THE EFFECTS OF REGULAR JOURNALING
ON 8TH GRADE PHYSICAL SCIENCE STUDENTS’
LEARNING AND ATTITUDES

by

John Anthony Bishel

A professional paper submitted in partial fulfillment
of the requirements for the degree

of

Master of Science

in

Science Education

MONTANA STATE UNIVERSITY
Bozeman, Montana

July 2013
STATEMENT OF PERMISSION TO USE

In presenting this professional paper in partial fulfillment of the requirements for a master’s degree at Montana State University, I agree that the MSSE Program shall make it available to borrowers under rules of the program.

John Anthony Bishel

July 2013
# TABLE OF CONTENTS

**INTRODUCTION AND BACKGROUND** ................................................................. 1  
**CONCEPTUAL FRAMEWORK** ............................................................................... 5  
**METHODOLOGY** ........................................................................................................ 8  
**DATA AND ANALYSIS** ........................................................................................... 12  
**INTERPRETATION AND CONCLUSION** ................................................................. 23  
**VALUE** ...................................................................................................................... 27  
**REFERENCES CITED** ............................................................................................. 29  
**APPENDICES** .......................................................................................................... 30  
  
  *APPENDIX A: Journal Assignment Prompts.......................................................... 31  
  *APPENDIX B: Data Collection Instrument- Student Journal Scoring Rubric.............. 33  
  *APPENDIX C: Pre-Treatment Likert Survey............................................................... 35  
  *APPENDIX D: Post-Treatment Likert Survey............................................................... 37  
  *APPENDIX E: IRB Exemption Letter ................................................................. 40*
LIST OF TABLES

1. Data Triangulation Matrix .................................................................12

2. Likert Survey Theme Summary ......................................................19
LIST OF FIGURES

1. Average Summative Test Scores Pre versus Post Treatment .................................13

2. Average Summative Test Scores from the Previous School Year for Comparison, with Equivalent PRE versus POST Treatment Tests .................................................................14

3. Rubric Scoring Example with Journal Date Codes Showing Trends .......................17

4. Student Progress on Journals throughout Treatment Phase .................................18

5. Pre-treatment versus Post-treatment Attitudes .......................................................20

6. Detailed Pre versus Post-treatment Attitudes Concerning Science, Combined .........21

7. Detailed Pre versus Post-treatment Attitudes Concerning Science, 5th Period ..........22
During this research, frequent journaling was introduced to eighth grade physical science classes to determine the effect on their mastery of new science concepts, as well as their attitudes concerning science and learning about science. Both Likert attitude surveys and summative assessments were given pre-treatment and post-treatment for comparison. Students certainly did not like the journal assignments, because they did not want to write, however, both science attitudes and performances improved slightly.
INTRODUCTION AND BACKGROUND

Project Background

Teaching Experience and Classroom Environment

I am a science teacher in the Coudersport JR/SR Area High School, in Coudersport, PA, a school of approximately 380 students. I am primarily the high school physics teacher, but have also been teaching from one to three class periods per day of eighth grade physical science each school year since the onset of my teaching career in 2006. This followed a twenty-year career as a mechanical engineer.

Consistently, it has been my observation that eighth grade students struggle with essay type questions on summative exams. In addition, they often have difficulty articulating newly covered science concepts. I believe students fully “own” new concepts when they can adequately convey that knowledge in either written form, verbal form, or both. In other words, when the students are comfortable accurately expressing science concepts in their own words, they demonstrate mastery of those science concepts. This is an important item of interest in all of our classrooms. How then, I thought, could I help my eighth grade students become comfortable expressing their science knowledge leading up to each summative assessment?

In my Conceptual Physics classes, my students have improved their grasp of physics concepts by a technique called “Check-your-neighbor” discussions I adapted from master teacher Paul Hewitt. While I would not use this same technique with eighth graders, I wondered if providing them with frequent opportunities to write about science would improve their understanding of science concepts, and perhaps, improve their
attitudes about learning science. I wondered if their journaling would also help them write better answers to essay questions as well.

Although multiple choice questions are easy for us to score as teachers, essay questions provide more meaningful data to us concerning our students’ grasp of science concepts. Again, I believe when students can accurately express science concepts in written or verbal form, they own those concepts. By providing my 4th and 5th period eighth grade physical science students with the opportunity to journal regularly, I wanted to see what affect this intervention had on my students’ level of understanding of science concepts. The method of journaling I employed with my students was to provide them regularly with several CAT-type (CAT – Classroom Assessment Techniques) questions which they responded to in written form in their journals.

The two classes of eighth grade that participated in my study were comprised of 21 females and 16 males, 32 Caucasian/white, two African American, one Hispanic and two Native American. While our school does not provide specific economic data for individual students to the teachers, I am sure we have some economically disadvantaged students in these classes as well, as the percentage of free lunches is 9.9% and the percentage of reduced lunches is 7.1% at Coudersport High School. Also, in 2000, the median household income in Coudersport was $35,813, compared to the National median income of $41,994 (Source: 2000 census, U.S. Census Bureau). Coudersport’s Cost of Living index is 100.10, nearly the national average of 100.00. Since the fall of Adelphia, a major communications company that formerly was headquartered in Coudersport, I am sure the median household income in Coudersport has fallen further.

