THE IMPACT OF SCIENCE NOTEBOOKS ON STUDENT ACHIEVEMENT IN FIRST GRADE SCIENCE

by

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Josie Shern

July 2013

DEDICATION

To my fabulous fiancé Joe, thank you for all the support and encouragement along the way. To my mom and dad, thank you for always pushing me to greater heights and instilling in me the power of education. I am truly blessed.

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ABSTRACT

This project implemented science notebooks into science teaching. Students respond in their notebooks by writing and/or drawing after each treatment lesson. Notebooks were used to reinforce concepts and to increase student achievement. The use of science notebooks increased achievement for some students, but more importantly, became a favorite science activity for most.

INTRODUCTION AND BACKGROUND

Project Background

At Longfellow Elementary, Bozeman, MT, I teach two classes of first grade science. I teach my own class, and I also teach science to the other first grade class. For many years I taught both science classes back to back; a 40-minute lesson for my class and then a 40-minute lesson for the other class twice a week. Having the classes back-to-back often left me feeling rushed at the end of a lesson and rarely left time to wrap my lesson up with my students. I was often unsure if the students understood the main idea for the lesson, and I never really knew what the students learned from the lesson.

This year my teaching partner, Dawn Perry, and I decided to change our schedules so that we were not teaching back-to-back lessons, which opened up room to have longer blocks of time for which to teach science. Changing our schedules eliminated one problem, but I was still unsure how much information my students were walking away with at the end of each lesson. I also wanted to give my students more time to write and draw what they learned in the science lesson. I decided that implementing science notebooks into my instruction would be the perfect way to have my students record their understandings after each lesson, and it would also be a wonderful way to integrate writing and drawing into science. It is important for students to realize how all areas of curriculum can be woven together. I want my students to know that science is not just fun experiments, but it is also writing and drawing about what they are learning. I want to

teach my students at an early age that no curricular area is completely independent, but that all areas of school work together to create a deep, overall understanding of material. Using science notebooks would also allow me to have a better understanding of what my students were truly learning during each lesson.

The purpose of my action research project is to understand the effects of implementing science notebooks into my class. As our district moves toward adopting the Common Core State Standards, I felt it would be a good idea to integrate more writing and drawing into my science instruction. I have always been concerned with being able to reach all learning styles in my class and felt by including more writing and drawing into my teaching, that science might become more appealing to more of my students. I incorporated science notebooks into each of my science lessons. Students were asked to draw and or write in their notebooks about the main ideas and focuses of each science lesson.

Now that my research is complete, I will share my findings with my school colleagues. I plan to create a presentation with the most important and helpful information from my research, so that my colleagues will have some tools with which to begin integrating science notebooks into their instruction.

I also plan to share the presentation that I create with my first grade partners across the district so they too can see the effects of implementing science notebooks into daily instruction. At this presentation, I can show them a few simple ways to begin incorporating notebooks into their teaching.

Purpose Statement

The purpose of my research was to understand the effects of implementing science notebooks into science instruction. I used various assessments, interviews, surveys and observations to see how students and teachers were affected by the use of science notebooks in class. The following are the specific research questions that I answered through my research.

Main Research Question:

What is the impact of science notebooks on student achievement?

Sub Questions:

- *What is the impact of implementing science notebooks on student attitudes?*
- *How are various learning styles impacted by drawing and writing in science notebooks?*
- *What is the impact of science notebooks on the teacher?*

Being able to conduct this research and answer the questions above was a large task so I enlisted the help of many of my friends and colleagues as I conducted my research.

I had colleagues observe my teaching, analyze my assessments and surveys and read my papers. I asked friends to read over my work and critique my projects and I asked professors to assist with papers and give guidance to my research. While many people have been a part of my research project, there are a few who have done a bit more to assist in my work and served a very crucial role in my research as my support team.

Dawn Perry- Teaching partner at Longfellow Elementary School

Mary Strickland- Veteran 5th grade teacher at Longfellow Elementary School

Leah Knickerbocker- 2012 MSSE Graduate and teacher at the Traveling School

Cheryl Shern- Mother and volunteer at Warner Nature Center

Dawn Perry has been a teacher at Longfellow Elementary School in Bozeman, MT for 12 years. She has been my teaching partner for the past three years. Since Dawn is my teaching partner she is someone I always turn to for quick answers and quick fixes to my teaching dilemmas. She was always so excited about my project since it directly affected her students.

Mary Strickland has been a teacher in the Bozeman School District for 33 years. Mary helped to read and revise papers and give me ideas on how to assess students on various science topics. Having Mary in my building makes constant communication easy.

Leah Knickerbocker is a friend and classmate that recently graduated from the MSSE program and has been working for the Traveling School on and off for the past three years. I felt as though it would be beneficial to have an MSSE graduate on my support team to help me through the process and to ensure that I was conducting my research correctly.

Cheryl Shern is the last member of my support team and happens to be my mother. I decided to have my mom as a part of my support team for many reasons, but mostly as my proof reading expert and advice giver. For many years I have been sending papers to my mother for consultation and this project was no different.

All of these women helped in various ways to make my research project a huge success. They served in ways that are invaluable to my project and for that I am so grateful.

CONCEPTUAL FRAMEWORK

I am also grateful for the researchers who have come before me. It is difficult to begin a research project with no previous work to guide and direct you. As I began to narrow down my research topic I searched for other people who had done similar research. I read their work and used their studies to guide my work.

During my research I found many fascinating themes that continued to emerge throughout various research papers. The themes that I discovered through my research helped to guide and mold my action project.

The benefits of using science notebooks within a classroom curriculum are countless and have been documented for many years. Countless teachers use science notebooks as a major component of their science curriculum because of their wonderful effects on student learning and achievement. According to Nesbit, Hargrove, Harrelson and Maxey (2004) a “science notebook component enhances student achievement in writing as well as other curricular areas” (p.21). With the amount of material that teachers are being asked to teach, it is vital to be able to cover as many curricular areas as possible within each lesson and science notebooks do just that. Using science notebooks throughout science lessons encourages students to not only participate in the science, but

also communicate their thinking through words and drawings. Having students express their thoughts through various modes will increase their level of understanding.

