

Teaching Writing in Science Through the Use of a Writing Rubric

by

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Chapter One

Purpose

This action research project investigates the use of a rubric for teaching and assessing expository writing in science for junior high students. This project explores how teachers and 7th grade students use rubrics in science, and how teaching a writing rubric affects students' performance and assessment in expository writing in science.

Interest in this project stems from the effort that teachers and administrators at this school put forth to improve students' learning of science concepts and skills, as well as to improve students' performance in authentic assessment and standardized tests.

In the 1995-96 school year, the State of Michigan first included questions on the science portion of the Michigan Educational Assessment Program (MEAP) that required written responses in essay form. At that time, scores dropped statewide in the science portion of the MEAP. This discrepancy generated more interest in improving students' performance in the science portion of the MEAP among many school districts in Michigan. In this district the same students who performed poorly on the science portion generally scored as well or better in the writing or language arts portions of the MEAP. A higher interest was generated in this researcher in studying and improving students' writing skills and performance of those writing skills on science assessments, whether authentic or standardized.

My hypothesis was teaching students to use a rubric to write and assess expository essay responses would produce higher quality essays than if a writing rubric was not used for instruction. My hypothesis was based on previous experiences I have had using a writing rubric in my science classes and the time I served on an elementary school

writing committee. I have assumed that the use of rubrics in writing are beneficial. How beneficial are they?

Chapter 2

Introduction to Rubrics

Assessment is a major aspect of teaching and learning. It enables teachers to provide feedback to students and at the same time gives teachers direction for pedagogical decisions. With such potential for insight lies great responsibility for choosing appropriate assessments within the classroom. With that responsibility, many factors must be considered when choosing assessments for curriculum taught: reliability and validity of measures, equitability for all students, ease in administration, meaningfulness of data produced, and benefits for the child (Solomon, 1998). A teacher must think like an assessor knowing for what and where to look for evidence of students' level of understanding of any concept or skill taught (Wiggins & McTighe, 1998).

One type of tool that educators have developed for the task of assessment is the rubric. According to Solomon (1998),

“Rubrics can be defined as a set of guidelines for distinguishing between performances of products of different quality. A rubric is an assessment tool that verbally describes and scales levels of student achievement on performance tasks, but it can also be associated with more conventional alphanumeric and numeric scores or grades” (p. 120).

Rubrics are designed to tell what matters, or the instructional expectations of the teacher, and the level of quality reached for those instructional expectations (Andrade, 1997).

Rubrics met Solomon's (1998) expectations for appropriate assessments. He considered them reliable and valid, equitable, easy to administer, meaningful, and a benefit for the child. Rubrics can be authentic and performance based assessments that consistently giving teachers, students, and parents a clear understanding of strengths and weaknesses of students' performance. This reliability allows students to assess themselves and peers

as well, promoting student responsibility for learning. Rubrics can be written to accommodate students' needs and abilities providing equity in the classroom and can be stretched in gradation for assessment for all types of learners. Teachers save time by using rubrics in their student assessment. The grading outline is clearly defined before an assignment is even given. Finally, rubric assessment provides meaningful language to describe student achievement rather than an empty alphanumeric grade (Andrade, 1997).

One major advantage of using rubrics for assessment is that they can be designed and written by the teacher. The designed rubrics can be developed and perfected over time as they are used. They can be customized to meet different needs of the teacher or students. The teacher can check for reliability and validity, and equitability for all students.

Figure 1, developed by Solomon (1998, pp. 120-121), outlines criteria for successful rubric writing.

- They are understandable to students
- The scores of the scale are equidistant on a continuum (at least four scores are suggested)
- Descriptors are valid (test what you want them to) and scores are reliable (consistent)
- The highest point (level) may be above the result of the performance standard
- Scores relate to empirically validated actual levels of student performance
- The scale types include holistic (overall performance) and analytic (dimensions); the assessment of a student performance should include both types
- They make explicit to students, parents, and administrators the criteria for student achievement
- They can be used by student to assess their own performance and the performance of other students

Figure 1. Criteria for Creating Rubrics

Properly written rubrics promote students' thinking and learning. They are instructional in their use and can even be instructional in their development. A well-written rubric not only instructs students in how to accomplish any given task, but guides

them in what to avoid in order to perform the task well. As students work through a task with the use of a rubric, self-assessment is a natural process. Students continually compare their product against the criteria of the rubric as they think and learn about what constitutes quality work. Teachers are encouraged to include students in developing rubrics. Powerful instruction of quality work is delivered when teachers and students work together to design a rubric (Andrade, 2000).

Some recommendations for developing specific rubrics are made by Kathleen Montgomery (2000). First, decide what characteristics determine well done and not so well done work. Studying samples of students' work is helpful. Next, list the criteria of instructional expectations, or what is important in developing the product that will be assigned. After the quality and instructional expectations are determined, gradation of that quality should be matched with appropriate criteria listed. An excellent product will have all of the instructional expectations. A poorly done product will have little or none. The middle gradations can be more easily filled when the teacher predicts common problems students might have. Finally, test the rubric on sample work. Have students evaluate and question using the rubric. Revise the rubric as needed.

Writing rubrics may be intimidating at first; however, there are many resources available for teachers to access rubrics for adaptation. Internet rubric banks are one of those resources. In the following figures are two examples of rubrics found in an internet rubric bank as displayed by the Chicago Board of Education (2000). In Figure 2, a portion of a rubric is outlined. It assesses hypotheses, one of the six parts of the scientific method: purpose, hypothesis, materials, procedure, results, and conclusion. While one might consider stating a hypothesis as a relatively simple task, much insight may be

obtained as to students' level of performance by comparing students' responses with criteria listed on the rubric. A quick assessment will rank a student from novice to distinguished and determine students' depth of understanding of hypotheses writing. The assessment can also be longitudinal following students' improvement over time.

<u>Scale III: Hypothesis</u>	
Distinguished	Predicts with correct facts and creates a new hypothesis
Proficient	Predicts with correct facts
Apprentice	Predicts with some facts
Novice	Guesses

Figure 2. Norwood Park Draft Science Lab Rubric

Figure 3 is a complete holistic scoring guide for tasks generated in science, mathematics, and social studies. Unlike the rubric in Figure 2, this scoring guide does not provide qualifiers such as distinguished, proficient, apprentice, or novice. Rather a score of 0 to 4 is assigned for students' level of performance. In this particular rubric, a zero is only assigned when no attempt of the task was made. As with any rubric, an alphanumeric grade might be assigned for level of performance as determined by the teacher.

The Typical Rubric Model (Erickson, 1995, p.164) in Figure 4 outlines the continuum of performance in five levels. It is designed to help rubric writers organize criteria for assessment. It uses the same numerical qualifiers as the holistic guide in Figure 3.

304 Kentucky Open-Ended Scoring Guide for Grade 8 Mathematics, Social Studies and Science

Source: Kentucky Department of Education

Subjects:	Science, mathematics, Social studies	# of scales	1
Grade(s)	8	# of scale points	5

Holistic Scale

- 4 The student completes all important components of the task and communicates ideas clearly.
- The student demonstrates in-depth understanding of the relevant concepts and/or processes.
- Where appropriate, the student chooses more efficient and/or sophisticated processes.
- Where appropriate, the student offers interpretations or extensions (generalizations, applications, analogies).
- 3 The student completes most important components of the task and communicates clearly.
- The student demonstrates understanding of major concepts even though he/she overlooks or misunderstands less important ideas or details.
- 2 The student completes some important components of the task and communicates those clearly.
- 1 Student shows minimal understanding.
- Student unable to generate strategy or answer may display only recall. Answer lacks clear communication.
- Answer may be totally incorrect or irrelevant.
- 0 Blank/no response.

Note: Scale points are defined in greater detail for each test question.

Figure 3. Holistic Scoring Guide

Typical Rubric Model

Rubric For

Attribute of the Expected Outcome and its Characteristics

Level

4

Expert Characteristic

3

Proficient Characteristic

(standard)

2

Beginner Characteristic

1

Novice Characteristic

NS

“Nonscorable” Characteristic

Decide if the rubric is task-specific, trait-specific, or generic. Make it as authentic and generalizable beyond the classroom as possible. Use an odd number of levels to judge balance of a skill or an attitude; use an even number of levels to mark the point where a skill must be consistently shown to be judged adequate. Use more levels for finer differentiations, especially in high-stakes situations. The standard is the expected target behavior. Have at least one level above the standard and two below it to show students what is next in the skills/attitude beyond basic competency. State rubric in both teacher and student (“I...”) language.

Figure 4. Rubric Development

More Advantages of Rubrics

Rubrics provide clarification of teacher objectives for students, promoting higher standards of performance. When teacher objectives are clearly outlined in rubrics, students need not guess or approximate teacher expectations. They are guided through a success oriented process of teaching and learning in which expectations are understood and therefore can be met. As rubric assessments become more aligned with the objectives being taught, students are provided a greater chance for success (Erickson, 1995).

Another advantage of using rubrics is that they can be longitudinal. Since understanding develops over time, curriculum is often written to *spiral* (returning to and building on same concepts) over the years to deepen conceptual understanding. Writing rubrics as a continuum from novice to expert for both skills and understanding of concepts gives both students and teachers the big picture. Students are able to see their progressive movement along the continuum as they work toward mastery (Wiggins & McTighe, 1998).