All-in-all, this group of 37 eighth grade students was probably typical of what other
rural teachers would experience in the state of Pennsylvania. Also typical, because of state standards, these Pennsylvania students would have tackled basic biology – plants, animals, photosynthesis; basic mechanics – Newton’s Laws, momentum; and basic earth science – weather, climate, geology prior to taking physical science as eighth graders.

While many questions could be posed concerning the effects of regular journaling, I focused on one main question, and three sub-questions which follow.

**Focus Question**

The following are my Action Research question and sub-questions:

**Question:**

What is the effect of regular journaling on 8th grade physical science students’ learning?

**Sub Questions:**

1. What are the effects of regular journaling on student mastery of new concepts?
2. How will student attitudes be affected by the use of frequent journaling?
3. What effect does student journaling have on me as a teacher?

Even though my action research project was fairly low-tech, as well as simple, it was invaluable to have a support team that kept me on track, advised, and sane during the process. Following are the people I am indebted to for helping me during this action research project.
Support Team

My support team during this AR process was invaluable. Nick Klepfer, Middle School Science Teacher, Coudersport Area Junior/Senior High School, taught the other two eighth grade physical science classes at our school. Over our years together at Coudersport, we have collaborated with each other concerning students, science, and curriculum. Nick is very familiar with how we approach our curriculum, both our similarities, as well as our differences. He is someone I trust as a teacher who has our students’ best interest in mind. We also shared 1st lunch together, and had frequent contact with each other. Nick was willing to pilot my Likert Survey in his two classes to get feedback vital to modifying prior to use in my project with my two classes.

Aaron Rendos, Technology Teacher, Coudersport Area Junior/Senior High School was a great sounding board on the project. Aaron and I coach our wrestling team together, and during the wrestling season, we car-pooled. This gave us an hour each day to discuss things while travelling. Aaron is also very proficient with technology, and was willing to give advice with efficient ways to survey and assess students. Additionally, Aaron reviewed my work in hardcopy form, and electronically.

Sara Bishel, French Teacher, Port Allegany Senior High School. This was my seventh year teaching, and I had been taking courses non-stop during this time. My wife Sara is an excellent writer, and has proofread my work while I have taken numerous courses online. She was not afraid to be critical of what I write, and could often help me flesh out more detail, as I tend to be fairly economical with my writing. Statements that I may
think are very clear, she sometimes points out that they are not. She was also available to review my work on a daily basis.

Carla Kusmierz, Middle School English Teacher, Coudersport Area Junior/Senior High School. We are on our school’s Middle School Team, and we both chaperoned the Art Club trip to Pittsburgh for Mrs. Batson, our school’s Art Teacher. Carla has a heart for our students. Additionally, Carla was an excellent proofreader, and provided advice and feedback on the scoring rubric for the science journals. Carla and I also had the same lunch schedule, and discussed my project as needed.

I trusted all of these four teachers’ opinions and judgments. All four were readily available and accessible for assistance and support. They are all very positive in their attitude towards students, learning, and teaching. I mostly interacted with them individually, but sometimes interacted with Nick and Carla at the same time during our lunch break.

CONCEPTUAL FRAMEWORK

One of my major teaching philosophies is that when students of all ages can express science concepts themselves in written form or spoken form, they own those concepts. As I mentioned above, teaching was not my initial career following college, and I had to learn to express and simplify concepts for my students. In one of the textbooks that had a significant impact on me while earning my initial Pennsylvania teaching certificate through Drexel University, authors Wiggins and McTighe (1998) describe the concept of “uncoverage”, versus coverage of material. My goal, shared by science teachers everywhere, is to have students achieve the desired outcome of their learning experience,
proper and accurate understanding of science concepts. To be more effective as content expert instructors, we need to be aware that what is obviously connected and meaningful to us, often is not to our students. Therefore, I have been driven to help students uncover their misconceptions, and discover the non-obvious meanings concerning science concepts. “The great teachers know precisely what their students will gloss over and misunderstand in textbooks,” Wiggins and McTighe (1998, p. 107), and I want to continue to discover my students’ misunderstandings. Concepts become more meaningful to students as they make meaningful connections themselves.

I use a similar technique with my Conceptual Physics classes I learned from Paul Hewitt, called “Check Your Neighbor.” I did not want to use a discussion technique like that with eighth graders though and did not have a classroom response system (clickers) at my disposal. Even without clickers, discussions are difficult to study because the actual conversations are hard to capture. The research revealed that “in 62% of the recorded conversations, students either discussed incorrect ideas not anticipated in the instructor’s multiple choice alternatives or submitted clicker responses that were inconsistent with ideas that had been articulated in their discussions” (James and Willoughby, 2011, p. 130). So how should I overcome this hurdle with eighth grade physical science students, without using clickers? I decided on journaling.

Given that it is very difficult to assess the understanding of a whole class with verbal questioning during a lesson, journaling seemed like a valid way to assess all of the students. In an article on learning logs, which are similar to journals, the authors assert “because thoughts are hidden from an observer, they are difficult to assess by direct conventional means” (Audet, Hickman and Dobrynina, 1996, p. 206). I enjoy open
dialog in class with my students, but many of them remain silent during that time. I
wanted a way during this study to capture where all of them were with their
understanding.