Science notebooks are also effective in reaching all types of learners. As teachers, we know that not all students learn in the same way, and it is our job to figure out how they learn and make learning accessible for them. As stated in an article by Britsch and Heise (2006), " Embracing the various modes through which students express their science understandings can go a long way in meeting goals for learners"(p.26). When using science notebooks, a teacher is able to allow various students to come to conclusions on their own, in a way that works for them. "These students' very individual processes are a reminder for teachers to try not to 'push' for particular modes of expression" (Britsch & Heise, 2006, p. 28). Making sure each student is able to express his or her ideas and thinking is critical. Science notebooks open the door to make that possible.

Butler and Nesbit (2008) report that "when students write in science notebooks, they discover what they think and come to a better understanding of what they know and what gaps remain in their knowledge" (p.137). It is very important for students to have a way to gauge their understanding and to realize where their muddy points may be. It is said that, "science notebooks have been proven to increase scores on standardized tests, which is becoming increasingly more appealing as a high-stake accountability programs are implemented nationwide" according to (Nesbit, C., Hargrove, T., Harrelson, L., & Maxey, B., 2006, pp. 21-22). The final benefit of science journals that I would like to mention is based on real scientists. It is important for our students to understand that real

scientists use science notebooks all the time. They use notebooks to record information, draw diagrams, make predictions and for countless other tasks. As teachers of science it is vital that our students see the connection between what they are doing in class and how science is practiced in the real world. Having students record information like real scientists can be a powerful tool. Nesbit et al., (2004) discusses the importance of letting students know how every day scientists use lab notebooks.

Scientists use lab books to record data and their thoughts about data, to draw images that represent their ideas, to formulate questions, and draw conclusions. Individual in nature, their notebooks help them to make sense of their investigation and reflect thoughts, trial-and-error experiments, data, drawings, charts, and graphs. This process of recording information provides a format for scientists to organize their thoughts, confront and formulate what they believe or do not believe and form conclusions (p.22).

Science notebooks have been proven to be a wonderful addition to science instruction. They have shown to increase understanding, comprehension of material, test scores and are a wonderful way for students to make real-world connections between how they are recording their findings and how real scientists record data.

When implementing science notebooks there are many ways in which your students may complete entries. In my action research project I had my students to write and draw in their science notebooks. In my research I found benefits to including both within the notebooks. First, I will look at the benefits of incorporating drawing into science notebooks. Glynn and Muth (2008) realize the importance of including drawing

activities in science lessons and say that, “drawing activities in science can help students conceptualize and reflect on their experience” (p. 48). When students are able to connect their learning to their own experiences they are more likely to understand the material being covered. “Drawing is inherently constructive and motivating because it is both a hands-on and minds-on activity” (Glynn et al.,2008, p. 48).

Drawing can also be used as an assessment tool. Looking at student drawings is a wonderful way to understand what students are learning and where their misconceptions lie. “The process of drawing helps students consolidate information about a concept, while providing teachers with a document to use to help identify any misconceptions” (Glynn et al., 2008, p.48). When a teacher looks at a student’s work in a science notebook they are able to fully understand what a student is absorbing from each lesson. When students are asked to construct a drawing to visualize their thinking, not all students are going to represent their thinking in the same way. Since this happens, science notebooks help teachers see who understands the material and who does not. According to the article, *Implementing Science Notebooks in the Primary Grades*, Data from science notebooks provide the teacher with a true record of each students’ thinking and level of understanding over the course of the investigation. This information can prove to be extremely insightful as teachers begin to understand how each student thinks, where their strengths and weaknesses lie and why they make the mistakes they make (Nesbit et al., 2004, p. 22).

Another assessment tool that was mentioned in an article I read was to interview students about what they are recording in their science notebooks. “Interviewing students

about their journal responses is a great way to assess their learning" (Harr and Lee, Jr., 2010, p. 36). As teachers, we are always looking for new and exciting ways to assess our students and science notebooks can be just that. Drawing in science is such a beneficial process. It enhances student understanding and can provide such a unique way to assess student progress. Drawing can also be a way for students to visualize their thinking and find a way to make their learning more concrete. The most interesting information I found regarding this topic was written by Brooks (2009).

Drawing often provides young children with their first means of making a permanent tangible, concrete and communicable record of their ideas so that most young children have a strong desire to draw. Drawing is both a means of communication as well as a problem-solving tool. Through drawing they are not only able to see what they are thinking, they are able to play around with and transform their ideas (p.319).

Asking students to draw in order to explain their thinking allows teachers to obtain a better picture of their conceptions. Drawing can lead a teacher further into the deeper understandings of their students. Ehrlen (2009) says that, "drawings are often used when our primary research interest is children's conceptions"(p. 41). The reason for including a drawing component in science notebooks is for the student's to have another way to describe their understandings, for the teacher to have an assessment tool based on authentic work, and for the teacher to obtain a deeper understanding of what their students are conceptualizing.

While drawing in science notebooks is an essential component to the curriculum, writing should be incorporated as well. Asking students to write about their science work

is great practice for many reasons. When a teacher asks their students to record their thoughts in writing, they are elevating the level of understanding and comprehension. Recording ideas in writing means that students must take what they are learning, synthesize the information and find a way to coherently record what they have learned. Subramaniam (2010) adds that having students write about science content, increases their comprehension. “When writing in the classroom is an interpretative activity, students’ writing exhibits their comprehension…” (Subramaniam., 2010, p. 31). I know very quickly when I read a student’s notebook entry, whether they understood the lesson or not, solely based on their writing. When a student grasps the information presented to them, they are able to put their understandings into words. If a child is struggling to fully understand a concept, they will find it much more difficult to write about their learning.