Performance tests or tests that resemble real world experiences are much more attractive to educators and administrators as school districts move toward more meaningful student assessment. Rubrics are designed for assessing such tests, both for efficiency and consistency (Popham, 1997).

Assessment can become a liability issue. A small liability may be present in the classroom as teachers decide whether to pass or fail students, but the liability can become a much larger issue. Assessment of students' performance on state mandated tests determines which students receive diplomas. Essay assessment in colleges helps

determine students' placement in English classes. Assessment of performance on certification board examinations determines if a person becomes a doctor, lawyer or teacher (Johnson, Penny, & Gordon, 2000). Rubrics are a way of systemizing what teachers naturally do. They confirm and give a tangible piece of evidence to what teachers do in their heads (Montgomery, 2000).

Rubric Controversy

One controversy over rubric use is that many rubrics are instructionally fraudulent. In an article written by W. Popham (1997), there are four common flaws found when teachers and commercial rubric designers create rubrics. One flaw is that the rubric is task specific for particular performance tests and do not lead to skill mastery. An example is that students are given the task on a standardized test to write a constructive response essay on what needs to be invented before the vacuum bottle could be manufactured and used. The criteria for the rubric to assess the essays are linked to a picture of the vacuum bottle. The students' success greatly depends on their interpretation of the picture (Popham, 1997).

A second flaw is that the criteria are too general (Popham, 1997). Vague words like "boring" or "creative" should be avoided as they can have different connotations to different people. Specificity helps to keep rubrics reliable (Montgomery, 2000).

Popham (1997) describes a third flaw. Many rubrics provide unnecessary detail. Criteria that overlap should be combined. They should be concise. "Avoid creating categories that are too big" (Andrade, 2000, p. 17).

The fourth flaw is that rubric users confuse assessment of a skill with the actual skill. An example of this is when a teacher ends up teaching math problems with multistep

solutions when problems like these are only given on standardized tests (Popham, 1997). Teachers end up teaching to the test instead of standards and benchmarks.

Other arguments focus on reliability and validity of rubrics. Reliability refers to the ability of any scorer to consistently assign accurate scores with the use of any particular rubric. Validity refers to rubrics accurately assessing objectives they were designed to assess. Mabry (1999) argues that the rubric structure itself forces reliability of the instrument, but validity of the instrument may be in question. Since the performance or quality usually ranges from four to six increments of gradation, assessors are forced to decide and even agree upon one of those increments. This produces a rubric that is reliable. Invalidity occurs when a student may reach the standard of performance in ways other than anticipated in the rubric criteria. Students may also meet criteria in their sample of writing and at the same time lack coherence throughout the piece (Mabry, 1999).

Gentile (2000) provided an example of rubric unreliability. He described a classroom activity on reliability and validity. College students were given an opportunity to design rubrics for assessing short essays. They were to score the essays from 0-10 based on the rubric they developed. Scores given for the same essay varied 75%. The scoring done by the students using the rubrics they designed was unreliable. Some factors that may have contributed to such unreliability in scoring are, inexperience, fatigue, bias, and boredom. Thomas Newkirk admitted to “cheating” on rubrics. He said he had trouble using rubrics, “I jimmy the categories so that they fit my general reaction, hoping to escape detection” (p. 41). He found it easier to assess writing as he read it naturally. A good text drew him in and made him alert. When a text lost continuity or lacked detail it distracted or repelled him.

One more complaint concerning the validity and reliability of rubrics is how discrepancies between raters are decided. For teachers in the classroom, this is not a concern. They alone score and evaluate students' work. Two or more raters are used for scoring standardized tests and data collection. Some ways discrepancies are refereed are taking the average of two raters, substituting an expert's score for the two initial rater's scores, averaging the raters' and expert's scores, and averaging the expert's score with the closest rater's score. In their application, these methods equally impact the scores to solve discrepancies among raters (Johnson, Penny, & Gordon, 2000).

Some researchers believe that rubric use for teaching and assessing writing is not beneficial. Writing rubrics tend to squelch creativity and standardize the teaching of writing, therefore writing becomes standardized. Michigan, Pennsylvania and Indiana, intended to improve standardized writing tests. Their goal was authentic assessment of student performance with the use of a writing rubric. The assessment was designed to fit objectives taught and actual classroom practices better than previous standardized tests. However, standardizing the scoring by rubric assessment negated that intention (Mabry, 1999). Instruction became driven by state testing producing mechanical, uniform products. The art of composing and response was lost (Newkirk, 2000).

Newkirk (2000) complained of the appropriateness of rubric use and standardizing all instruction. An example he gives is of a kindergarten teacher who used a rubric to outline expectations for an art drawing. To obtain a perfect score of 4, students needed to include a tree, sky, clouds, the sun, and green and brown colored ground. The objects needed to be clearly defined. Children spent a class period on the art piece until they obtained a 4 or improved their piece at least one level. There was clearly no benefit to

teacher or student with this use of a rubric (Newkirk, 2000). Does art remain art if it is standardized?

Pros and cons should be weighed when choosing or writing a rubric. Careful consideration must be given to factors such as purpose, appropriateness, design, reliability and validity of rubric, integrity and experience of scorer, and the stakes of the assessor and assessed. Questions should be contemplated. Will the rubric provide direction for instructional improvement? Is the rubric assessing what it is designed to assess and do students have a complete understanding of that rubric and how to use it? Should students always be given rubrics in advance where rubrics are used for assessment? Is it necessary for every assessment?

Writing Assessment in Science

In science, the instruction delivered by teachers in the State of Michigan is directed by the MEGOSE (Michigan Essential Goals and Objectives for Science Education) Standards. MEGOSE is a set of standards set by the Michigan Department of Education. It is a detailed plan for teaching science in grades K-12. The main objective of the goals and objectives that is encompassed in the MEGOSE is to promote scientific literacy among all Michigan students. In promoting science literacy for all students, the MEGOSE claimed to emphasize understanding over content coverage (Michigan State Board of Education (MSBE), 1991). MEGOSE is the Michigan Framework for science education, but it expands and details State objectives for clarification and specification (Michigan Department of Education (MDE), 1996).

Classroom assessment of the MEGOSE Standards is guided by the goals and objectives themselves. However, it is left up to the teachers to choose assessment tools

for science. Assessment may include evaluation of a variety of tasks. Some of these may be working experiments, written responses, tests, projects, reports, labs, reports, journals, drawings, and portfolios. It is the assessment of expository written responses that is the focus of this study.

Interest in the study of instruction and assessment of expository writing responses stems from changes in State assessment and students' performance on that assessment. State assessment involves the MEAP (Michigan Educational Assessment Program). The science portion of the MEAP test was implemented in the 1985-86 school year. This program was designed to improve the State's low scores on national assessments. These early tests were made up of multiple choice questions. No questions requiring written responses were asked. It was not until the 1995-96 school year that written responses were expected in the science portion of the MEAP to assess understanding. In 1997-98, the MEAP included science investigations with reflective and constructive response questions (MSBE, 1994-5; MDE, 1997).

Statewide test scores dropped dramatically from the 1994-5 to the following year when the first changes in the format of the science MEAP were implemented requiring written responses from students. In the school district in which this study was conducted, the average 5th grade MEAP scores in one elementary school in science went from 90% proficiency before written responses to 48.7% after. Interestingly, these scores were above the District and State averages and the school scored above average on the language arts portion of the MEAP as well (MSBE, 1997). One immediate focus for teachers and administrators was studying and improving written response writing in science.

Developing the rubric to assess expository writing for this study began two years ago. I was on an elementary school improvement committee. Our subgroup worked on improving writing skills in science and social studies based on perceived need through evaluating existing science MEAP scores, forthcoming changes in social studies MEAP testing, and student writing samples in these areas. Upper elementary teachers were previously given two rubrics by district curriculum advisors, one for science, and one for social studies with which to teach and assess expository, reflective and constructive responses (see Appendices A and B). These rubrics were designed specifically to score written responses on science and social studies portions of the MEAP. As with any school improvement strategy, ease in application is a must for school wide participation. To simplify rubric use and develop continuity among teachers' instruction and assessment of expository writing responses, a general rubric was designed by our committee and distributed to 3rd through 6th grade teachers (see Appendix C). This rubric is used to teach and assess expository writing and study writing improvement in social studies and science. I continued to use this rubric teaching science at the junior high. This rubric has generated this study and is my obvious choice for investigating the use of a rubric for assessing expository writing in science, exploring how teachers and 7th grade students use rubrics in science, and examining how teaching a writing rubric affects students' performance and assessment in expository writing in science.

Some investigation was done on the reliability of the rubric. In the summer of 1999 I prepared and delivered a presentation on rubric use in assessing expository writing for a graduate writing assessment class. A rubric designed by an elementary writing committee within the district of this study was distributed, and grad students assessed five

examples of expository writing. These samples were previously scored by the school's writing committee. Each sample was scored at a different performance level from zero to four. Table 1 outlines the results of the graduate students' scores for the five samples. Scores were consistent among teachers and graduate students. The highest number each score received fell in the column of its actual score as determined by the school's writing committee. All scores fell within one point of the actual score except for sample #1. Interpretation of science concepts on this sample was a bit controversial. The rubric was designed to assess students over several grade levels. The controversy stemmed from expected learned concepts at this particular grade level. Overall the rubric proves to be a reliable instrument.