Another important thing to consider was the philosophy of how learners best
assimilate new concepts. I have learned to get away from the method of teaching I was
raised with, what I call “fill, drill and spill”, and move more towards letting students
construct their own new knowledge. Writing is an excellent way to accomplish this goal.
“The practice of regular writing shifts the responsibility for learning to the student and
reduces student anxiety over grading systems that rely heavily on the ability to recall
information. Analyzing what and how a student writes can provide a teacher with
insights about prior states of understanding, underlying thought processes,
misconceptions, and other factors associated with learning. “The information that
journals reveal thus builds a dynamic feedback loop between assessment and the goals of
instruction” (Audet, Hickman and Dobrynina, 1996, p. 207). The other thing that really
appealed to me when approaching this action research project was the thought of being
able to assess students individually. Journals could accomplish this goal.

Further research on journaling in terms of supporting students with learning
disabilities yields another important goal of having students construct their own
knowledge. “Writing is a powerful tool for thinking and learning. As children write, they
shape their thinking and personalize their learning” (Fahsl and McAndrews, 2012, p.
234).

One form of data collection that was key to shedding light on my other data, was student
interviews. I was nervous about conducting interviews, but got two pieces of advice
during the literature review that helped. First, when preparing for an interview “The second important and central component of this stage is the development of the questions and follow-up probes” (Rabionet, 2009, p. 564). As I had never conducted interviews before, this advice, coupled with suggestions from my advisor, helped me have valid questions in advance. Second, I am slow when typing or recording by hand, as well as having terrible short-term memory, and therefore had trepidation concerning recording the interviews by either of those means. “There are many ways of recording interviews. The most commonly used are notes written at the time, notes written afterwards, audio recording, and video recording. The literature recommends audio recording above all the other methods” (Rabionet, 2009, p. 565). In terms of documenting the interview, this article helped confirm my need to find a recording device, and it worked out well in my situation.

Research also confirmed the need to have guidelines on journal assignments, or what we commonly call a scoring rubric. “During the writing process, students and teachers can refer to the scoring guide to assess their writing and progress toward the end product” (Fahsl and McAndrews, 2012, p. 237). Students had a copy of the journal rubric each time they wrote in their journals.

METHODOLOGY

Treatment

For this AR Project, I implemented frequent and regular student journaling as the new treatment introduced to my curriculum. All 17 students from 4th period eighth grade physical science, and all 20 students from 5th period eighth grade physical science
were included in the study. Both classes had students ranging from ones with Individual Education Plans (IEP), nine total, to ones with Gifted Individual Education Plans (GIEP), six total.

Students wrote in their science journals approximately once per week, responding to Classroom Assessment Technique (CAT) -type teacher prompts. These prompts ranged from the relatively easy, introductory warm-up question of “What is your favorite topic we have studied so far and why?” to the more challenging question of “Explain why there are really only two simple machines, what they are, and how the other four come from the two.” With the influence of courses I have had at Montana State University, a “Muddiest Point?” prompt was included with each journal assignment. Students respond to a “muddiest point” prompt by explaining what is unclear to them at that point in the unit of instruction. Please see Appendix A for a complete list of journal assignment prompts. The students wrote in their journals twice during each of the two physics units we covered during the treatment phase of the project, responding to three prompts per session, for a total of twelve journal entries. With the exception of the “muddiest point” entries, which were one to two sentences, student journal entries were several paragraphs to a page long. The journaling was both a treatment and an instrument, because it was also evaluated with a scoring rubric (Appendix B) for science journals. I had hoped that all other aspects of my eighth grade physical science curriculum would remain the same, including limited lecture, discover activities, guided reading homework, reading and discussion time, and lab activities. In actuality though, to stay on track to cover the energy unit prior to state testing, some labs and activities were eliminated.
I ran the journaling through two units of study, starting approximately February 12, 2013, and ending approximately April 5, 2013. Originally I had intended the journaling to be a weekly endeavor, however shortened weeks due to breaks, post-season wrestling tournaments, and Pennsylvania System of School Assessment (PSSA) testing rendered that plan impractical. The students still managed twelve total journal entries each during the study. In four journaling sessions during the treatment, they responded to three CAT-questions, including reporting on their muddiest point at that point in the lesson. These two units, Forces in Fluids and Work and Machines, followed the first two units of the physics portion of the course, Motion and Forces/Newton’s Laws which did not include the journaling treatment. This allowed comparison of scores on summative tests between treatment and non-treatment units.

Typical units of study consist of two to three weeks per unit, from introduction to summative assessment. With the exception of lab periods of one to two per unit, most days have a brief hands-on discovery activity or a teacher demonstration to hook students’ interest, followed by a combination of group reading, group discussion and one-on-one dialog during guided reading work. Guided readings are assigned generally four times during a unit of study. We also practiced problems involving mathematics and formulas several times a week.