Including writing as a component of science notebooks also enhances other curricular areas. The writing that a student completes in their science notebooks is much different than the writing they are asked to do during a writing lesson. If a student is able to record their thoughts in a scientific manner in their notebooks and in a creative manner during writing time, their writing proficiency is bound to increase. “A science notebooks component enhances student achievement in writing, as well as other curricular areas” (Nesbit et al., 2004, p. 21). It is proven that when a child is able to communicate through the writing process, that he or she will be able to perform better in other academic areas as well. As teachers we need to make sure that our students are connecting with our lessons and with the content. If students do not make a connection during the lesson, then the learning taking place is only temporary. In order to fully grasp a concept, students

must make connections with the material. The writing process allows for students to make connections with their learning, in turn opening an avenue for them to fully understand the material. Butler et al. (2008) refers to the process of writing in his 2003 article. In that article he quotes Rivard (1994) “The process of writing is important not only for learning about something or acquiring knowledge, but also for generating a personal response to something, for clarifying ideas and for constructing knowledge” (p.970).

Including both writing and drawing in science notebooks is essential. Both allow students to fully grasp new concepts and be able to formalize their thinking. Writing and drawing also make it possible for students to make connections with their learning on a personal and in-depth level. I plan to use both writing and drawing as integral parts of my science notebooks.

Throughout my research on science notebooks, I kept finding information related to how science notebooks should be laid out. I had not put much thought into this aspect before, but realized quickly that how a teacher structures his or her science notebooks can be very important. Fingon (2008) has many suggestions for when to use science notebooks in your lessons. “Journals can be used as a warm-up activity, discussion generator, closure, self-reflection, or assessment” (p. 41). These suggestions were very helpful in deciding when I will want my students to respond in their science notebooks. It is nice to know that the notebooks can be used at any point within a lesson. This knowledge frees me up to feel like I can include them when they will be most beneficial. Fingon (2008) also suggests that there should be strict guidelines for how students

complete entries in their notebooks. This will give students guidance and structure. Setting up guidelines in advance also gives the teachers something with which to assess the students.

My research also gave me information on how I may want to implement science notebooks in my class. Many articles discussed a format they used for their research and in-class work. I am still struggling with having one specific way that my students must always complete notebook entries. I see myself as having more of a mixed approach. I know that I want my students to act like scientists and begin each entry in a specific way. Nesbit et al. (2004) says that "I introduced science notebooks and remind students that we are also scientists; therefore, we need to keep records of our experiments. The first thing we do as scientists is to write our name, the time, and the date in the upper right-hand corner" (p.23). I like the structure of this and will have my students begin each entry as she has mentioned. From there, the style of each entry will depend on what type of entry they are doing. If they are recording information from an experiment, they may use the strategy discussed on p. 25 of Nesbit et al. (2004). If my students are drawing or responding creatively to a writing frame, I may ask them to use something like Subramaniam (2010) suggests on p.33.

Another aspect of science notebooks that I am still mulling over is how to assess student work. While reading Nesbit et al. (2004), I came across a great point. "It is important to remember that the science notebooks ultimately belong to the student. It is their authentic record and should be revered as a personal document. For this reason, comments from the teacher should be recorded in a way that is not permanent" (p. 26). A

great way to record comments would be to attach sticky notes to entries. Also, it was suggested to leave a few pages at the end of the notebook for teacher comments. At the end of each unit the students may rip out the comments if they choose.

As far as grading notebooks is concerned, it seems as though most of the research on science notebooks suggests using a rubric to grade students. “Rubrics can be an effective tool for articulating where a student is functioning on this independent continuum” (Nesbit et al., 2004, p.27). I agree with this statement and also understand the importance of students knowing and being familiar with the rubric. All students must understand the criteria to which they were being graded.

The structure of science notebooks in my AR project was greatly influenced by the articles that I read. As a result of this research, I gained a great deal of information necessary to complete my AR project. After reading the above articles, I learned more about specific areas of my project and where I may want to make changes. The articles I read helped me to realize the importance of both writing and drawing within science notebooks. “What is important to note is the child’s development over time. Not only are students developing scientific literacy, but they are honing their writing skills and demonstrating growth in other areas of curriculum” (Nesbit et al., 2004, p. 28).

Reading these articles also helped me understand the impact that science notebooks can have on student learning. “Notebook writing in science is an important tool for recording information, generalizing, hypothesizing, and theorizing- in other words, for assisting thinking, reasoning and problem solving in the pursuit of science inquiry” (Baxter, Bass and Glaser, 2000, p.28). I have always known that science

notebooks could have a great impact on student learning, but I did not realize how large that impact could be.

METHODOLOGY

For my action research project I had a two/three-week treatment phase and a two/three-week non-treatment phase that created a single unit cycle. My project consisted of three cycles total. I began with a unit on the Earth and Sky and finished with a unit on Solids, Liquids and Gases. Within the Earth and Sky unit, the section on Day and Night was a treatment phase and the section on Earth's Landforms was a non-treatment phase. Within my Solids, Liquids and Gases unit, the section on solids was a treatment phase, Liquids a non-treatment phase, gases a treatment phase and the section on changing states of matter was a non-treatment phase. Below is a table that illustrates these cycles.

Table 1
Treatment and Non-Treatment Cycles

Unit	Treatment	Non-Treatment
Earth and Sky: Day and Night (3 weeks)	X	
Landforms (3 weeks)		X
Solids and Liquids: Solids (2 weeks)	X	
Liquids (2 weeks)		X
Gases (2 weeks)	X	
Changing States (2 weeks)		X

During a treatment phase, students were asked to write or draw in their science notebooks describing the main idea of the lesson. Students were to show me their understandings through pictures, words or a combination of both. For example, say my lesson for the day was on the properties of solid objects. The main idea for the lesson would be to have students understand that solid objects have their own shape. After teaching the lesson I would have students write in their journals about what they thought the main idea for the lesson was, and then I would have them search the room for examples of solid objects. Once they found three or four things, I would have them record their objects into their notebooks by either writing or drawing them. If time allowed, we would gather back as a group and share our findings as a class.
Having students write and draw about their learning solidified their understandings and created a higher level of achievement. During non-treatment phases students were taught the same as during treatment phases. The only difference was that they were not asked to respond to the lessons in their science notebooks. Their notebooks were graded against a rubric at the end of each treatment phase. Along with their notebook rubrics, I also had many other ways in which I gathered data.