Sample Number	Score 4	Score 3	Score 2	Score 1	Score 0
#20	3	18	7	0	0
#1	0	0	10	5	13
#3	19	6	2	0	0
#16	0	7	17	4	0
#15	0	0	4	18	5

Table 1. Grad Class Assessment Scores from Expository Writing Rubric

Chapter 3

Methods

Study Site and Subjects

This study was carried out in the regular classroom setting, using four intact 7th grade science classes at a junior high. This suburban junior high is situated just outside a large industrial based city in southeast Michigan. Approximately 850 students attend this school. It is part of a district that is known for its diversity.

The treatment was teaching the expository writing rubric to science students and promoting its use for writing scientific essays. Two of the classes received the treatment, while two others did not (only about 55% of each group of two classes participated due to the number of permissions slips returned). The classes were each random selections of students by computer at the start of the year. The first consideration was which two classes to combine to give the treatment. Two major factors considered through observations of students were group dynamics and overall classroom performance in order to make the groups most similar overall. Deciding which group would not be part of the study was easiest. Second hour students performed consistently lower than all other hours on varied types of tasks. They were consistently more off task and more disruptive than any other class. Two groups most similar were first and third hour students. Both classes were attentive, were highest in classroom performance, interacted well with peers and the teacher. My decision was to make sure these groups were not placed together. Finally, in deciding where to place the remaining classes, randomly seemed best. Neither the fourth or sixth hour had any outstanding factors to consider, either positive or negative at the time (several 6th hour students moved later in the year).

However, the overriding factor in my decision as to how to group the classes was alternating the treatment. This would help to ensure that I, as a teacher, would be fresh for each class. The classes receiving the treatment were third and sixth hours. First and fourth hour classes did not. The treatment group will be referred to as Group A; the group with no treatment will be referred to as Group B.

Table 2 gives some demographic information to describe the groups of students. The groups' academic performances in science class are very similar. Distribution of gender is fairly even. The groups turned out to be quite similar in size as well: Group A numbering 33, and Group B numbering 28.

Group	Group Average Grade in Science	Boys	Girls
A	84.5%	17	16
B	86.0%	12	16

Table 2. Group Demographics

Data Collection and Analysis

Pretreatment Assessment

Pretreatment writing samples from both groups were taken in February, 2001. For these pre-test samples, students were to respond to the following:

1. Describe the path of a complete circuit.
2. What is the difference between a complete circuit and an incomplete circuit?
3. How does the ability to predict the weather benefit humans?

Questions one and two were given the same day. The better score of the two was counted. Two weeks later, question three was assigned. All pre-test sample questions

were part of a chapter or unit test. Students knew that it was an essay question and would be graded for it. They were encouraged to do their best and use all skills necessary to write a good response.

Treatment

The next part of the study involved teaching the writing rubric to Group A, and teaching Group B how to write expository essay responses. Both groups received writing instruction making the comparison of the groups to be whether using a rubric in learning and assessing expository writing differs from conventional classroom instruction and assessment of the same skill. That is, does using a rubric make a difference?

Instruction for both groups began with showing students anonymous authentic samples of their essays. After students read the essays, a discussion was facilitated to highlight what was good about the essays and how they might be improved. This activity generated the discussion of important aspects of good essays. Students' responses when asked to make a list of important factors to consider when writing a scientific essay were, "restating the question," "give examples," "support your answer with facts," "it's correct," "use science vocabulary," and "write neatly." Group A was then given the writing rubric to compare it to the list of criteria they developed for essays that were well written. Students decided that they were similar, and the only important factor missing on the rubric was "using science vocabulary." After discussion, students agreed that if appropriate examples were used, detail and support given, students would automatically use science vocabulary in an essay. Special attention was given to the second line of the rubric, "Uses appropriate examples, gives detail and support." Examples of detail and

support were studied. The word “appropriate” was defined as correct and applying to the subject discussed.

Over the next few weeks, students practiced writing essays. Group A reviewed and used the writing rubric, working toward scoring 4’s on their essays. Group B reviewed factors or aspects of good essay writing, working at writing essays that were well done. Both groups scored their own essays as well as those of their peers. Group A used the writing rubric to assign a score. Group B used only the qualifiers: well done, satisfactory, and unsatisfactory. (For purposes of scoring the qualitative terms, numbers were assigned: well done-2 points, satisfactory-1 point, and unsatisfactory-0 points.) Samples were shown on the overhead and discussions were facilitated about the quality of the essays and how to improve them. In order to assess whether students had learned the criteria for a well-written expository response, I compared their scores to mine for responses to the prompt, “Discuss why the Earth’s magnetic force is necessary for life.” The following data was collected.

Response 1. *The Earth’s magnetic force is necessary for life because without the Earth’s magnetic force, a compass wouldn’t work*

Group A scored it: 4points-0, 3points-5, 2points-9, 1point-4and 0points-0 (6 no score).
Group B scored it: Well Done-0, Satisfactory-5, and Unsatisfactory-14 (5 no score).
Teacher’s Rubric Score: 2 Teacher’s Qualitative Score: Unsatisfactory

Response 2. *The Earth’s magnetic force is necessary for life because if there were no magnetic force we would be floating out in space. Because the Earth’s magnetic force is keeping (pushing) us down on the Earth.*

Group A scored it: 4points-0, 3points-0, 2points-4, 1points-17, 0points-0 (3 no score).
Group B scored it: Well Done-0, Satisfactory-7, Unsatisfactory-15 (2 no score).
Teacher’s Rubric Score: 1 Teacher’s Qualitative Score: Unsatisfactory

Response 3. *The magnetic force stops the solar wind or supercharged particles from reaching Earth and destroying it.*

Group A scored it: 4points-0, 3points-0, 2points-12, 1point-5, 0points-0 (7 no score).

Group B scored it: Well Done-3, Satisfactory-15, Unsatisfactory-2 (4 no score)..

Teacher's Rubric Score: 2 Teacher's Qualitative Score: Satisfactory

Response 4. *It protects us from solar winds.*

Group A scored it: 4points-0, 3points-0, 2points-0, 1point-6, 0points-14 (4 no score).

Group B scored it: Well Done-0, Satisfactory-0, Unsatisfactory-20 (4 no score).

Teacher's Rubric Score 0 Teacher's Qualitative Score: Unsatisfactory

The previous data collected from only one class of each group, third hour of Group A and first hour of group B, were indicative of students' understanding of what the expectations are for well written essays. Both groups' scores proved reliable for both methods of rating the quality of the essays. For each response to the previous prompt, the mean, median and mode scores that the students assigned as a group were the same for both groups A and B. The mean, median and mode of student assigned scores also matched the teacher's assessment of the responses. While these statistics show that both groups' assessments were reliable in their scoring, the group who used the rubric scores 0-4, demonstrated clearer understanding because the difference between the scores for responses 2, 3 and 4 varied by only one point and by two points for response 1. Not only was reliability of the scoring processes demonstrated in both groups, but students also showed a good understanding of what well-written responses look like. Group B had three choices in its assessment and varied across the whole range for response 3. Students' assigned score for responses 1 and 2 varied one gradation. For response 4, all students assigned the same degree of quality. Scores for this group were not as consistent, but as a whole, students in both groups demonstrated that they learned skills to write good essays.

Post-treatment Assessment

Two weeks later, one post-sample was collected. A second post-sample was collected three weeks later. The post-samples were responses to the following prompts:

1. Scientists believe that millions of years from now the United States may be geologically quite different. As a scientist, how would you support this theory?
2. Choose wind or water and describe how either process weathers and erodes landforms.

As with the pre-test samples, these post-test samples were part of a unit or chapter test and were graded. Students knew they were expected to write an essay and to use all skills necessary to write it well. After the last post-test samples were taken, a post-test questionnaire was given to Group A to study post test knowledge of rubrics and attitudes toward them and their writing (see Appendix E).

Analysis of Treatment

Scoring all of the students' writing samples for both Group A and Group B was accomplished using the rubric. The rationale for scoring Group B with the rubric was twofold. First, students in both groups were taught very similar skills for improving expository essay writing and second, the criteria in the rubric well reflected expectations taught. Scoring using the rubric for both groups provided an additional experimental control. Students' scores reflected a possible of 4 points for each essay. Two essays were scored before and after evaluation of the treatment given. The total possible score for subjects was 8 before and 8 after.

Frequency distribution was then studied using mean, median and mode, which were calculated for both groups before and after the treatment of writing instruction with and without the use of a rubric. Evaluation of the range of distribution was analyzed using

Statistical Package (SPSS) version 3.3 for Business and Social Sciences as well. Tables were created for comparing raw scores and statistic summaries. Graphs developed to compare data were frequency line graph and scatter plot complete with slope lines. These graphs were developed by entering the scores in Microsoft Word Version 7.0. Finally, because sample sizes were small, nonparametric, Mann-Whitney U tests were used to compare each group before and after treatment and to compare pre and post-treatment scores between Group A and B with the use of SPSS version 7.5.1.

