Standards-Based Grading Rubrics in Elementary Mathematics

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Introduction

As a new teacher I was aware of many of the challenges ahead of me. Something I was not expecting was to be two years in and still have no idea what level my students were performing at in regards to mathematics concepts. In addition to this, even if I knew their misconceptions, I couldn’t effectively group them or differentiate my instruction to meet their needs. Some of this came with getting to know new curriculum and learning my students, but I will be teaching third grade again this year, so no more excuses. Last year I was discovering which students grasped the concepts and those who didn’t at the end of the chapter when there was nothing I could do about it. Lesson after lesson went the same way...introduce a new concept, model it, complete example questions with the whole class and then turn them loose to finish the problems. I would circulate around the class working with students that didn’t seem to grasp the concept, but never noted who they were so I could pull a strategy session later. Enrichment consisted of an extra problem solving page given to the students who finished early in order for the other students to have time to finish. Going into my third year teaching I wanted this to change. I am using the same curriculum as last year and I have a better idea of what this age group of students is capable of, which will be an asset to me in planning my objectives for the year.

Starting Point

The subject of my action research is what effect creating standards-based grading rubrics have on my students understanding of math concepts, as well as my ability to better accommodate their needs. I decided to develop a rubric to go with each quiz, mid-chapter check point and chapter test that corresponds to the objectives taught during lessons. I have some students who understand everything you teach them, others don’t get any of it, and most fall somewhere in between. It is difficult to know who fits into each category because their understanding changes from day to day, topic to topic. I have a very difficult time keeping up with who “gets” what, and who needs more help because of this. The rubric would identify the objectives of the chapter, section, lesson, etc. and the corresponding math problem(s) that were required to show understanding of that objective. Once scored it would tell where weaknesses lie. It is something that could potentially help both myself, in keeping track of everyone, and my students, by showing them (and their parents) exactly what they are missing. I will focus my research with these questions:

- Does providing students, and their parents, with a standards-based grading rubric showing current skills and areas for improvement help their overall understanding of math concepts?
- Will I be better able to differentiate instruction by utilizing a standards-based grading rubric and placing students into flexible groups based on their need?

Literature Review

Since the enactment of the No Child Left Behind policy, schools and teachers have been testing the effects of standards-based assessments on student achievement. Although there are some contradicting results, each of the resources examined found standards-based assessments to
be useful and beneficial for both teachers and students if they are used appropriately. Their function is to document student and teacher progress, provide feedback to the student and their family as well as the teacher, and to inform instructional decisions (Standards-Based Grading Presentation. 10). According to the *No Child Left Behind Issue Brief*, “Standards-based reform hinges on the premise that clear expectations prompt greater effort from both teachers and students on specific achievement targets” (Education Commission 2002. 2). They give criteria for desirable features of assessments, such as, having these tasks involve activities that are valued in their own right in addition to engaging students in “real-world” problems rather than artificial tasks. It also states that assessments should lead to improved learning by engaging students in meaningful activities that are intrinsically motivating, while at the same time, providing a mechanism for staff development (Education Commission 2002 pg. 3). Additionally, Patricia Scriffiny(2008) identifies seven reasons for using standards- based grading. She states that grades should have meaning, rather than a simple letter that explains nothing, grades should help to inform instruction. She describes how to challenge the status quo by assigning homework that is based on learning objectives and applies directly to the assessment they will be given. Whether required to use a point system or not, Scriffiny explains, teachers can control grading practices by using a standards-based system and avoiding averages. Standards-based grading also reduces meaningless paperwork, helps teachers adjust instruction, and teaches students what quality looks like. She calls standards- based assessments “a launch pad to other reforms” because once they are in place teachers realize their entire practice needs to be reevaluated (pgs. 1-3). It is believed that these improvements will directly translate into higher student achievement.

An excerpt found in Robert Marzano’s book, *Formative Assessment & Standards-Based Grading*, explains that teachers can create standards-based assessments in multiple ways. He describes three types of classroom assessment: obtrusive (lessons stop to take test), unobtrusive (assessment is within lesson), or student generated (where students choose their own manner for demonstrating knowledge (2010. 23-25). These provide teachers a variety of options for creating formative and summative standards-based assessments to meet the needs of their students. They also supply teachers with a medium through which instructional feedback can be given. All of these options are seen as ways to improve student learning through standards-based assessment.