Data Collecting Methods

Prior to beginning my research project, I gave both my first grade classes a student survey (Appendix A), for a total of 40 surveys. These surveys were intended to gather information about students' attitudes and beliefs about science before beginning

the project so that I could measure how their attitudes and beliefs changed throughout the project. I also gave this same survey in the middle of my project and at the end to compare results over time.

The first time I gave my students the survey, they really struggled. I had to read each question, one at a time it took almost 30 minutes to administer. My students were frustrated and did not really understand how to take a survey. For the next two surveys I changed the word choices from always, sometime and never to smiley face options. This seemed to make things a little more clear for them, but the surveys were still challenging. In the future I would make sure to really model for my students how to take a survey.

I also gathered pre-project data in the form of interviews (Appendix B). Prior to my project, I interviewed five students from my class and five students from the other first grade class. There were five boys total and five girls total, all with varying degrees of ability in science. I selected the students to ensure a range of ability and an equal number of girls and boys. I began with randomly selecting students, but I found that the students I selected created a pool that was not an accurate picture of all my students. I had too many girls and not enough boys. I wanted the numbers to be equal. I initially selected seven very high achieving students and felt that was too many and not an accurate picture of all my students. I ended up switching three, higher achieving students with more average students in class to make the interview pool a better overall sample.

I interviewed the students individually, so that they could be completely honest when responding to questions. I found that as the students became more comfortable with

me, their responses were very honest and showed their true feelings. Each interview took about fifteen minutes and I interviewed each student three times throughout my project.

I used these interviews as another way to gather information about students' attitudes and learning styles. These interviews were given pre, mid and post-project and the results were used to see if the implementation of science notebooks had any effect on students' attitudes, learning styles and beliefs towards science and school.

Before each phase, students were given a pre-test that mirrored their post-test to measure their growth over the unit. I used this information to compare achievement during treatment phases, to achievement during non-treatment phases. Students were also given a quiz at the end of each phase to assess their achievement differences between treatment and non-treatment phases.

Lastly, I used teacher notes and observations to answer my research questions and to better understand how science notebooks impacted my science classroom. As my students were working in their notebooks I walked around and took notes about how each student was doing. During this time I was able to see if any students had misconceptions about the lesson. I often ran into a few students who were either unable to journal or who had misconceptions within their journal entry. As I came across this, I was able to pull these students to the back table and re-teach the main idea for the lesson and really discuss the misconceptions they were having. This allowed me to make sure that each student grasped the concepts being taught.

Below is a table illustrating the various data collection methods that were used to ensure that all research questions were addressed and that ample data was being collected to answer each question.

Table 2
Data Collecting Methods

	Data Sources					
	Student Surveys	*Student Interviews*	*Pre/Post Tests*	*Teacher Notes*	*Teacher Observations*	*Quizzes*
Research Questions						
What is the impact of science notebooks on student achievement?			X	X	X	X
What is the impact of science notebooks on student attitudes?	X	X		X	X	
How are various learning styles impacted by drawing?	X	X				
What is the impact of science notebooks on the teacher?	X	X	X	X	X	X

The above table illustrates how I made sure that each of my research questions was answered. I also took measures to make sure the collection methods that I used were valid and reliable. Before giving my students the interview and survey, I had another first

grade teacher in my building pilot them with her students. She and I went over the results and changed a few things, and then she gave them to her students again. To help insure validity and reliability, I also had my teaching partner look over all my quizzes and assessments before I gave them, checking to make sure they would produce valid information about what our students learned in science.

The demographics of my class and Ms. Perry's class were very similar. I had twenty students participate in this study. Eleven of those students were girls and nine of them were boys. Of those students, I had one student who participated in the Free and Reduced Lunch Program. Eighteen of my students were Caucasian, one was Hispanic and one was African American. I had one student who was on an Individualized Education Plan and received extra academic support. Ms. Perry's student demographics are very much the same. She also had a class of twenty students, 11 boys and nine girls were in her class as well. She had no students participate in the Free and Reduced Lunch Program. Eighteen of her students were Caucasian and two were Hispanic. She also had one student who was on an IEP that received extra academic support.

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 C).

DATA AND ANALYSIS

As I began to analyze data from my two science units, I quickly realized that my students were learning a lot in class. My main research question addressed the impact of science notebooks on student achievement and after looking at my data it was obvious that my students were learning. At the end of every lesson, I would journal about how my students did that day. In my entries, I often wrote about how effective the notebooks seemed during the lesson. During the treatment phases of my lessons, I discussed in my journal often about how effective science notebooks were becoming. In fact, during the treatment phases, when students were using their notebooks, I mentioned how much my students enjoyed their science notebooks, or what a great learning tool they were over 75% of the time in my journal entries. It was clear to me that science notebooks were becoming a very effective learning and teaching tool within my class. Quotes such as this were written very frequently in my teacher journal.

After today's lesson, students got right to work in their notebooks. Students were on task for 15 minutes journaling and drawing. As I walked around I saw various types of entries from a simple picture, to a labeled picture to a picture with five sentences to discuss the picture. I am constantly surprised by my students' entries (Jan. 2013).

While I knew my students were learning, the question still remained, were they learning more as a result of the notebooks, or were they achieving just as much without the use of notebooks?

I gave my students a quiz at the end of every treatment and non-treatment phase to compare the results of their learning between the two phases. I wanted to know if they were learning more with the use of notebooks or without the use of notebooks. The data I found was all over the board. My class usually performed better during treatment phases when they were allowed to use notebooks, but Mrs. Perry's students performed better during non-treatment phases when they were not using their notebooks. I chose to look at the data from both classes separately because the results were so different.

For my class of twenty students, the results showed that they achieved higher quiz scores during the treatment phases. I concluded that this meant they were able to understand the information better during treatment phases as a result of using their science notebooks. Below you will find their average quiz scores for each phase. Each quiz was given out of six points. The treatment columns are indicated with ** and the non-treatment phases are not marked.