Instrumentation

Prior to implementing this treatment, I surveyed my 4th and 5th period eighth grade physical science classes in regards to their confidence in writing about science concepts, as well as their attitudes concerning science, writing, and writing about concepts. Fortunately, I was able to pilot my pre-treatment Likert survey (Appendix C) in the other
two eighth grade physical science classes, as Mr. Klepfer, one of my action research project support team members, teaches those two classes. From that pilot, one question was reworded for clarity. Additionally, and probably more importantly, the scale was reversed, as the students were used to having the larger number, five, correspond to strongly agreeing with the statement. Having colleagues, classmates, and professors look over and help with revisions, gave me confidence in the validity and reliability of my AR study instruments. As survey questions had a number ranking scale, qualitative data was converted to quantitative data. In this way, trends between pre, and post treatments were more easily analyzed. I also asked students for written explanations for select Likert Survey questions on the post-treatment survey (Appendix D) to more fully understand student attitudes once the treatment phase was complete. This helped me draw conclusions. Finally, I kept a written reflection journal to capture my thoughts, attitude, and response to this treatment. This was done mainly to answer the question of how journaling affected me as a teacher. Prior to embarking on the action research project, my intent was to enter thoughts daily in my personal journal, but actually only managed to make entries once or twice a week.

The research methodology for this project received an exemption by Montana State University's Institutional Review Board and compliance for working with human subjects was maintained (Appendix E).

A summary of my data collection instruments follows in the Triangulation Matrix (Table 1).
Table 1
Data Collection Chart (Triangulation Matrix)

<table>
<thead>
<tr>
<th>AR Questions</th>
<th>Data Source #1</th>
<th>Data Source #2</th>
<th>Data Source #3</th>
<th>Data Source #4</th>
<th>Data Source #5</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the effects of regular journaling on student mastery of new concepts?</td>
<td>Survey pre-journaling</td>
<td>Journaling, with CAT-type prompts from the teacher. (Rubric score)</td>
<td>Survey post-journaling</td>
<td>Summative exams</td>
<td>Student Interviews</td>
</tr>
<tr>
<td>How will student attitudes be affected by the use of frequent journaling?</td>
<td>Survey pre-journaling</td>
<td>Survey post-journaling</td>
<td>Student written responses to certain survey questions</td>
<td></td>
<td>Student Interviews</td>
</tr>
<tr>
<td>What effect does student journaling have on me as a teacher?</td>
<td>Written reflections</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When first developing my curriculum, the summative tests for each unit were made before I started teaching each unit. This was done with backward design in mind, to assure my lessons supported the learning I expected of my students during the unit of study. Content experts would find these summative tests easy to complete, and student scores range from one-hundred percent to the occasional failure, which is below seventy percent at Coudersport High School. They are both reliable and valid. The following details the results of using these instruments.

DATA AND ANALYSIS

My intent during this AR project was to collect enough different data sources to feel confident that the AR questions had been answered satisfactorily.
In answering the question on how the treatment of frequent journaling affected mastery of new concepts by students, prior to the onset of the treatment, I covered two physics units with the two eighth grade classes. Summative tests were given at the conclusion of each unit and recorded in our school’s online grading system for later comparison to the two summative tests taken during the treatment. Results showed a slight drop in average test scores for 4th period (N=17), a modest increase in average test scores for 5th period (N=20), and a slight increase in average test scores for the entire group (Figure 1).

![8th Grade Physical Science Current Year Average Test Scores (out of 50 pts)](image)

*Figure 1. Average summative test scores PRE versus POST Treatment, (N=37).*

While this increase may not seem very significant, in my experience during the previous six years of teaching this subject, summative test scores tend to go down as we progress through the physics portion of the eighth grade physical science course. This trend seems to be the case with my 11th grade general physics classes as well. I am uncertain exactly why this happens, but I suspect it is because the concepts keep building,
and students tend to view units or chapters as islands. Out of curiosity, I looked up the equivalent test scores from the previous school year, with different students, which verified the observation of declining test scores as the physics units progressed in the past. This comparison is displayed in Figure 2, below. Thus, even a slight overall increase in summative test scores is a plus, and the decrease in summative scores for this year’s fourth period were small in comparison to last year’s students. However, this data alone was not enough to be convinced journaling was effective or not. It took student interviews to actually feel confident in drawing a conclusion.

![Figure 2](image)

*Figure 2.* Average summative test scores from the previous school year for comparison, with equivalent PRE versus POST Treatment tests, different students, \(N=35\).

I chose to interview eight of the 37 students post treatment over a three-day span during the end of the school year. As I write and type very slowly, I chose to record the interviews, and then transcribe notes later. In this way the flow of the interview was not slowed. This process was still time consuming though.
I asked the students what effect journaling had on their attitude about science. I also asked them what effect journaling had on their performance on their tests. I would then ask further clarifying questions depending on their responses. Some students were surprisingly shy. This required me to back up and ask some yes/no questions, such as “Do you like to write?” to get them warmed up, and then follow up with the why. Two positive themes did emerge from the interviews, despite the fact that some students groaned on the days they wrote in their journals.

The first theme evident was that some students felt the journaling helped somewhat with how they viewed science, and some felt it made no difference. One boy, student #7, said, “Made me like it even more than I did before, ‘cause I could write down what I know, and it made me know it better.” One girl, student #6, did say though that journaling made “No difference” in their attitude of science, however, she said she liked science earlier in the interview. No students interviewed said that the journaling decreased their science attitudes.