Attitudinal Assessment

Students from both groups were given a pre-test survey to study their knowledge and attitudes toward rubric use a few days before writing instruction in science began (see Appendix D).

Students who used the rubric were also given a post-test questionnaire to determine if knowledge and attitudes remained the same after instruction and use of a writing rubric (see Appendix E). This post-test questionnaire was given a few days after the last sample was taken.

Responses were classified and ranked by frequency for both pre-test and post-test assessments; trends were analyzed. To accomplish this, similar responses to each question were grouped together to form a category. For example, in the pre-test survey students named the subjects in which they remembered using a rubric. Four categories were developed from their responses: science, language, social studies, and math. When students' responses varied more as in their discussion of the utility of rubrics, more categories were generated. Categories from each question were organized in separate

lists in order of highest to lowest frequency of response. Attitudinal trends were then analyzed and compared from these categorical lists.

Finally, interviews of the Junior High science teachers were conducted during this study as to their rubric use and attitudes (see Appendix F). Trends of the interviews were quantitatively and qualitatively studied and analyze through the same process as students' attitudinal assessments.

Chapter 4

Results of Treatment

Table 3 shows the raw scores of the pre-test and post-test sample assessments of Group A's writing scores. Of the 28 students, scores for 21 increased in a range from 1 to 5 points after writing instruction using the rubric. Four of the students' scores remained the same and three students' scores dropped. Two students' scores dropped 1 point, while one student's score dropped two points. On the assessments before writing instruction using a rubric, the sum of students' scores ranged between 1 and 8 points. After the treatment, scores ranged between 2 and 8 points. Four points were possible on each of the two pre-test and post-test sample assessments for a total of 8 points.

Sample Number Group A	Score Before Using Rubric	Score After Using Rubric	Sample Number Group A	Score Before Using Rubric	Score After Using Rubric
31	4	6	58	6	7
35	5	4	59	8	6
36	4	3	96	4	7
37	6	8	98	1	3
38	6	6	99	1	6
39	4	8	100	4	5
41	3	3	101	4	6
48	5	8	103	5	6
50	4	6	104	5	8
51	5	6	106	2	2
52	6	7	111	5	8
53	3	3	115	4	8
55	3	6	116	4	6
57	5	6	118	2	5

Table 3. Raw Scores of Group A, Treatment

Table 4 shows the raw scores of the pre-test and post-test sample assessments of Group B's writing scores. Of the 33 students, scores for 24 increased in a range from 1 to 4 points after writing instruction without using the rubric. Seven of the students' scores remained the same. Two students' scores dropped 1 point. On the assessments before writing instruction, the sum of students' scores ranged between 1 and 7 points. After instruction, scores ranged between 3 and 8 points. Four points were possible on each of the two pre-test and post-test sample assessments for a total of 16 points.

Group B Sample Number	Score Before Writing Instruction	Score After Writing Instruction	Sample Number Group B	Score Before Writing Instruction	Score After Writing Instruction
1	7	8	30	5	5
3	4	6	64	5	8
5	4	6	65	1	4
7	4	6	68	3	5
9	4	4	70	5	6
10	6	6	71	4	8
11	2	3	72	2	3
16	4	6	73	2	8
17	3	3	74	4	5
20	4	7	75	3	5
23	6	5	80	5	5
24	6	7	81	5	5
25	6	8	82	4	8
26	7	6	88	7	7
27	4	5	89	6	8
28	6	6	90	6	7
29	5	6			

Table 4. Raw Scores of Group B, Control

Descriptive statistics of both groups' assessments are shown in Table 5. Before instruction, the median and mode scores for both groups were 4. After the treatment, the

median and mode scores for both groups were 6. The mean scores before the treatment differed by 0.31, after by 0.09. Group A's mean score before writing instruction was 4.21; Group B's mean score was 4.52 which is consistent with Group B's slightly higher classroom performance before the study began. After the treatment, the mean score for Group A was 5.82, Group B's mean score 5.9. The change in the mean for Group A was 1.61 points and the change for Group B was 1.38 points.

Statistic	GroupA Before	GroupA After	GroupB Before	GroupB After
Valid Samples	33	33	28	28
Mean	4.21	5.82	4.52	5.9
Median	4	6	4	6
Mode	4	6	4	6
Range	7	6	6	5
Maximum	8	8	7	8
Minimum	1	2	1	3
Major Outliers	0	0	0	0
Stand.Deviation	1.54	1.73	1.52	1.5
Variance	2.38	3	2.31	2.26
Error of Mean	.297	.334	.269	.266
Sum of Scores	118	163	149	195