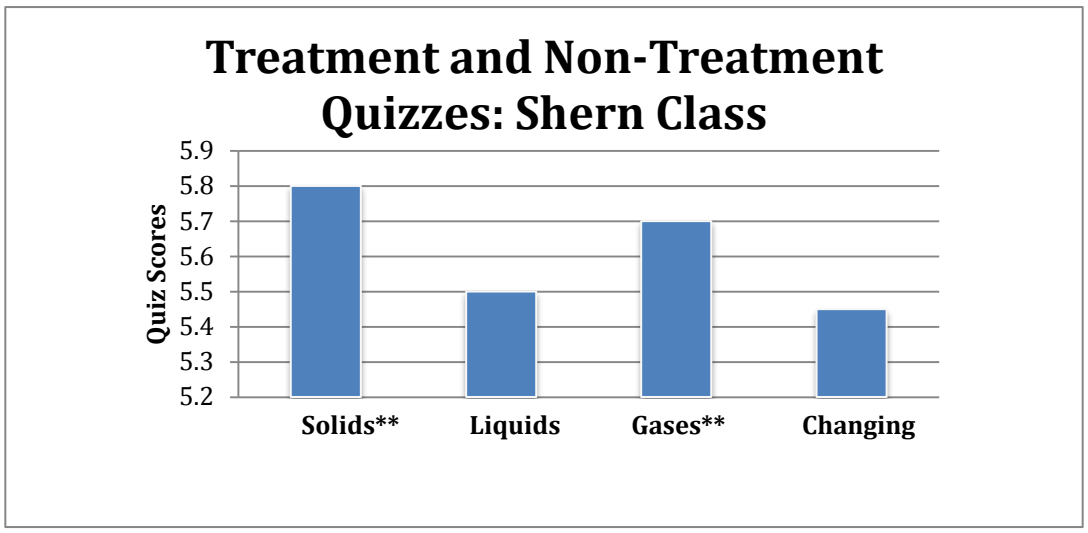


Figure 1. Treatment and non-treatment quizzes: Shern class, (*N*=20).

As you can see from the figures, my class did a bit better on quizzes during the treatment phases as opposed to the non-treatment phases. The results are not drastically different, but I would guess that if my study were over a longer period of time that the results would become more evident.

While my class seemed to really benefit from the use of science notebooks in class, the other class of first graders did not show the same results. They were also given the same quizzes at the end of each unit to measure their achievement. The treatment columns are indicated with ** and the non-treatment phases are not marked.

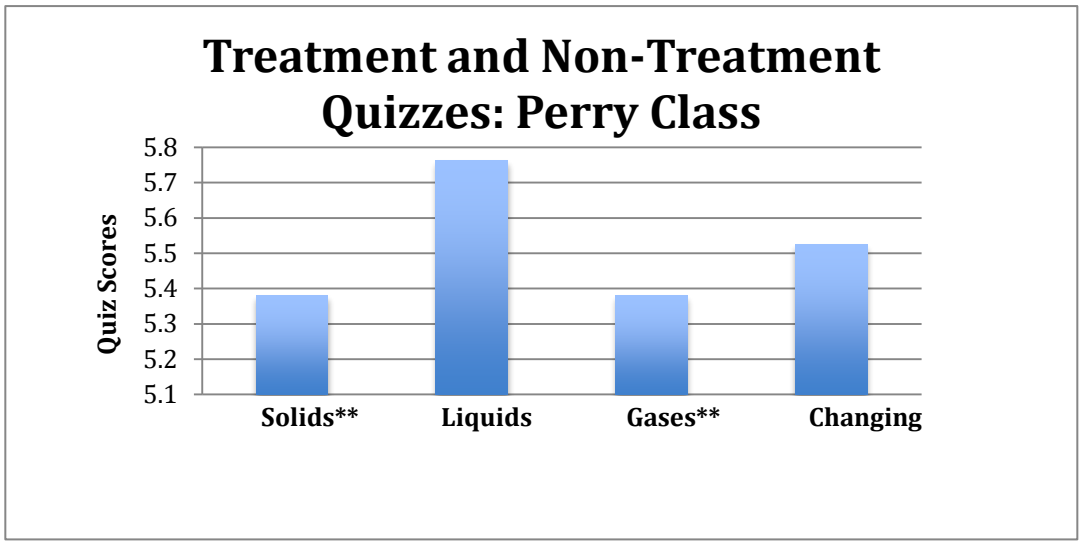


Figure 2. Treatment and non-treatment quizzes: Perry class, (*N*=20).

As you can see by looking at the figure from Mrs. Perry's class, her students performed worse on the quizzes that were given after treatment phases. These students also performed worse overall on the quizzes when compared to the other class. I think there were a few reasons this may have happened that I will discuss later in my interpretation.

Another data source that I used to answer my main research question was the pre and post-tests of each unit. At the beginning of each unit I gave my students the final test so that I could compare the results to their final scores at the end of the unit. I was hoping to see my students do much, better on the final test than on the pre-test and that was the case.

For this test I chose to put all 40 scores together since the scores for both classes were about the same on each test. The test was out of eight points total.

Table 3
Pre and Post Test Percentages for Solids, Liquids and Gases Unit (N= 40*)*

Pre-Test Percentages	**Post- Test Percentages**
2 out of 8 questions answered correctly = 2.5%	2 out of 8 questions answered correctly = 0%
3 out of 8 questions answered correctly = 5 %	3 out of 8 questions answered correctly = 0%
4 out of 8 questions answered correctly = 12.5%	4 out of 8 questions answered correctly = 0%
5 out of 8 questions answered correctly = 12.5%	5 out of 8 questions answered correctly = 0%
6 out of 8 questions answered correctly = 32%	6 out of 8 questions answered correctly = 0%
7 out of 8 questions answered correctly = 32%	7 out of 8 questions answered correctly = 2.5%
8 out of 8 questions answered correctly = 2.5%	8 out of 8 questions answered correctly = 95%

Looking at the differences in percentages, it is easy to see that my students did much, better on the post-test, which 95% of the students answered eight out of eight questions correctly.