The second theme that emerged was stronger than the first. All eight reported that the journaling helped them understand science better. One girl, student #3, when asked if the journaling helped with her understanding replied, “Uh, yeah, it did actually. It kind of, like, made it so that I could get it better.” “Because I already had written it down, and I had it right in my head.” She stated this as she pointed to her temple. Through follow-up questioning, students reported that the journaling helped them learn the concepts better in two primary ways. They said it was because they had to process the material in a different way. Some also said the journal writing was extra repetition of the concepts, which also helped them learn. Although I did not ask all eight whether they would
recommend I continue journal assignments next year, the three that I did said they would recommend to include journaling, even two who said they did not like the journal assignments.

For ease of grading, as well as paperwork reduction, I decided to only give one journal grade per student in my grade book. Because I only gave one journal score per student in my grade book, I chose to code the regular journal scores directly on a single rubric for each student. Figure 3 shows an example of what this looked like for a student’s journal scores throughout the treatment time period.

Figure 3. Rubric scoring example with journal date codes showing trends.

The circled numbers in each rubric category represent the student’s score on progressive dates, with one being the initial journal assignment, two the next journal...
assignment, and so on. As seen in Figure 3, this particular student had most of their scores from the first journal date in the Proficient and Basic portion of the Journal Scoring Rubric. All but their Use of Diagrams scores from their fourth journal date were in the Advanced portion of the Journal Scoring Rubric. I felt this student used the rubric as a guide to improve the quality of their journal entries. This method of grading was used for the sake of efficiency, but it provided me another source of data I had not intended. When I made the time to grade each student’s journal rubric, a general pattern of each student’s progress during the treatment period became evident. Some showed progress, and some did not.

Students are categorized as Advanced, Proficient, Basic or Below Basic on standardized tests in Pennsylvania, so those were the categories used on my rubric. Next, I categorized each individual rubric as one of four classifications, which I coined: PA – Progressed Advanced, PP – Progressed Proficient, SP - Static Proficient, and SB – Static Basic/Below Basic. Progressed Advanced codes were given to students who showed improvement from Basic or Proficient to Advanced during the treatment. Progressed Proficient codes were given to students who showed improvement from Below Basic or Basic to Proficient during the treatment. Static Proficient codes were given to students who stayed essentially at Proficient during the treatment. Static Basic codes were given to students who stayed essentially at Below Basic or Basic during the treatment. Figure 4 below displays the number of students who fell in each category throughout the treatment phase of the project.
As seen in Figure 4 above, ten of the students progressed to Advanced during the treatment and ten students progressed to Proficient during the treatment. One boy, student #7, replied, when asked during their interview if the rubric helped as he progressed through the journaling, said “It helped most of the time.” “Yeah, sometimes when I got a bad grade I would go back (to the rubric) and get better at it.” I believe this verifies the importance of providing rubrics to students to help guide them. Thus, in my opinion, students who used the rubric were ones who progressed from Basic to Proficient, Progressed Proficient, and students not using the rubric as a guide were Proficient to begin the journaling and maintained that level, Static Proficient.

In answering the question on how the treatment of frequent journaling affected
student attitudes, pre-treatment and post-treatment Likert surveys were given to both eighth grade classes. The sample size for this instrument, both pre-treatment and post-treatment was 37. The survey was anonymous, as students did not have to provide their names on the survey. The first time the survey took about five minutes at the beginning of class, from passing out the survey to collecting it back. The second time, because I also asked for written explanations of why they answered the way that they did on certain questions, the survey took about ten minutes total. As seen in Table 2 below, attitudes about science increased slightly, even while attitudes about writing in the journal decreased following the treatment period.

Table 2
Likert Survey Theme Summary (N=37, both pre and post treatment)

<table>
<thead>
<tr>
<th>Survey Theme</th>
<th>Avg Likert Score Pre-Treatment</th>
<th>Avg Likert Score Post-Treatment</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student attitudes on learning about science and the</td>
<td>3.46</td>
<td>3.58</td>
<td>+ 3.5%</td>
</tr>
<tr>
<td>physical world. (Questions 1 &amp; 6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student attitudes concerning writing in a journal.</td>
<td>2.11</td>
<td>1.92</td>
<td>- 9.0%</td>
</tr>
<tr>
<td>(Question 7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student attitudes concerning writing about science.</td>
<td>2.32</td>
<td>2.32</td>
<td>0.0 %</td>
</tr>
<tr>
<td>(Question 4 )</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I imagine there wasn’t much of a shift in student attitudes about science because they already had a fairly positive view of science before the treatment. I found it very interesting that student attitudes on science went up at all, especially after hearing complaints from the students during the journaling assignments. I feared attitudes about
science due to the journaling would go down, due to student statements ranging from “I don’t really like writing that much.” to “I hate writing.” One particularly interesting student comment concerning writing about science was “I don’t really like to write about it because if you get a good person to teach it to you and he really explains it, it’ll be in your mind.” I’m not sure if I necessarily agree with that, but found it interesting nonetheless. Also of interest was that their attitude about writing in a journal increased in negativity, while their attitude about writing about science held steady, albeit also negative (Figure 5). I really appreciated one positive quote about why they enjoy learning about science, “Because I enjoy what we learned in this class. #coolstuff”.