Table 5. Descriptive Statistics for Writing Assessments

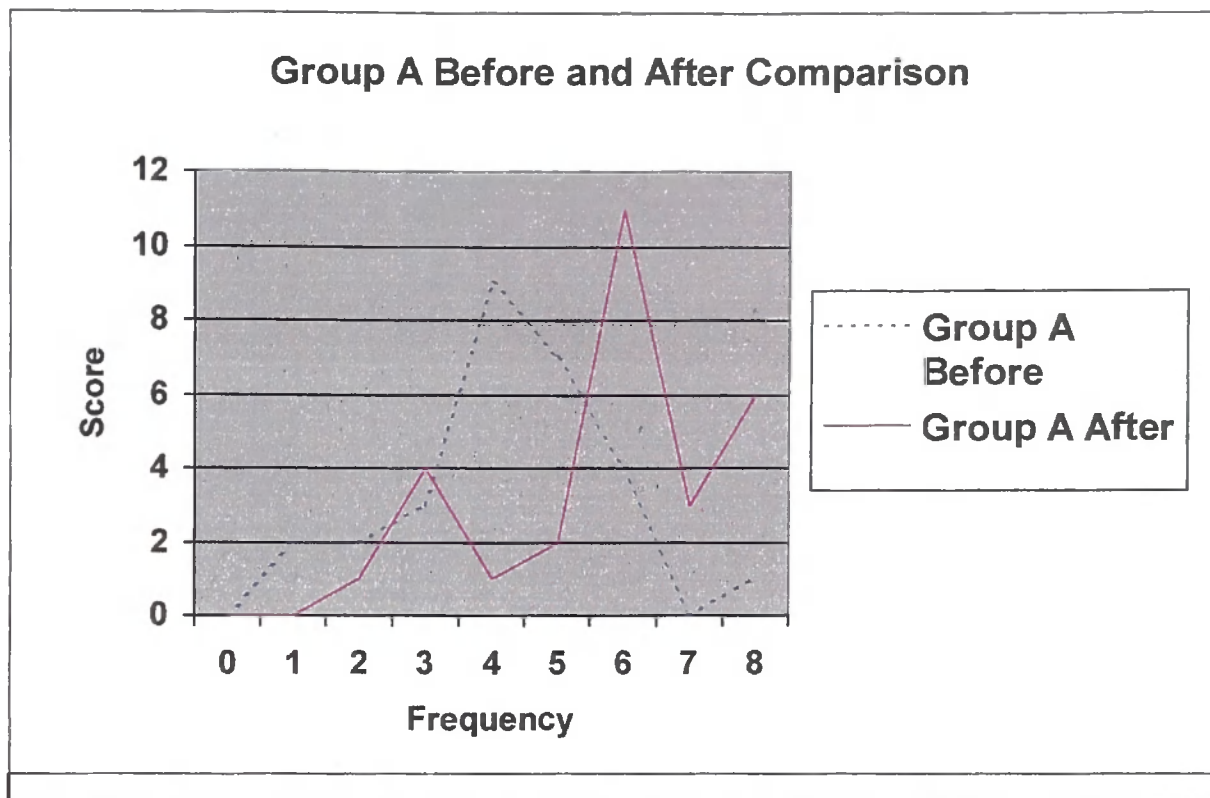


Figure 5. Group A Comparison

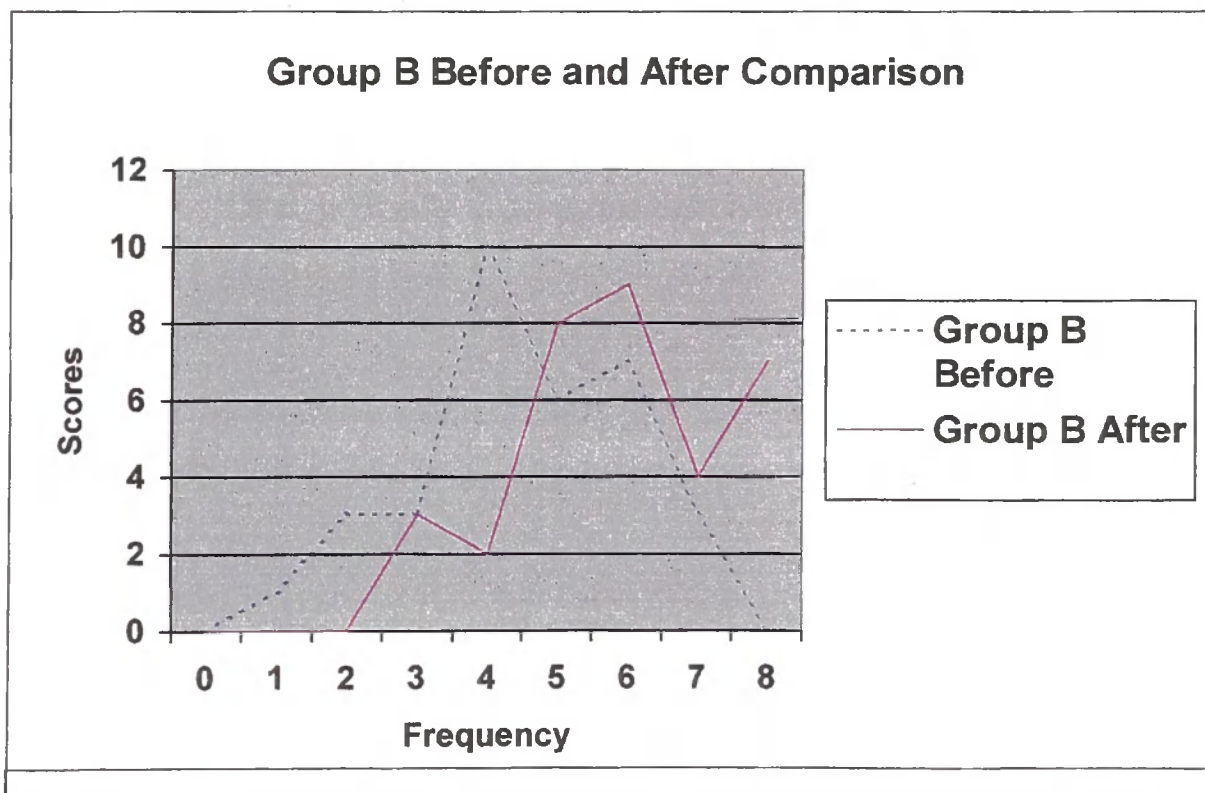


Figure 6. Group B Comparison

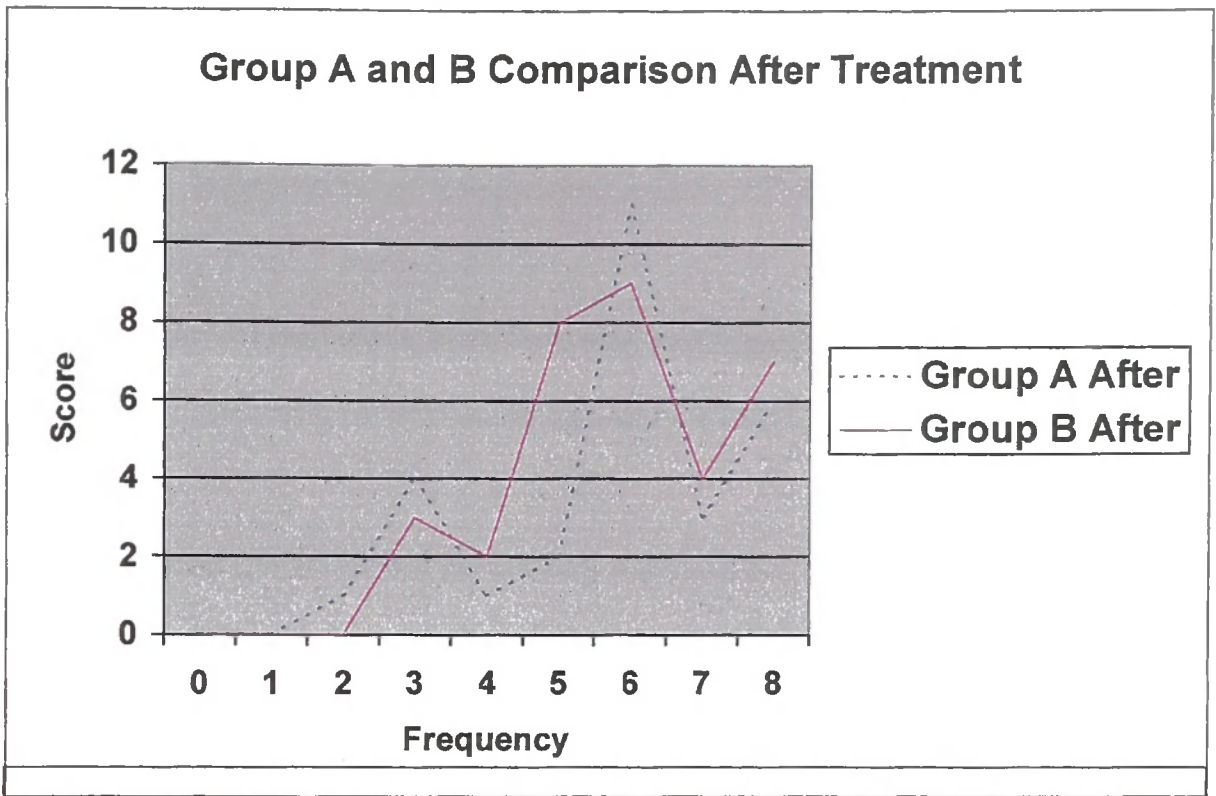


Figure 7. Group A and B Comparison

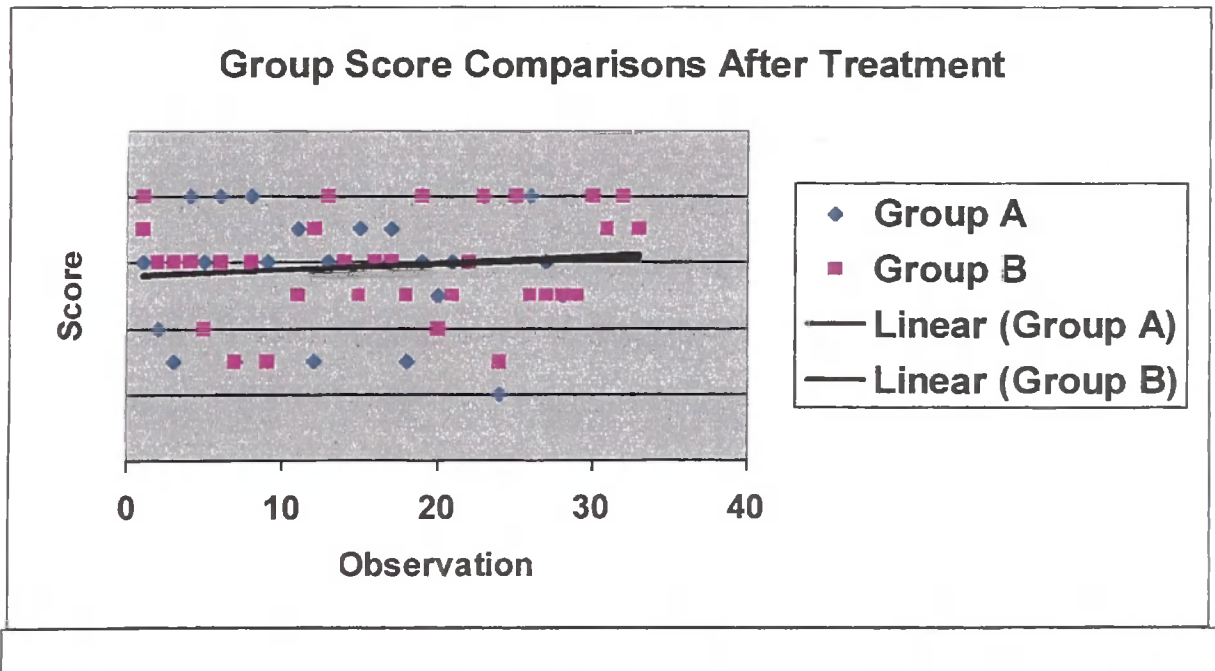


Figure 8. Score Comparison Scatter Plot After Treatment

The similarity between the two groups before and after treatment is clearly pictured in the frequency line graphs. Modes are the same for both groups before and after the treatment. Improvement for both groups is evident in this graph as well. After treatment, both groups' A and B modal scores increased 2 points. Both groups had fewer occurrences of lower scores, more occurrences of higher scores, and both groups' ranges decreased. According to the data, both groups improved in their expository essay writing.

The scatter plot of the two groups after treatment does not indicate that there is any significant difference between the two groups. The slope lines, which portray the trends of the observations, virtually overlap for Groups A and B.

Mann-Whitney U Test

The trend suggested by the descriptive statistics is supported by the Mann-Whitney U Test. This nonparametric test is for comparisons of small groups where assumptions made by familiar parametric tests (e. g., t-tests) are not met. This test determines if there is a significant difference between two groups by comparing the sums of the ranks of individual scores in both groups (Beyer, 1976; Rohlf and Sokal, 1981). Using SPSS (1996), the following summary of statistics was developed with the data in tables 7 and 8.