This shows me that my students are able to achieve at higher levels once they have been given the opportunity to learn the material. It also shows me that for this unit a few students had prior knowledge of solids, liquids and gases but many students were not very familiar with this subject matter.

The other unit that I taught during my project was on Earth and Sky. I also gave my students the final assessment before the unit began and then again at the end of the unit to compare their scores. This test was out of 11 points.

Table 4
Pre and Post Test Percentages for Earth and Sky Unit (N=40)

Pre-Test Percentages	**Post- Test Percentages**
8 out of 11 questions answered correctly = 2.5%	8 out of 11 questions answered correctly = 2.5%
9 out of 11 questions answered correctly = 20 %	9 out of 11 questions answered correctly = 2.5%
10 out of 11questions answered correctly = 20%	10 out of 11 questions answered correctly = 17.5%
11out of 11questions answered correctly = 57.5%	11 out of 11 questions answered correctly = 80%

My students did much better on the pre-test for Earth and Sky than on the pre-test for Solids, Liquids and Gases. I attribute these higher scores to the fact that my students must have had a greater knowledge of earth and sky before the unit began. I also know that the Kindergarten standards address areas within our Earth and Sky unit, so maybe some of my students retained information previously taught in Kindergarten.

Overall, I feel these assessments are another great indicator of how well my students are doing in science. On both assessments 97.5% of my students scored within the 90^{th} percentile on the post-test. These assessments, along with the quiz scores really helped to answer my main research question about student achievement. My students were performing well on their assessments, it may not have been solely because of the use of science notebooks, but they were learning the material that was being taught. The second research question that I would like to address is one of my sub-questions, “what is the impact of student notebooks on student attitudes?”

Before beginning any of my research I surveyed my students to get a better understanding of their feelings towards science and school. The initial Likert survey showed me that my students really enjoyed school and really enjoyed science. There were a few students who said science was not very challenging, but the majority of the students said they thought they were learning a lot in science and that science class was exciting. Out of the 40 students surveyed, 36 said they always or sometimes think science is interesting and 38 said that they always or sometimes think science is fun. When asked about the activities in science, 38 students said they always or sometimes enjoy the activities done in science. The survey responses were very positive.

As my project continued, I surveyed my students two more times, once in the middle of the project and once at the end of the project to gather more information regarding their attitudes and how they may have changed. I was surprised to learn that my students' attitudes basically stayed the same throughout the project. There was little to no change in their attitudes towards school or science when surveyed in the middle of the project and when surveyed at the end of the project.

My students said that school and science were fun and that they found science to be interesting. One trend that stood out was that about four students continually reported that science was not challenging and no students reported that science was too difficult.

Another trend that emerged in the surveys as my project went on was that more and more students reported that science notebooks were their favorite part about science class. When asked to write about their favorite aspect of science class, in the first survey no students wrote science notebooks. In the second survey, 18 students wrote that science

notebooks were their favorite part of class and in the final survey 29 students wrote that science notebooks were their favorite part of class.

Prior to any research being done, I also interviewed ten randomly selected students about their attitudes and feelings concerning school and science. Again, I felt their responses were very positive. Students seemed to be enjoying both school and science and felt as though they were really learning a lot in class. It was very interesting to see how much the survey responses resembled the interview responses. In the interview, I asked students to tell me their favorite part of science class and why. This was a student's response from the final interview, "I loved the science notebooks we used. It was fun to be able to draw sometimes and to be able to write sometimes. It was a fun part of class." This student response fits very closely to a survey response from many students that science notebooks were their favorite part of science because it was "fun to draw and write in our notebooks." This information told me that my measurement tools were producing very valid information.

I also interviewed this same group of students during the middle of my project and at the end. I took the students' responses and put them together into a table below. The table below shows the interview questions grouped into like categories and the responses students had to the interview questions.

Table 5
Interview Question Categories with Student Responses

Interview Sub Category	**Interview Questions**	**Summary of Student Responses**
Students' attitudes towards science class	How do you feel about school? How do you feel about science class? 3. How would you describe science class?	1. All students responded with a positive feeling about school. (Ex: Good, great, really fun, happy) 2. **8** students responded with "really like it." One student said it is "sometimes easy" and another student said, "sometimes they already know the stuff being taught." 3. **6** students said, "it is full of learning." 2 students said "observing things" and 2 other students described math activities, "working with numbers" and "counting."
Interview Sub Category	**Interview Questions**	**Summary of Student Responses**
Students' attitudes towards science activities	1. What are your favorite parts of science class? 2. What parts of science do you like least? 3. What is your favorite thing we have done in science class?	1. **6** students said the "science notebooks", 2 students said, "reading stories", 1 student said "activities and 1 student said "playing outside." 2. **9** students said, "nothing" and 1 student said, "working with numbers." 3. **8** students said, " wetlands festival" and 2 students said, "class skits."
Students' attitudes towards learning	1. Do you feel like you are learning new things in science class?	1. **8** students said, "yes." 1 student said, "sometimes" and 1 student said, " I did not learn very much."

I feel that my students came into this project with wonderful attitudes towards school and science. The use of science notebooks may not have positively increased their attitudes towards science by very much, but the use of notebooks definitely did not decrease their attitudes towards science.

While the attitude of my students was not greatly affected by the introduction of science notebooks to class, I feel the impact on their learning styles was greatly affected. I used the Likert surveys and my own classroom observations to assess whether students' learning styles were being impacted by the implementation of science notebooks, which was another one of my sub-questions.

As my project got underway, I quickly realized that certain students were really excited to draw and write in their notebooks. I was seeing students who were normally not engaged and excited during science all of a sudden quickly getting to work so they could share their understandings. I feel that because students did not always have to raise their hands and share their ideas, but rather were given other outlets to share their knowledge that they became more and more excited about science. Being able to draw and write their ideas was new, exciting and right up their alley.