![Student Attitudes Pre & Post Treatment](chart.png)

*Figure 5. Pre-treatment versus post-treatment attitude chart, (N = 37).*

Contributing to the increase in post-treatment attitudes about science was a shift in outliers. In the pre-treatment survey, there were a total of five strong negative responses,
while there was only one in the post-treatment survey. The post-treatment survey also saw one additional strong positive response (Figure 6).

![Attitude Responses Concerning Science Pre & Post Comparison - Combined I Enjoy Learning About Science (N = 37)/I Like Science (N = 37)](image)

*Figure 6.* Detailed pre-treatment versus post-treatment attitudes concerning science, combined classes, *(N=37).*

Digging deeper, most of the negative responses, Likert scores of one or two, in regards to attitudes came from my fifth period physical science class. One fifth period student, responding to enjoying learning about science and the physical world, wrote “because science is boring and confusing”. In response to enjoying writing about science, another fifth period student wrote “because I think it’s hard about writing about science”. Thus, most of the contribution to the higher favorable response in attitudes
concerning science came from that fifth period physical science class of students. I imagine this is because it is the lower performing class between the two periods, as evidenced by the average test scores shown in Figure 1 above. In my experience, attitudes and performance track together with students. I have witnessed students getting more positive about the subjects of science and math when they develop more confidence through additional success. After isolating fifth period data in a similar Figure 7 to follow, I will comment on one particular student from this lower performing class.

Figure 7. Detailed pre-treatment versus post-treatment attitudes concerning science, 5th period class, (N=20).

One boy from this fifth period class, student #2 from the interviews, was one I suspect shifted to a more positive attitude. I cannot say that definitively though, as the Likert surveys were anonymous. I suspect this because I saw his confidence increase during the treatment phase. He is one of my IEP students who stutters when anxious. He
started to participate more in class discussions as the treatment progressed. After asking him if he thought the journaling made any difference with how he answered essay questions on the tests, he answered, “I think I wrote them (test essay question answers) longer, and a little more complete.” I followed up with the question, Why do you think that is? “Maybe, since I, like, learned it more, like, learning in multiple ways, like, writing it and (you) teaching it in class.”

When the interview was over, and as he was heading out of my classroom, I remembered that I had that observation of him participating more, and asked him if he felt he thought he was participating more since the journaling, and he answered “yes”. I asked him if he thought the journaling gave him more confidence to discuss things in class, and he answered in the affirmative again. I then asked him why he thought that was, but he just shrugged his shoulders and said “I don’t know”.

Finally, as mentioned before, the main source of data used in answering the question of how frequent journaling by my students affected me as a teacher, was a hand-written personal journal where I recorded my thoughts and observations a few times a week. I had intended to do this daily, but fell short, only jotting thoughts down once or twice a week. This data contributed to my thinking regarding my interpretation and conclusion contained in the following section of this paper.

INTERPRETATION AND CONCLUSION

The main focus of my action research project was to investigate the effect of regular science journaling on my eighth grade physical science students’ learning and attitudes. A minor focus of my research was what effect the regular journaling would
have on me as a teacher.

The data gathered over the course of the study suggests both student achievement and attitudes concerning science improved slightly. Average combined summative test scores went up 0.4% versus a 4.0% decrease from the previous school year. Likert scores for science attitudes went up by 3.5%. While no attitude data was available from the very beginning of the school year, summative test scores at the beginning of the year went down in both fourth and fifth period classes as units progressed, with, again, fifth period being the lower scoring class of the two. Thus, although the increase in summative test scores was slight as a result of this action research project, the increase is worth note. Although I did not investigate the treatment on an individual student level, it is very possible some students benefited from the treatment more than others.

In response to the AR question on journaling impacting student understanding of concepts, student achievement improvement on summative tests per-treatment versus post-treatment was slight overall for the combined 4th period and 5th period eighth grade physical science students. From Figure 1 earlier in the paper, the average score on summative tests was 43.8 out of 50 pre-treatment, and the average score on summative tests was 44.0 out of 50 post-treatment, a gain of 0.4%. Interestingly enough, the 4th period eighth grade physical science class had the highest average summative test scores pre-treatment, which means the gain in overall summative test score averages were driven by the 5th period eighth grade physical science class.

Student achievement improved on the journaling itself as well. Ten students progressed to Advanced on the rubric from lower categories as the treatment progressed, and ten students progressed to Proficient on the rubric from lower categories as the
treatment progressed. This shows us that students can use a rubric as a guide to better writing and understanding.

My students’ attitudes concerning science improved slightly in both of the class periods as well. In aggregate, the average Likert score went from 3.46 to 3.58, a 3.5% gain. Again, scores were higher in the 4th period eighth grade physical science class at the onset, so again, more of the gain in the attitude score came from the 5th period class. This makes me wonder if regular journaling has more of a positive effect on lower achieving students, as I have more of them in my 5th period class, but it may be this category of students have further to go score-wise. In fact, that class has more IEP students in it than the other. Also, I noted in my journal that one of my IEP students from 5th period seemed to be more willing to offer explanations during class discussion, and that was positive. That was student #7 from the interviews that I described earlier.

