes.

I also think that it would be beneficial to give my students opportunities to practice finding errors within a problem. One way that I plan to do this is by giving my students warm-ups where they see how a fictitious student solved a problem and they have to identify what he/she did wrong. Perhaps if I model this in class, it will become easier when they are doing it on their own.

Throughout the course of my action research, I saw the benefits of highlighting my students' careless errors on their tests. When I handed back their tests, many of my students would first look to see if they had anything highlighted; this showed me that they were working hard to make sure that they reduced the number of careless errors that they made. I think that it might also be beneficial to pass back their tests and have them highlight their errors that they consider "careless." In my school district, we provide students with the opportunity to relearn and re-test over the material that they did not do well on. However, in order to re-test, students are required to demonstrate that they have relearned the material and are prepared to do better on the re-test. During this next school year, I plan to have my students write a statement that explains what he/she did wrong and then re-work the problem along with a few extra practice problems to prepare for the re-test. I think this will help my students identify their errors and hopefully heighten their awareness for not making the same mistakes again.

Lastly, I intend to offer the homework template to any of my students who would like to use it. Instead of making a homework template for each assignment and requiring my students to use it, like I did for my action research, I will use a more generic homework template. This template would require them to write in the assignment, number the boxes, and pay attention to which problems they are to show their work on. It may not prevent students from writing down the assignment incorrectly, forgetting to do problems or showing their work, but it will help

some students organize their work better than on an ordinary piece of paper. By doing this, the students can choose for themselves the most effective way to complete his/her assignment.

The homework template and checklist have proven to be effective in a very generic manner for most students, so I will make them available to my students if they so choose to use them. After all, the students have said all along that they have to have the desire to do well; it is not something that I can give them or do for them.

## References

- Brown, A. (1988). Motivation to learn and understand: On taking charge of one's own learning. *Cognition and Instruction*, 5(4), 311-321.
- Blando, J., Kelly, A., Scheneider B., & Sleeman D. (1989). Analyzing and modeling arithmetic errors. *Journal for Research in Mathematics Education*, 20(3), 301-308.
- Clarkson, P. (1983). Types of errors made by Papua New Guinean students. *Educational Studies in Mathematics*, 14(4), 355-367.
- Clements, M.A. (1982). Careless errors made by sixth-grade children on written mathematical tasks. *Journal for Research in Mathematics Education*, 13(2), 136-144.
- Fuchs, L., Fuchs, D., & Phillips, N. (1994). The relation between teachers' beliefs about the importance of good student work habits, teacher planning, and student achievement. *The Elementary School Journal*, 94(3), 331-345.
- Meers, G. (1950). Check sheet for errors. *The English Journal*, 39(3), 160-161.
- Movshovitz-Hadar, N., Zaslavsky, O. & Inbar, S. (1987). An empirical classification model for errors in high school mathematics. *Journal for Research in Mathematics Education*, 18(1), 3-14.
- National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: Author.
- Radatz, H. (1979). Error analysis in mathematics education. *Journal for Research in Mathematics Education* 10(3), 163-172.
- Van Kraayenoord, C. & Paris, S. (1997). Australian students' self-appraisal of their work samples and academic progress. *The Elementary School Journal*, 97(5), 523-537.
- Watson, I. (1980). Investigating errors of beginning mathematicians. *Educational Studies in Mathematics*, 11(3), 319-329.

## Appendix A

## Chapter 10 Test Checklist

Name \_\_\_\_\_

Please go over this checklist for each question that you do on your test.

<b>TALLY:</b>			
Did I follow the directions?	Yes	No	
Did I show all of the steps that led to my solution?	Yes	No	N/A
Did I double-check my calculations?	Yes	No	N/A
Did the answer written in the blank match the answer I found?	Yes	No	N/A
Did I include a correct label?	Yes	No	N/A
Does my answer seem logical?	Yes	No	N/A

Once you are done with your test, please answer the following questions.

1. On a scale of 1 to 5 (1 being the lowest and 5 being the highest), how much effort did you put into using the checklist?
2. Out of the thirty questions that were on this test, how many questions would you say you used the checklist on?
3. When you used the checklist, how many careless errors did you actually find?
4. On a scale of 1 to 5 (1 being the lowest and 5 being the highest), how confident are you that you found all of the careless errors on your test?
5. Did you find the checklist to be beneficial? Why or why not?