Prior to the beginning of my study, I did not always give students many opportunities to draw and write during science, and I feel as though I was never allowing certain learners to truly be able to share their ideas. There were many students in my classes that were not excited about sharing their ideas with the whole group in a discussion, but were more than willing to draw a picture about what they learned or write a poem about the difference between solids and liquids.

One day as we were working in our notebooks, I overheard two students talking.

Student A: “I love that we get to draw in science.”

Student B: “I wish we could draw more in math and stuff.”

Student A: “It’s way easier for me to draw than write.”

Student B: “And it is way more fun!”

I think this conversation is a great example of how many of my students felt once introduced to science notebooks. I also had another student in class who was usually shy and reserved write a fabulous Haiku about solids and liquids. He shared it with the class and as he was reading you could tell that he was so excited to have a new way to share his knowledge.

Within a classroom there are so many different types of learning styles that need to be addressed. It is so important that teachers are aware of those learning styles and do all they can to meet those various styles so that all students are given opportunities to shine. For more in-depth survey responses see Appendix D.

The final research question that my project addressed focused on the impact of this research on the teacher. I wanted to know how I was being affected by implementing science notebooks in my class. My teaching was greatly affected by this project both in a positive and in a less positive way. Implementing science notebooks into my teaching made me more aware of the importance of reaching every learner in my classroom. My students loved being able to draw and write during science class, seeing them excited and motivated made me a happy teacher.

This project also made me realize the importance of integrating curriculum in the classroom. As a formative assessment during the States of Matter Unit, I had my students write in their notebooks about how certain things can change states of matter. In this entry, my students had to do a descriptive writing piece using a format we had used in writing to describe what happens first, second, next and last. It was amazing to see how my students could transfer their knowledge of a specific writing process from one curricular area to another.

It was sometimes challenging for my students to put their understandings into words or pictures, but it pushed them to new levels of comprehension. I know they learned more as a result of the notebooks. After one lesson I wrote in my journal, That lesson was tough! It took a long time for my students to explain in writing how matter can change from a solid, to a liquid, to a gas, but WOW, when they shared their writing the next day, I could really tell that most of them truly understood the process. I even heard another student explaining their thinking to their classmate who was struggling. This is why I did this project (December, 13th, 2013)!

Also, as a result of this project I have tried to integrate my other lessons, and I truly think it only benefits my students to integrate curriculums. Sometimes it is a struggle to figure how things can fit together across the curricular areas, but once my students can see how things fit together and begin to understand that science is not just investigating, but rather it is a mixture of math, art, writing, and investigating then real learning can truly take place.

I always enjoyed this project, but there were a few things that impacted my teaching in a less positive way. I was impacted in a more negative way by the time commitment of my project. As I began to implement notebooks into my teaching, I soon realized that I had to lengthen my science time drastically during my treatment phases. At the beginning of the year when I began my project, my first graders were novice writers. To ask them to write about their understandings and observations was a daunting task. It often took 20-30 minutes for them to get their thoughts recorded and I often was unable to read most of what they had written. I quickly learned that I had to stick to mostly pictures at the beginning of the year until their writing skills improved. While I did include some writing entries at the beginning of the year so that my students were given a challenge and a way to grow as scientific writers, I also wanted the notebooks to be a successful experience for everyone, especially at the beginning of the year.

I also quickly realized that in order to gather enough information to answer all my research questions appropriately, I felt that I was always giving surveys, quizzes, tests, or interviews to my students, and I really felt as though it took away from my teaching. Since I only taught science twice a week to each class, I felt that at least once a week I was administering some sort of data source so that I could gather more information and all I really wanted to do was “teach” science. This administering of quizzes, tests and surveys was a bit tiresome and I began to realize there are reasons we do not do this for all out subject matter at the same time!

Overall, this was a fabulous project that benefitted my teaching greatly. I learned a lot about myself, my students and my teaching and the impact on me, as the teacher, was profound.

INTERPERTATION AND CONCLUSION

As I stepped back and looked at my project and my results, I quickly realized that the amount of information that my students learned was also profound. I feel that all the data I gathered allowed me to answer my research questions thoroughly.

The purpose of my research project was to find out the impacts of using science notebooks in class. My main research question was "What is the impact of science notebooks on student achievement?" As I stated before, my students learned a lot during my project, both as a result of using notebooks and without the use of notebooks. Looking at the pre and post-test scores of both my units, it is easy to see that my students are learning at high levels. The post-test scores show that over 97% of my students scored at least 90% on the end of the unit tests.

The quiz scores paint a different picture, but still show that my students are learning the material presented to them. Looking at the quiz scores of just my class, it is easy to see that they performed much better during treatment phases when they were allowed to record their understandings in their notebooks (Figure 1). I know they enjoyed using the notebooks to reiterate what they were learning, and I truly think they took the use of science notebooks seriously. The effort and seriousness they gave to the use of

science notebooks showed in both their quiz scores and their test scores and it showed in the quality of work they produced. For a few journal samples, please look at Appendix L.

Mrs. Perry's class was a different story. Her class did not perform as well on the quizzes in general and even worse on the quizzes given during the treatment phases, except during the liquids section. I think the higher score during the liquids section was due to the fact that the students had a great deal of background knowledge about liquids and the information being taught was not new.

I think the lower scores were due to a few underlying factors. The first factor I would like to address is that I did not have these students all day. I only taught science to them and therefore our relationship was different. When they came to my class for science they were not as focused as my class and listening was a challenge. They were off-task more often and it usually took me longer to teach my lessons to this class-as a result of how frequently I had to stop and regain their attention and focus.

Another reason I feel Mrs. Perry's students scored lower than my students on the quizzes, was due to the fact that she had a lower achieving class, meaning that she had a handful of students who struggled academically. 20% of Mrs. Perry's class received below grade level scores in reading and 25% of her class is below grade level in math. The scores in my class were much different. Only 10% of my students received below grade level scores in reading and only 10% of my students received below grade level scores in math.