Class	Number	Statistic	Pretest	Posttest
Rubric	28	MannWhitneyU	409.5	454.5
Control	33	Wilcoxon W	815.5	1015.5
		Z	-.788	-.111
		Asymp.Sig. 2-tailed	.436	.911

Table 6. Summary of Mann-Whitney Test Statistics

Observed Score Group A Before Treatment	Rank	Observed Score Group B Before Treatment	Rank
4	24	7	59
5	40	4	24
4	24	4	24
6	52	4	24
6	52	4	24
4	24	6	52
3	11.5	2	6
5	40	4	24
4	24	3	11.5
5	40	4	24
6	52	6	52
3	11.5	6	52
3	11.5	6	52
5	40	7	59
6	52	4	24
8	61	6	52
4	24	5	40
1	2	5	40
1	2	5	40
4	24	1	2
4	24	3	11.5
5	40	5	40
5	40	4	24
2	6	2	6
5	40	2	6
4	24	4	24
4	24	3	11.5
2	6	5	40
		5	40
		4	24
		7	59
		6	52
		6	52
Sum of Ranks	815.5		1075.5

Table 7. Assessment Scores and Their Ranks Before Treatment

Observed Score Group A After Treatment	Rank	Observed Score GroupB After Treatment	Rank
6	32.5	8	55
4	10.5	6	32.5
3	5	6	32.5
8	55	6	32.5
6	32.5	4	10.5
8	55	6	32.5
3	5	3	5
8	55	6	32.5
6	32.5	3	5
6	32.5	7	45.5
7	45.5	5	17.5
3	5	7	45.5
6	32.5	8	55
6	32.5	6	32.5
7	45.5	5	17.5
6	32.5	6	32.5
4	10.5	6	32.5
3	5	5	17.5
6	32.5	8	55
5	17.5	4	10.5
6	32.5	5	17.5
6	32.5	6	32.5
8	55	8	55
2	1	3	5
8	55	8	55
8	55	5	17.5
6	32.5	5	17.5
5	17.5	5	17.5
		5	17.5
		8	55
		7	45.5
		8	55
		7	45.5
Sum of Ranks	855.5		1035.5

Table 8. Assessment Scores and Their Ranks After Treatment

A test of pretreatment differences in assessment scores indicated there was no between-group difference ($U=409.5, p>.05$). Therefore, any post-treatment differences that may be found between these groups could be attributed to the treatment. However, as expected based on the descriptive statistics, a test of post-treatment scores showed no difference between the two groups ($U=454.5, p>.05$). Therefore, although the mean score of Group A increased more than that of Group B, according to both descriptive and inferential statistics, there was no greater benefit to students who used a writing rubric for expository essays than those who did not.

Discussion

As with any instruction, teachers expect improvement in student performance when that instruction is delivered. Therefore, it is not surprising that both groups of students improved after instruction. Students were taught how to write good expository written responses and generally, students used that knowledge to improve their writing. Despite the fact that the data did not support the hypothesis that the use of this writing rubric is more beneficial for learning to write good expository essays than learning without it, the data did show the rubric was at least equally valuable in learning to write scientific responses. The use of the rubric for teaching and assessing student performance, however, proved invaluable for this project. Without the teacher's use of the rubric, equity between individual and group scoring would have been less reliable and inconsistent. The rubric not only gave a concise guide for final assessment of each piece of writing, it also helped in assessment of student understanding of the writing instruction. Any reliability of this study's assessment is a direct result of the use of a writing rubric.

Threats to Validity

During the experiment, several factors were considered that may have influenced the outcome of this study. Immediately, recognition was made that the average classroom performance grade percentages were high. These averages did not reflect the classes as a whole. By evaluating the permission slips, observations indicate that those turned in, were primarily those from students with high performance in the classroom. Several attempts were made to obtain all permission slips from all students. Notes were sent home, parents who came to parent/teacher conferences were reminded, second forms were mailed to all parents whose form was not received, students were reminded in the classroom, and a second mailing went out with self-addressed, stamped envelopes. Only about 55% of parents of each group responded. This observation led to a question not addressed in this study, “How much does parent involvement contribute to students’ performance in school?”

A second factor, which seemed to be impossible to isolate is teacher expectations. Teachers quickly learn the importance of consistent feedback in order to develop students’ awareness of expectations. It seems that if teachers are not consistent, that many students become careless of the quality of work turned in. Most students attempt to meet expectations of teachers. So how does one separate the students’ dependency on teacher feedback and understanding of expectations? Since the feedback is often linked to a grade, is this factor part of a bigger issue, that is the reward/punishment of grading? Does this factor enhance or reduce student performance?

Many of these students were taught to write good expository essays in elementary school. The MEAP scores indicate that they write well. Some of the teachers used the

same or similar rubrics throughout the district. Some of the students in the study were from an elementary school where students used the rubric as part of a school-wide writing improvement plan the year before. Why was there such an improvement after instruction or reinstruction to these students in writing good expository essays? The assumption may be made that students forget concepts from one year to the next; however, how much does the teacher-expectation issue affect performance?

A final factor which could have affected the outcome of this study was the difficulty of questions in the pretreatment and post-treatment assessments. However, all of the questions used were directly related to concepts being taught at the time of taking the samples. Furthermore, in developing the question, much consideration was given to the type of questions asked. For both pretest and posttest samples, reflective and constructive questions were assigned. To make sure that students had ample opportunity to produce an acceptable pretest response, two reflective responses were assigned and the best of the two scores was recorded. The constructive question, "How does the ability to predict the weather benefit humans?" was very open as well. Students should have done well with this question even if they hadn't been learning weather concepts. After evaluating the pretest responses, the trend of the essays was that students were not supporting or giving examples in their answers. Considering the opportunity given for acceptable pretest responses, the relationship between concepts taught and questions asked, the careful selection of both constructive and reflective questions, the difficulty of the questions was equitable for both groups and was not a factor in influencing the outcome of the study.

Conclusions

In conclusion, students who were taught to use a writing rubric for writing and assessing expository essays in science performed as well as students who were instructed without the use of a writing rubric; however, the rubric is especially beneficial to the teacher for instruction and assessment by providing reliability and equity. While both groups' expository written responses improved with instruction, it is unclear how much teacher expectations attached to grades affected writing improvement. Regardless of the method of instruction, it is imperative that science teachers instruct/reinstruct students in how to respond to scientific questions for students to reach their highest potential in science writing.

Chapter 5

Results of Student Pretest Survey

Rubric Use in Core Subjects

Fifty-nine of the sixty-one student participants turned in the pretest survey to assess their attitudes and prior knowledge of rubric use (see Appendix D). A summary of the quantitative portion of the survey is listed below. In response to the question, “I have used a rubric in the following subjects,”

- 57 students said they have used rubrics in science.
- 56 students said they have used rubrics in language.
- 48 students said they have used rubrics in social studies.
- 35 students said they have used rubrics in math.

Rubrics in Science

When asked to “Give an example of how you have used a rubric in science,”

- 26 students said they have used a rubric for science fair projects.
- 21 students said they have used a rubric for projects in science.
- 5 students said they have used a rubric for writing in science.
- 2 students said they have used a rubric for getting the best grade possible.
- 1 student said that he/she used a rubric to learn new things.

Rubric Experience

“Do you still use a rubric you have been taught by a teacher to use? and How long?”

were the next questions asked.

- 36 students said they still use rubrics that teachers have taught them.
- Of those 36, 28 said they have used them from 2-4 years.

Rubric Utility

Fifty-two students said that rubrics are helpful. When asked how,

- 27 students said rubrics help them know expectations/what to do/is a guide.
- 24 students said rubrics help them to get a good or better grade.
- 11 students said rubrics help them know how to do something.
- 2 students said rubrics keep them “on track.”

- 2 students said rubrics help them learn.
- 1 student said rubrics help him/her get started.
- 1 student said rubrics help him/her know when he/she is done.

Discussion

Rubrics in Core Subjects/Science

Students have used rubrics in a variety of subjects. Most students remembered using rubrics almost equally in science and language. Therefore one might assume that the majority of students were familiar with rubric use before writing instruction was introduced for this study. Since only five students remembered using rubrics for writing in science, one might also assume that most students were not familiar with using rubrics for writing or assessing expository essays in science. However, when one considers the efforts of teachers and administrators in district-wide science writing improvement, particularly through the distribution of a writing rubric (see chapter 4), the assumption that students were familiar with rubrics seems viable.

The majority of students remembered using rubrics in science for the science fair and science projects. Some of the 21 students may have been referring to the science fair projects, but they did not specify. Some of the “other” projects in science listed were weather projects, book making, and posters. The fact that the majority of the students remembered the rubric for the science fair is not surprising. This makes sense because in this district most of the elementary schools require 4th through 6th graders to complete a science fair project. Many of these rubrics are extensive because when the rubric is followed and the project correctly completed by a student, the project is ready for entry in the local science fair.

According to the data, only five students remembered using rubrics for writing in science. As discussed in Chapter 4, many students were taught to use a rubric for writing in science in previous years. After reading the responses, I realized that the question may have generated more responses if it had read, “Give some examples of how you have used rubrics in science.” By writing the question in singular form, limitations were set on the number of examples, which produced fewer responses. Most students gave one example of how they used rubrics in science. It may not be that some students did not remember using a rubric in science writing, but that they simply limited their answer to the most memorable example when answering the question.

Rubric Experience

Two-thirds of the students said they still use a rubric they have been taught by a teacher. About half of the students have used them from two to four years. These statistics support the assumption that most students had a knowledge of rubrics before writing instruction was introduced for this study.