However, there exists a body of research where the results were unclear as to whether standards-based assessments had a positive or negative effect on student achievement. In these cases, assessments were used appropriately/ inappropriately and evaluated to determine the effect on students. Lauer et al, in *The Influence of Standards on K–12 Teaching And Student Learning: A Research Synthesis*, made an interesting argument. They state,

In cases where testing content and format do encourage problem-solving and open-ended reasoning, there is some indication that pedagogy is adjusted accordingly…In the best of cases, standards-based assessment programs appear to influence teachers to adopt a range of reform-based classroom practices that are consistent with these assessments…The available research, however, reveals several issues with respect to the choices teachers are making in response to standards-based assessments (2005. 93).

The studies that showed poor results were ones where teachers did not use the assessments to inform their instruction, deviated from the standards, or taught the material covered on the tests and nothing else. The evidence supports positive outcomes for assessments used properly.
**Methods**

Administer Student Pre-survey

Identify Curriculum Topics ↔ Chapter Objectives

Create standard-based rubric for check point 1

Pilot

Review Student Performance

Place students in appropriate groups

Re-teach, support, or provide enrichment opportunities to students

Create standard-based rubric for check point 2

Implement

Repeat review, placement of students and teaching opportunities

Create standard-based rubric for summative chapter test

Compare and contrast student performance and administer post surveys to students and parents

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**Timeline:**
September through October (First term of school)
Data collection

Research questions:

- Does providing students, and their parents, with a standards-based grading rubric showing current skills and areas for improvement help their overall understanding of math concepts?
- Will I be better able to differentiate instruction by utilizing a standards-based grading rubric and placing students into flexible groups based on their need?

I will be incorporating many forms of data, or triangulating my research, to get a better picture of my study. I want to look at this issue from multiple viewpoints to maintain objectivity. I want the teacher, student and parent perspective to eliminate bias and help inform my instruction.

At the start of the school year students will be given a survey of current abilities and beliefs about themselves as mathematicians and their understanding of math concepts. A similar survey will be administered at the end of the study/quarter in late October. I will be utilizing surveys from both students and their parents to determine the effectiveness of standards-based grading rubrics outside of the classroom. I will also be using these to assess whether the rubrics have had a positive effect on students’ attitudes about themselves and their ability to succeed at mathematics. While the student surveys will be given before and after the research period, parents will only be asked to share their thoughts after the project has completed. They will be asked to describe the rubrics’ usefulness in improving student scores and determine whether it was affective to send home rubric with student assessment.

Assessment scores from math quizzes, tests and progress monitoring assignments will be analyzed to observe positive or negative trends in student achievement. These will be given weekly or as they come up in the sequence of the unit. The students’ scores on these assessments will be graded against standards-based grading rubrics. Students will receive either “Secure, developing, or needs re-teaching” for each of the objectives. These will be recorded to create groups and determine overall strength in this particular area. Then students will receive enrichment, support, or re-teaching. They will also serve as a comparison for before and after implementing the rubrics.

Charts will be used to show flexible grouping determined by the assessment scores. Student names will be recorded down the side with the assessment questions across the top. The boxes corresponding to the child’s name are filled in if a problem was solved incorrectly. By doing this after each assessment students can be grouped with others who need the same skills.

I will be collecting notes on a daily basis in a teacher journal. My thoughts will reflect how practices have changed over time and positive or negative effects on the classroom and students achievement. The journal contains four columns for the date, objectives for the lesson taught and special materials needed, how the lesson went with suggestions for the future, and general comments and observations made by myself, or the students (see appendix).

A copy of the rubrics with teacher feedback will be kept on file throughout the research project. These will be used to determine if there are any trends found with certain students requiring re-teaching after each assessment. If students repeatedly need re-teaching, regardless of the concepts being covered I will investigate further to see if it is the rubric failing, my
teaching style or if the students might be in need of additional services in mathematics instruction.

Observational notes from a mentor teacher will be collected during two classroom visits. One visit will occur two to three weeks into the term to observe classroom norms and student interaction during mathematics lessons. The second observation will take place at the conclusion of the research period. Use of an open ended checklist will guide the first observation to determine what changes are occurring in the classroom. A predefined checklist will be given for the second visit to look for specific student learning evidence aligned with the lesson objectives.

Data Analysis

At the conclusion of the research period I will compile the data collected and look for any trends that may occur.

The surveys given to students at the beginning of the quarter will be compared with those administered at the completion of the project. The student surveys were not anonymous and are scored using ratings of 1-5 with 5 being the highest. The pre and post survey from each child will be compared to determine if the rubrics had a perceived effect on the student’s understanding of the concepts covered and their confidence in math. The parent survey will be used to supply feedback and suggestions for whether it will be beneficial to implement the standards-based grading rubrics through the remainder of the school year. This will also be used to determine whether it is useful to send the rubrics home with students, or if this intervention is only effective at school.