In answering the question of what effect this AR project had on me as a teacher, my reflective journal helped. Some things noted from my personal journal were positive, and others were not. One observation that gave me encouragement was that in both classes, their attitudes concerning science were above neutral even prior to the treatment phase of the project. “This is good! Overall these guys like science.” A question I did not anticipate came from a female student after I passed out the pre-treatment Likert survey. She asked “Should I answer the question about liking science about science in general, or your class? I don’t like science, but I like your class.” I love science, and try to pass that passion to my students, so that was gratifying. I also noted enjoyment in seeing the quality of writing go up in most journals. It is important for us to remember our value to our students, and keep our enthusiasm and energy a part of our curriculum.
During the process I also wondered if the time devoted to journaling was worth it. What I initially imagined would take five to ten minutes turned out to be closer to thirty minutes. While noting that I enjoyed the quiet time while they worked on journaling, I missed some of the labs and activities. I also expressed frustration with how long it took me to grade the journals, especially with how much the students complained about them. “Is there a faster way to grade these journals… Will this be worth it? It’s tough to hear them groan the day we do these journals.” These negatives are something to consider and manage when implementing journaling.

I will introduce journaling at the beginning of next school year, but try to adjust my curriculum so some of the labs and activities are not sidelined. I will modify the journaling assignment to have only one probe to go with the muddiest point, rather than two probes. This should cut down time both for the students writing in their journals, as well as the time it will take me to grade them. During this project, I did not want the journals to leave my room for fear of losing them as data, however, they could also be assigned as homework to allow more class time for other curriculum.

In summary, I believe the journaling made a positive impact on my eighth grade physical science classes. While the gains were slight in overall summative test averages, this was certainly a contrast to the previous year where summative test scores went down during the same physics units. I think, combined with the slight gains in positive attitudes concerning science, implementing journaling is probably worth the extra time and effort. Again, despite some of the students complaining about the journal assignments, and Likert scores concerning writing getting more negative during the treatment, students benefitted.
One striking value is the impact performing an action research project in general has had on me as an educator. It has made me more curious and driven to find out how to determine the impact various parts of my curriculum have on my students. I am uncertain I will ever perform a full action research project in my own classroom, because of the time it takes. This has given me more appreciation of what goes in to good research. So even if I do not perform an action research project prior to trying something new in my curriculum, I will certainly seek out research that others have done to help decide whether or not to introduce a new strategy or treatment.

Based on this research, other educators can be more confident in utilizing frequent journaling in their classrooms to benefit their students. They will have to weigh the time necessary to implement and grade journals, and decide if it is worth it to them, or keep working on ways to bring the journaling in to supplement existing curriculum, which is what I will do. At the very least, I would recommend frequent use of a “Muddiest Point” prompt. Even though that was not a focus of my study, it was brought up during student interviews as something the students found helpful. They liked when I came back after grading journals and went over the muddy points. Additionally, as it seems as though journaling has the greatest impact on lower achieving students, and I base this thought solely on the fact that my lower achieving period saw the gain in summative test scores, another researcher could perhaps make that question a focus of a study of their own.

If I were to do this research again, I would try to focus more on individual students, as well as classes in aggregate. It would make it easier to determine where the greatest impact occurred, and why. Also, when conducting interviews, I would ask all students
the same questions. It was the first time I had ever conducted interviews, and learned to ask more and different questions as the interviews went on. In hindsight, I could have maybe brought the first students in again, but did not. While I would not consider myself committed to conducting many action research projects, I have learned a lot during this process. Every educator should probably conduct at least one action research project early in their career, as it makes us more aware of what questions to focus on, what data to gather, and how to measure the value of what we do.
REFERENCES CITED


APPENDICES
APPENDIX A

JOURNAL ASSIGNMENTS
Appendix A – Journal Assignment Prompts

JABishel Capstone Project – 8th grade physical science journal assignments

2/20/13
1) What is your favorite topic we have studied so far and why?
2) Explain why submerged objects experience an upward, buoyant force.
3) Muddiest point.

3/14/13
1) Give an example of doing work in the horizontal direction. Explain. Give an example of doing work in the vertical direction. Explain.
2) Give an example of when you apply a force and no work is done. Explain. Can this happen (no work) when you are moving?
3) Muddiest point.

3/22/13
1) What is an ideal machine? Explain in terms of input and output work.
2) How is a real machine like an ideal machine and how is it different? Why don’t ideal machines exist in real life?
3) Muddiest point.