Rubric Utility

After considering all the reasons students gave as to why rubrics are beneficial and evaluating the definition of a rubric, it followed that most students are familiar with the term “rubric” and have used it in correct context. The five students who responded with a “no” for not being helpful did not give a reason. One student left it blank. With the lack of responses elsewhere on these six surveys, the students who marked “no” may not have understood the concepts involved in using rubrics, or they may have not taken the survey seriously.

Conclusions

Most students have used rubrics in core content areas: science, math, English, and social studies and thought they were helpful. Half of the students remembered using rubrics for a few years. In science, the most memorable way students have used rubrics was for science fair projects. Few students mentioned using rubrics for learning and assessing the writing of constructive and reflective responses in science.

Questions for future study stemming from knowledge of the students' academic background include: Why were students who were previously taught the rubric not using it? How much did they forget or choose not to use it? Why was there such an improvement after instruction? Were teacher expectations a factor?

Chapter 6

Results of Student Posttest Questionnaire

The posttest questionnaire was only given to the treatment group (see appendix E).

Twenty-six of the twenty-eight students completed the questionnaire. The questionnaire was specific to the rubric used in the treatment of this study.

Rubric Description

In response to the first question, “Describe the rubric you were taught for expository written responses,” students wrote the following:

- 14 students referred to the 4-point scoring of the rubric.
- 10 students listed some or all of the expectations.
- 6 students referred to getting an A, good, or better grade.
- 5 students referred to expectations in general.
- 4 students referred to quality essays “good” or “bad.”
- 2 students referred to the number of sentences.
- 1 student referred to it as a way to learn.
- 1 student said he/she used it to study for tests.
- 1 student referred to a “beginning, middle, and end.”
- 1 student didn’t remember.
- 1 student left it blank.

Rubric Utility

In response to how the rubric was most helpful, students made the following replies:

- 11 students referred to getting an “A” or “good grade.”
- 10 students referred to expectations in general.
- 1 student said it helped him/her to restate.
- 1 student referred to the rubric as a way to learn.
- 1 student said it helped him/her to not forget things.
- 1 student referred to test taking.
- 1 student referred to “knowing about rubrics.”
- 1 student referred to knowing the quality of an essay, “good” or “bad.”
- 1 student referred to checking homework “what to do or not do.”
- 1 referred to the rubric as a “guide for whatever I write.”
- 1 student didn’t know.

Use of the Rubric

Twenty-three of the twenty-six subjects responded “no” to the question, “Did you choose not to use the rubric?” The following reasons were given:

- 11 students referred to rubrics being helpful to know expectations/what to do.
- 9 students referred to a “good” or “better” grade.
- 3 students referred to the quality of the response.
- 2 students referred to improving essays.
- 1 student knew “when it was completed.”

Writing Improvement

Twenty-one of the twenty-six students answered “yes” when questioned if they had improved. The following reasons were provided:

- 6 students referred to better grades.
- 4 students referred to meeting expectations in general.
- 4 students referred to specific expectations, restate, give examples, use vocabulary.
- 4 students referred to better quality. (“good” or “better”)
- 2 students referred to length of essay being increased.
- 1 student left it blank.

Five students replied that they had not improved. One of these five said, “I already knew what you needed.” Another said that he/she really did not learn it. A third said, “I’m really not that good at answering essay questions.” Two students gave no reason.

Difficulty with Using the Rubric

In response to the question, “Is there anything that was difficult about using the rubric?” 20 students replied “no.” Of the six who answered “yes,” one student “always forgets about it” another student “didn’t know how to use it.” One said, “It is difficult to keep looking at it.” A fourth student was not sure when he/she was “doing it right.” Another student left it blank. The final student said, “It was hard to stick to it and not let

myself settle for a 3 paper or even a 2, because I knew what I would get.” Three of these six students who found it difficult, also found it beneficial.

Sharing with Peers

Finally, in response to the last question, “Did you share information about the rubric with peers?” Twenty-one students said they did not. One student responded as a giver of the rubric information. One other student who received the information used it in writing essays. Two more students responded that they shared the information with a peer; however, both responded “no” for being giver or receiver of the information. One of these two students wrote, “Everyone in our class know how to use it to improve their own grades.” The last of the 26 responses was left blank.

Discussion

Rubric Description and Utility

Most students in the study remembered concepts of the writing rubric. Only two of the 26 responding students clearly did not remember correct concepts about the rubric. While one of these left it blank, his/her response to what is most useful about the rubric was, “Checking out the homework we need to do and not to do.” This child clearly didn’t remember the writing rubric. Four more students may have had misconceptions about the rubric. For example, two of these four students referred to the number of sentences they were to write, suggesting that they did not clearly understand the concepts of the rubric. However, while a specific number of sentences is not mentioned in the rubric, students could not have included examples or support for their answers in a well-written essay without writing a paragraph. The other two students, one referring to using the rubric for studying for tests, and the other referring to beginning middle, and end,

may also have had misconceptions; however, any conclusion about the students' perceptions of the rubric utility is limited by the nature of their written responses.

Students' descriptions of the rubric and their perceptions of its utility reveal students' concerns. In fact, scores, grades, and expectations were the most common responses to most of the question asked on the questionnaire: 30 related responses in students' descriptions of the rubric, 21 related responses in its utility, 20 related responses in students use of the rubric, and 10 related responses in writing improvement. Most of the students in this study were concerned about teacher expectations and grades. This data gives legitimacy to the question raised in Chapter 4 concerning the reward/consequence of grades influencing writing improvement.

One student responded that the rubric was helpful for a guide for whatever he/she writes. If the student was referring to essays in other subjects, he/she took the instruction to a higher level of application.

Use of the Rubric

Most students chose to use the rubric. Again, most students referred to teacher expectations and grades supporting in their reasons for using it, supporting the theory that teacher expectations and grades influenced student performance. Two students said they chose not to use the rubric. One student said, "I didn't learn about it." Much of his/her questionnaire was blank. The other student said, "Life is not about step taking. Sometimes you just have to wing it." One more student left it blank as with much of his/her questionnaire. This provides evidence that two of the three who chose not to use the rubric may not have understood how to use it, which is not the same as choosing not to use it. They simply might not have known how.

Writing Improvement

This data suggests that most students' attitudes toward rubrics were positive. They felt their performance had improved. Four of the five students who did not feel they improved may have not learned the concepts of the rubric. If they had learned how to use the rubric, would their attitudes remain negative?

Again, because grades are an instrumental way in which teachers give feedback to students, many students equated the rubric as beneficial with receiving better grades. These students must have used some criteria in the rubric in order to improve their essays which resulted in grade improvement. Most students referred to meeting general or specific expectations. These students may have been more cognizant of why the rubric is beneficial along with those who recognized their essays as being of better quality. It is interesting that 21 students who responded thought rubrics were beneficial; 21 students' scores improved (see table 3). It may be assumed that those who improved in their expository writing essays perceived rubrics as beneficial.

Difficulty with Using the Rubric

Most students did not find using the rubric difficult. Responses of five of the six who found it difficult suggested that they did not learn it, one was blank, one kept looking at it, one did not remember it, and two did not know how to use it. If they had learned it, would they have still found it difficult to use? The final student who found it difficult was concerned about his/her grade and did not want to settle for lesser points. This makes sense because it is physically easier to write a poor response than it is to write a good one. One question stems from this response: if a grade was not attached to the performance, would this student still choose to perform to obtain higher points?

Sharing with Peers

It seems that few students shared the rubric information with other students. Of these, one could not assume that the sharing was done outside of the classroom. One may not assume the scores of Group B were influenced by students from Group A sharing rubric information.

Conclusions

In conclusion, most students learned concepts of the writing rubric and benefited from it by meeting expectations, improving their grades on essays, and producing higher quality essays. The majority of students chose to use the rubric to meet expectations and improve their grades. Students generally thought that the rubric was not difficult to use. Sharing the rubric between Group A and Group B was not a factor and did not influence the outcome of the study.

Chapter 7

Results of Teacher Interviews

Rubric Utility

All of the six 7th and 8th grade teachers interviewed (see appendix F) said they use rubrics in science. They used them for a variety of reasons.

- All six teachers referred to projects.
- 3 teachers referred to expectations/check list/what to do.
- 2 teachers referred to student self-evaluation.
- 1 teacher referred to peer evaluation.
- 1 teacher referred to practice MEAP questions.
- 1 teacher referred to a writing assignment.
- 1 teacher referred to labs.

When asked, “How do you feel rubrics are most useful?” the following responses were recorded.

- 3 teachers referred to projects.
- 2 teachers referred to usefulness for teacher in assessing.
- 1 teacher referred to teaching/learning tool.
- 1 teacher referred to advantage for low ability/special education students.
- 1 teacher referred to student and teacher guide to task completion.
- 1 teacher referred to students knowing “how they’ll be graded.”
- 1 teacher referred to students choosing quality of assignment they will do.

Rubric Experience

The responses for number of years rubrics have been used are; 1-1/2, 2, 2-4, 5-6, 15, “always used checklists (30+ years).” The number of years taught by each teacher at the time of this study, matched the number of years each teacher used rubrics within 0 to 4 years.