I will document the students’ progress on assessments throughout the research period in 2 areas. One will be whether their check point and test scores increase after utilizing the grading rubric. The students’ scores on the first assessment will be compared with those from the end of the study. Since the objectives will not be the same I will be looking for the percentage of correct answers to increase. The other way I will monitor their progress will be by documenting the percentage of times the student needed re-teaching for the same objective, or how many “needs re-teaching” scores they received throughout the research period. It is possible that students may show a negative trend in their grades that is not correlated to rubric use, but rather the difficulty of the material or an undiagnosed learning disability. I will watch for students requiring repeated re-teaching and take the necessary steps toward getting them the assistance they need.

I will use charts throughout the study to create flexible groups for instruction based on the students’ score on the grading rubric for that particular assessment. These will be analyzed as the project continues, but will also aid me in having a visual representation of those students in repetitive need of re-teaching.

The last forms of data will be used to help me in reflecting to determine if I have accomplished my goals for the project. I will have my own data written in a teacher journal, as well as feed back from two mentor teacher visits. I will look for connections between lessons I thought went well (or didn’t) and student comments compared against the scores they received on the assessments. I will also create an instructional timeline (Sagor 2000) and judge by my written notes and observations whether my differentiated instruction was beneficial or made no difference. The mentor notes will be looking at two separate aspects of my teaching, so I will be looking for any overall growth as an educator reflected in the mentor checklists.
References


**Parent Survey**

Please answer the following questions regarding your student’s performance in mathematics this term. Use the scale below to help guide your answers:

1 = Strongly Disagree  
2 = Disagree  
3 = Neutral  
4 = Agree  
5 = Strongly Agree

<table>
<thead>
<tr>
<th>Question</th>
<th>Please Circle one</th>
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</thead>
<tbody>
<tr>
<td>1. My child was confident in their mathematics abilities before receiving the grading rubric…</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>2. My child is confident in their mathematics abilities now…</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>3. I find it easier to work with my student on their mathematics homework using the grading rubric…</td>
<td>1 2 3 4 5</td>
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<tr>
<td>4. I find it easier to help my student study for a test using the grading rubric…</td>
<td>1 2 3 4 5</td>
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<tr>
<td>5. The grading rubric gives an accurate representation of my student’s understanding of mathematics concepts covered…</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>6. I think my student’s understanding of mathematics concepts has improved since the implementation of grading rubrics…</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>7. I think my student’s academic needs are being met in mathematics instruction…</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>8. The grading rubric is written in a format that is easy to understand…</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>9. I would like to see the rubrics continue throughout the school year…</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>10. I am pleased with the overall effect grading rubrics have on my student’s mathematics instruction…</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

Please indicate below any comments or questions you have about this survey or regarding mathematics grading rubrics.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Optional: ___________________________  

Parent Name ___________________________  
Student Name ___________________________
# Teacher Journal

<table>
<thead>
<tr>
<th>Date</th>
<th>Lesson Objectives and Special Materials Needed</th>
<th>Outcome of Lesson Future Suggestions</th>
<th>General Comments by Students or Teacher</th>
</tr>
</thead>
<tbody>
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</table>
### Example of Standards-based Grading Rubric

Name________________________________________

Chapter 9 Fractions and Measurement: Diagnostic Checkpoint pg. 531

<table>
<thead>
<tr>
<th>Objective</th>
<th>Example</th>
<th>Problems</th>
<th>S</th>
<th>D</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name fractional parts of a set</strong></td>
<td>8 boys and 4 girls went to the zoo. What fraction of the students are boys? 8/12 or 3/4</td>
<td>1, 3,4</td>
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<tr>
<td><strong>How much of the “whole” is it?</strong></td>
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<tr>
<td><strong>Find fractional parts of a set</strong></td>
<td>Sam used 1/3 of a carton of eggs. There are 12 eggs in a carton. How many eggs did he use? 4</td>
<td>5, 6</td>
<td></td>
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<tr>
<td><strong>Divide to find the fraction of a set</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Add and subtract fractions with same denominators</strong></td>
<td>1/4 + 2/4 =3/4</td>
<td>7,8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Use mixed numbers to name fractions greater than 1</strong></td>
<td>2 ½ sandwiches</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Whole numbers and fractions</strong></td>
<td></td>
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</tr>
<tr>
<td><strong>Solve a problem by solving a simpler problem</strong></td>
<td>How many squares are in this quilt? Find large squares made up of small squares. 14 squares.</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Key* Student is:

S= Secure in understanding, D= Developing understanding (need more practice and support), R= Requiring Re-teaching (not understanding objective)