3/27/13
1) What type of simple machine is a: A) door stopper? B) rake? C) windmill? D) slide? List your own examples for all six simple machines and explain why.
2) Explain why there are really only two simple machines, what they are, and how the other four come from the two.
3) Muddiest point.
APPENDIX B

STUDENT JOURNAL SCORING RUBRIC
# Appendix B: DATA COLLECTION INSTRUMENT – STUDENT JOURNAL

## SCORING RUBRIC

### 8th Grade Physical Science Journal Scoring Rubric

*Mr. Bishel*

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>4 - Advanced</th>
<th>3 - Proficient</th>
<th>2 - Basic</th>
<th>1 - Below basic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weekly Science Topics Covered</strong></td>
<td>All topics are addressed and all questions answered with at least 2 paragraphs about each.</td>
<td>All topics are addressed and most questions answered with at least 2 paragraphs about each.</td>
<td>All topics are addressed, and most questions answered with 1 paragraph about each.</td>
<td>One or more topics were not addressed.</td>
</tr>
<tr>
<td><strong>Quality of Information</strong></td>
<td>Information clearly relates to the main topic. It includes 3 or more supporting details and/or examples.</td>
<td>Information clearly relates to the main topic. It provides 1-2 supporting details and/or examples.</td>
<td>Information clearly relates to the main topic. No details and/or examples are given.</td>
<td>Information has little or nothing to do with the main topic.</td>
</tr>
<tr>
<td><strong>Paragraph Construction</strong></td>
<td>All paragraphs include introductory sentence, explanations or details, and concluding sentence.</td>
<td>Most paragraphs include introductory sentence, explanations or details, and concluding sentence.</td>
<td>Paragraphs included related information but were typically not constructed well.</td>
<td>Paragraphing structure was not clear and sentences were not typically related within the paragraphs.</td>
</tr>
<tr>
<td><strong>Use of Diagrams</strong></td>
<td>Diagrams and illustrations are neat, accurate and add to the reader's understanding of the topic.</td>
<td>Diagrams and illustrations are accurate and add to the reader's understanding of the topic.</td>
<td>Diagrams and illustrations are neat and accurate and sometimes add to the reader's understanding of the topic.</td>
<td>Diagrams and illustrations are not accurate OR do not add to the reader's understanding of the topic.</td>
</tr>
<tr>
<td><strong>Level of Understanding Demonstrated</strong></td>
<td>Journal entries demonstrate a high degree of student's understanding of the topic and concepts. No misconceptions evident.</td>
<td>Journal entries demonstrate a medium degree of student's understanding of the topic and concepts. One or two misconceptions evident.</td>
<td>Journal entries demonstrate a low degree of student's understanding of the topic and concepts. Several misconceptions evident.</td>
<td>Journal entries demonstrate a poor degree of student's understanding of the topic and concepts. Many misconceptions evident.</td>
</tr>
</tbody>
</table>
APPENDIX C

PRE-TREATMENT LIKERT SURVEY
Pre-Treatment Survey

Participation in this research is voluntary and participation or non-participation will not affect a student’s grades or class standing in any way.

Please answer the following questions using the following scale:

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

1) I enjoy learning about science and the physical world.

   12345

2) I enjoy discussing science concepts with my fellow students during class.

   12345

3) I enjoy discussing science concepts with my fellow students outside of class.

   12345

4) I enjoy writing about science.

   12345

5) When I discuss science and the physical world accurately, I have confidence that I understand the concepts.

   12345

6) I like science.

   12345

7) I enjoy writing in a journal.

   12345

8) I am uncomfortable writing about science concepts when I am not sure I understand them.

   12345
APPENDIX D

POST-TREATMENT LIKERT SURVEY
APPENDIX D: POST-TREATMENT LIKERT SURVEY

Post-Treatment Survey

Participation in this research is voluntary and participation or non-participation will not affect a student’s grades or class standing in any way.

Please answer the following questions using the following scale:

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

1) I enjoy learning about science and the physical world.

12345

Why did you answer how you answered? Explain.

2) I enjoy discussing science concepts with my fellow students during class.

12345

3) I enjoy discussing science concepts with my fellow students outside of class.

12345

4) I enjoy writing about science.

12345

Why did you answer how you answered? Explain.
5) When I discuss science and the physical world accurately, I have confidence that I understand the concepts.

12345
Why did you answer how you answered? Explain.

6) I like science.

12345
Why did you answer how you answered? Explain.

7) I enjoy writing in a journal.

12345

8) I am uncomfortable writing about science concepts when I am not sure I understand them.

12345

Additional thoughts?
APPENDIX E

IRB EXEMPTION LETTER
MEMORANDUM

TO:        John Bishe & Walt Woolbaugh
FROM:  Mark Quinn, Chair
DATE:  December 20, 2012
RE: "What is the Effect of Regular Journaling on 8th Grade Science Students’ Learning?" [JB122012-EX]

The above research, described in your submission of December 19, 2012, is exempt from the requirement of review by the Institutional Review Board in accordance with the Code of Federal regulations, Part 46, section 101. The specific paragraph which applies to your research is:

- (b) (1) Research conducted in established or commonly accepted educational settings, involving normal educational practices such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

- (b) (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects’ responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects’ financial standing, employability, or reputation.

- (b) (3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section. If: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

- (b) (4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available, or if the information is recorded by the investigator in such a manner that the subjects cannot be identified, directly or through identifiers linked to the subjects.

- (b) (5) Research and demonstration projects, which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.

- (b) (6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the FDA, or approved by the EPA, or the Food Safety and Inspection Service of the USDA.

Although review by the Institutional Review Board is not required for the above research, the Committee will be glad to review it. If you wish a review and committee approval, please submit 3 copies of the usual application form and it will be processed by expedited review.