Rubric Disadvantages

“Are there any reasons you think they are not helpful?” was the last question asked.

The following responses were made.

- 4 teachers referred to less creativity on the part of the student.
- 2 teachers said they would not use them for “discovery” or inquiry-based teaching and learning.
- 2 teachers referred to students just meeting expectations “not going beyond,” “cookie copy of rubric.”
- 2 teachers referred to student dependency on rubrics. Rubrics are a “crutch.”
- “Students need to think...they need to struggle and fight through it.”
- 1 teacher referred to rubrics as “overwhelming” to “some” students.
- 1 teacher referred to rubric use as “time consuming” at first.
- 1 teacher referred to rubrics as sometimes “too general or vague,” and at the same time “have a lot of verbage.”

Discussion

Rubric Utility

The majority of teachers’ initial responses of how they used rubrics in science matched the majority of students’ responses of how they used rubrics in science. Most students used rubrics as teachers instructed them in their use.

Teachers’ responses indicated they were student-centered in their use of rubrics. Examples of this are that one teacher discussed the “many parts of an assignment for students to remember.” Other teacher responses were “students lose focus,” students “understand,” “grade themselves,” and “get a better idea of expectations.” Teachers used rubrics to promote student success.

As with the previous responses, most teacher responses of how rubrics were most useful were student centered. Seven of the ten responses referred to students. However, the majority of teacher responses to rubric usefulness did not match student responses to the same question. Teachers’ responses indicated teachers’ understanding of rubric

utility for themselves as well as students. The fact that one teacher chose when to give the rubric, “sometimes before...midway...after,” depending on the task supports the assumption that teachers understood rubric versatility for teaching, learning and assessing. The following responses support this as well. Teachers said rubrics are “most useful” as a guide to grading essays, research papers, and reports when students used “multi-media.” Rubrics can be “tweaked” once designed for changing needs. One teacher said that rubrics can be adjusted for grading special needs students. Special needs students can receive the same rubric, but quality expectation can be “adjusted” to fit the needs of the students. These teachers agreed with studies previously discussed of the usefulness of rubrics in Chapter 2.

Rubric Experience

Responses support that teachers eventually learn the advantages of using rubrics. However, one may not assume that teachers have not been using rubrics since their first year of teaching. According to Montgomery (2000) rubrics are a way of systemizing what teachers do naturally, in their heads.

Rubric Disadvantages

Some teachers’ responses mirrored referenced research in this study under “Rubric Controversy” in Chapter 2. Teachers were concerned about student creativity, rubric vagueness, lengthy rubrics containing unnecessary detail, and standardization of performance. Two concerns these junior high science teachers addressed that this study did not, in preliminary research, was the inquiry-based, discovery learning and the need for students to “struggle” and figure it out. The FAST curriculum, which is completely inquiry based, includes rubrics for assessing student learning. Standardized test are

nonexistent in this curriculum. It may be that some teachers in this study may be so focused on students, that teacher use of rubrics for assessment after task completion was not considered. Sometimes rubrics are not distributed to students at all.

The other issue one teacher was concerned about that was not discussed in the preliminary research was that rubrics were “time consuming.” Other teachers in this same study responded to the time saving issue when grading big projects. “You can just check it off,” was one response. Rubrics can be reused and “tweaked.” For these teachers the benefits of rubrics must have outweighed the disadvantages because all of the teachers in this study used rubrics.

Rubrics for Writing in Science

Only one teacher addressed using a rubric for essay questions. This same teacher used the rubric for practice MEAP questions. He/She did not say whether the rubric was used throughout the year. One teacher said he/she did not use them for essay questions. When asked about how he/she used rubrics in science writing, one teacher responded that rubrics are “excellent... a lot of work!...not with every assignment.” There is no evidence that most science teachers used a writing rubric for teaching concepts of writing good scientific reflective and constructive responses. Generally, teachers did not discuss responsive writing at all. Therefore, one might assume more teachers did not use rubrics in responsive writing in science than did. Since scientific expository writing can be successfully taught without the use of a rubric, according to the results of this study, it may not be assumed that science teachers are not teaching writing in science.

Conclusions

All of the teachers used rubrics for a variety of reasons that benefited students and themselves. The years of experience with rubrics for each teacher varied only a few years from the number of years each teacher has taught. Teachers' concerns about rubrics were similar to the concerns found in research. Despite the controversy, teachers chose to use rubrics. Most teachers did not use rubrics to teach students to write constructive and reflective responses in science.

Chapter 8

Summary and Conclusions

In addressing the usefulness of this particular writing rubric to instruct and assess well-written reflective and constructive responses in science, the following observations were made: (1) the rubric is beneficial for both teachers and students; (2) students were given consistent guidelines for proficient written responses; (3) teachers' instruction was concise; (4) teachers' assessment and feedback were specific, reliable and valid; and (6) the rubric was flexible by meeting a range of student performance ability.

Much of the rubric controversy does not apply to this particular use. Expository writing is not meant to be conducive to creativity, is not affected by use of inquiry-based learning, and since it is prewritten, is not time consuming in its use for teaching or learning. Furthermore, teaching to the test is not a concern with the use of this rubric because it is intended to be used for all types of expository written responses.

The participants in this study involved more students who performed well in the classroom prior to this study than with those who did not. Because this was true for both groups A and B, it most likely did not influence the outcome between groups. However, as discussed in Chapter 6, students' preoccupation with scores and grades attached to the assessment of their performance affected how and why they used the rubric. Questions stemming from these issues that are yet to be answered include: Would it be beneficial to attach a classroom grade to standardized tests? Would it hinder performance?

Finally, students forget or choose not to use science writing concepts taught from year to year, making it imperative to teach or re-teach science writing concepts yearly.

According to this study, it makes no difference if students were taught those concepts through the use of a rubric or through the use of traditional instruction.

Science Rubric for MEAP Writing

- | | |
|-----|--|
| 4/3 | <ul style="list-style-type: none">* Restates the question*Uses scientific words*Answers the question completely*Your reader has full understanding |
| 2/1 | <ul style="list-style-type: none">*The question is not completely restated*Used a few scientific words*Question is not completely answered*Reader is not sure of your meaning |
| 0 | <ul style="list-style-type: none">*The question is not restated*Used no scientific words*Did not answer the question*Reader has no idea what you mean |

Holistic Feature Scoring of Civic Writing: Grade 5

Points	Description
4	<p>In order to receive a 4-point score, the response must</p> <ul style="list-style-type: none"> • give a clearly stated position on the issue • provide one (or more) statement of accurate, valid, and relevant supporting information from the Data Section • provide one (or more) statement of accurate, relevant, and important supporting knowledge from history, geography, civics, or economics that comes from the student's prior knowledge (information other than that supplied by the Data Section or a core democratic value of American constitutional democracy) • provide at least one supporting point that is based on the core democratic values of American constitutional democracy
3	<p>In order to receive a 3-point score, the response must</p> <ul style="list-style-type: none"> • give a clearly stated position on the issue • provide at least one supporting point that is based on the core democratic values of American constitutional democracy • contain at least 1 of the remaining 2 elements
2	<p>In order to receive a 2-point score, the response must</p> <ul style="list-style-type: none"> • give a clearly stated position on the issue • contain at least 1 of the 3 remaining elements
1	<p>In order to receive a 1-point score, the response must</p> <ul style="list-style-type: none"> • give a clearly stated position on the issue
0	<p>In order to receive a 0-point score, the response will show no evidence of any of the elements</p>

NOTE: The supporting points used by the student must be explained in enough detail to show a clear connection to the position taken.

General Rubric for Expository Written Responses

4/3

- Restates the question.
- Uses appropriate examples, gives detail and support.
- Answers the question completely
- Reader has full understanding

2/1

- The question is not completely restated.
- Uses few appropriate examples, gives little detail and support.
- Question is not completely answered.
- Reader is not sure of your meaning.

0

- The question is not restated.
- Uses no appropriate examples, gives no detail or support.
- Did not answer the question.
- Reader has no idea what you mean.

If a response would be a 4, but the writer did not restate, give the writer a 3.

If a response would be a 0, but the writer did restate, give the writer a 1.

Student Survey

Check the appropriate boxes below:

I have used a rubric in the following subjects:

- Science
- Language
- Social Studies
- Math

Give an example of how you have used a rubric in science.

Do you still use a rubric you have been taught by a teacher to use? _____ If you answered yes, how long ago were you taught the rubric? _____ years _____ months _____ weeks.
Describe how you use this rubric.

Do you think rubrics are helpful? _____ If you answered yes, how?

Post Test Questionnaire for Students

Describe the rubric you were taught for expository written responses.

What do you think is most useful about the rubric?

Did you choose not to use the rubric? _____ Why?

Do you feel your expository writing responses have improved since you have been using the rubric? _____ How?

Is there anything that was difficult about using the rubric? _____
What was it?

Did you share information about the rubric with peers? _____ If so, were you the giver or receiver of information? _____ If receiver, did you use the rubric for expository writing?

Interview Questions for Science Teachers

Do you use rubrics in science?

How do you use them?

How do you feel rubrics are most useful?

How long have you used them?

Are there any reasons you think they are not helpful?

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