#10	SYW	#11	SYW
#12	SYW	#13	SYW
#14		#15	
#16	SYW	#17	SYW

#18	SYW #19 SYW
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**Appendix C**

**Post-Project Survey**

Name \_\_\_\_\_  
 Period \_\_\_\_\_ Date \_\_\_\_\_

**Please give your honest response to each statement using the following scale:  
 1=never, 2=rarely, 3=sometimes, 4=almost always, 5=always**

- |  |   |   |   |   |   |
|--|---|---|---|---|---|
| 1. I want to do my best on my quizzes and tests.   | 1 | 2 | 3 | 4 | 5 |
| 2. I think it's important to look over my quizzes/tests before I turn them in.                   | 1 | 2 | 3 | 4 | 5 |
| 3. When I look over my tests and quizzes, I find the errors that I have made.                    | 1 | 2 | 3 | 4 | 5 |
| 4. I feel confident that I have done the best that I can do when I turn in my tests and quizzes. | 1 | 2 | 3 | 4 | 5 |
| 5. I feel rushed while taking quizzes and tests.   | 1 | 2 | 3 | 4 | 5 |
| 6. I want to be the first one done on my quiz and test.  | 1 | 2 | 3 | 4 | 5 |
| 7. I go back over my quizzes and tests before I turn them in.                                    | 1 | 2 | 3 | 4 | 5 |
| 8. I take my time on quizzes and tests.  | 1 | 2 | 3 | 4 | 5 |
| 9. The smartest students are the ones that turn in their quizzes/tests first.                    | 1 | 2 | 3 | 4 | 5 |
| 10. I review my homework after I get done with it.   | 1 | 2 | 3 | 4 | 5 |
| 11. I lose points on my homework for not showing my work.  | 1 | 2 | 3 | 4 | 5 |
| 12. I lose points on my homework for not doing all of the problems.                              | 1 | 2 | 3 | 4 | 5 |
| 13. I put my best effort into my homework.   | 1 | 2 | 3 | 4 | 5 |

14. On quizzes and tests:

a) I forget to do problems.	1	2	3	4	5
b) I don't show my work on problems.	1	2	3	4	5
c) I make basic computation errors. Example: adding incorrectly	1	2	3	4	5
d) I forget to put a label on my answer.	1	2	3	4	5
e) I show my work on a problem, but don't find a solution.	1	2	3	4	5
f) I don't follow the directions, even though I read them.	1	2	3	4	5
g) I forget to read the directions.	1	2	3	4	5
h) I don't show all of the steps that lead me to a solution.	1	2	3	4	5
i) I forget negative signs.	1	2	3	4	5
j) I forget to write my name on my paper.	1	2	3	4	5
k) I write down a wrong number. Example: 4 becomes 9 or 34 becomes 43	1	2	3	4	5
l) I get the correct answer, but write the wrong answer in the answer blank.	1	2	3	4	5

Other Comments:

## Appendix D

### Pre-Project Interview Questions

1. Why do you think students make careless errors?
2. What kinds of careless errors do you think students make the most?
3. If you don't look over your quizzes/tests, why not?
4. Why do you think it's important to look over your quizzes/tests/homework?
5. Which classes you currently look over your assignments in? Why?
6. Do you think there is anything that a teacher can do to encourage/make you look over your work? Why or why not? Is it strictly an intrinsic behavior?
7. Do you check over your homework when you are done with it? Why or why not?
8. How long do you think it would take to look over your homework once you are done?
9. How long do you spend (on average) on your math homework each night?
10. What sorts of things do you look for if you do check over your work? Do you find those things?
11. Do you feel rushed when you take quizzes/tests? Why?
12. If you know that going fast produces careless errors, why do you continue to do it?
13. If you do look over your assignments, what class do you feel like it is most important to do so?
14. Do you think that a teacher can tell if you really understood a concept or if you just made a careless error?

## Appendix E

### Post-Project Interview Questions

1. If you did not recognize the importance of checking over your quizzes/tests before the project, do you understand it now?
2. Do you think you spend more time going over your quizzes/tests now at the end of the project?
3. Do you think you make fewer careless errors now?
4. Do you feel more confident when you turn in your tests/quizzes now?
5. Do you find yourself checking over work in other classes now?
6. Do you check over your homework before turning it in now?
7. Are you finding more of your careless errors on quizzes/tests/homework now?
8. Do you think you are more careful while solving problems the first time?
9. What are your feelings about rushing through quizzes/tests now?
10. Do you think that you will continue some of the strategies that we used during the project in the future?
11. What have you learned throughout the project?
12. What did you like and/or dislike about the homework template?
13. Next year, do you think the checklist would work well as a coversheet for tests and quizzes?
14. Do you think you will be able to take some of the strategies that we have been working with and use them next year on your own?