It was difficult for five of her students to record what they had learned in their notebooks. I had to constantly give them support and constantly remind them to stay on-task. There were many lessons where this small group of five students was not able to finish their notebook entry due to the fact that it was simply too difficult. I would often modify their work to make it more worthwhile and to make these students feel more successful.

Lastly, I feel that the amount of school absences that Mrs. Perry's students had, greatly affected what they were able to achieve in class. There were three or four students, about 20% of the total class, who would miss both classes during a week. In my class I rarely had students who would miss both science lessons in a week. My absences were never high enough to record in my observations and never seemed to affect my student's learning. When Mrs. Perry's students returned the following week they would be completely lost. In first grade it is hard to assign reading for a student to do at home, or make-up work to complete outside of class, so they often have to just try their best to catch up in class, which is not ideal. A few of Mrs. Perry's students missed a great deal of school and I think it played a role in how they were able to perform on tests and quizzes.

Overall, I cannot say that my students' academic performance greatly improved as a result of using science notebooks in class. Their test and quiz scores were not greatly different between treatment and non-treatment phases and sometimes their quiz scores were even lower during treatment phases.

I attribute this to a few things, one of them being the level of first grade science content. In first grade, the content matter is not very difficult. Most students were able to

grasp the concepts fairly quickly and easily, and with little practice they were able to master the subject matter. If I taught a different grade, with more difficult content, I really feel as though science notebooks would benefit student understanding greatly. When more practice is needed to grasp a concept, notebooks would allow students to write and draw about what they were learning, allowing the information to become more concrete. It was really evident in my student survey responses and my student interview responses that my students truly enjoyed working in their science notebooks. The notebooks became the favorite activity for over half of my students.

Another reason why I feel I did not see a drastic difference in scores between treatment and non-treatment phases was due to the fact that my student's ability to write and draw complicated things was minimal. I began my project at the beginning of the year, which may have been a mistake. When I would ask my students to write about the lesson's main idea they would look at me with blank stares. Writing at the beginning of the year is difficult, especially when it is not just writing simple sentences. I decided to allow many of my students to just draw at the beginning of the year, which was fine, but I do not think the depth of work was achieved by just drawing.

I also had a few students who struggled with the writing aspect all year long. They would sit at their desks with nothing on their paper because they could not figure out the words to use, or the mechanics of writing was too difficult. This inability to write would often result in me writing or drawing for them as they told me what to put in their notebooks. I felt like this worked, but it was just not what I had imagined for my project, and I feel as though these students struggled in science as a result of having to use a

science notebook. In the future I may consider using science notebooks as another avenue to teach and reinforce writing skills.

While the science notebooks may not have led to a greater level of achievement, they may have helped students in other ways. My next two sub-research questions were related to student attitudes and learning styles. After giving student surveys and interviewing ten of my students multiple times, I was able to see that my students really did enjoy drawing and writing in the science notebooks even if it was difficult. Over half of my students reported that being able to draw and write in their science notebooks was their "favorite science activity." My students felt that having their own science notebook was a "fun way to share their learning" and was much more enjoyable than taking a test or quiz. It was really fun to see how excited students would be to record their learning in their notebooks and most of them took great pride in making their entries "top notch."

VALUE

My last research question was related to how the implementation of science notebooks would affect the teacher. I do think that implementing science notebooks affected me in many ways. I had to make time in each of my treatment lessons for my students to record their understandings in their notebooks and that required a lot of time. On average it took my students 18 minutes to complete a notebook entry. The times were much longer at the beginning of the year; closer to 30 minutes and towards the end of my project were around 15 minutes. I also spent a lot of time administering tests, quizzes,

surveys and interviews to my students, which took away from my teaching time. If I were to use science notebooks in my teaching next year, I would change a few things. First, I would give my students an outline to complete within their notebooks, so that their entries were not so open-ended. I feel that at the beginning of the year the vagueness of what they were supposed to record was difficult for many students. Towards the end of the year I would give them more freedom to write and draw whatever they choose. They ended up really enjoying the freedom to record however they wanted to in their journals, but at the beginning of the year it was difficult for them because they had never used science notebooks before. Also, at the beginning of the year I would model, model, model how to do a notebook entry. It is important to set up some expectations for your students so they know what is expected of them during each entry. I also instilled in my students the idea that science time is for science things, meaning that when it was time to work in our notebooks, that is what everyone was doing, for the whole time. I did this so that students would not rush through their work, but realize that they were expected to work through the whole allotted time for science. This helped keep my students on task and allowed those students who typically rush through their work, to slow down and produce quality entries.

If I had a more difficult class, or taught a different population of students, I may provide some incentives for them to complete quality notebook entries. I may also find it necessary to use a rubric to grade their entries from time to time. With my population of students, I did not want to grade their notebooks and they did not need that incentive, but other groups of students may. Rubrics can provide structure for students and allow them

to work towards a goal and a grade. If I did this project again, I would also create a schedule that allowed for a longer science time so that I would not feel as rushed to complete each entry.

I have noted in my teacher observations that, “students seem to really enjoy recording writing in their notebooks.” I also wrote in my observation notebook that, “students are excited to share with one another what they wrote each day.” While these science notebooks added additional work for me, they seem to provide a great deal of excitement for my students.

Based on what I learned from this project, I would recommend using science notebooks with all first grade science classes. Having the ability to write and draw to reinforce science concepts proved to be academically beneficial for many students. It also proved to be a morale booster within class. More than half of my students reported on their surveys that science notebooks were their favorite aspect of science class. While it does require extra time, the time is well worth it when you are able to see happy, excited students able to write and draw about the concepts being taught. Science notebooks were also a wonderful way to integrate writing and drawing within the science curriculum. My students became better scientific writers and drawers as a result of their science notebooks. They were able to draw pictures and label them; they were also able to write step-by-step instructions for how to complete certain investigations we had done in class. All these skills combined to create much more scientific thinkers and first graders who really know how to communicate scientifically.

This was a fabulous project that I truly enjoyed implementing into my class. I know that my students learned a great deal as a result of this project and I learned even more as their teacher. I will continue to implement science notebooks into my science teaching even if the results were not drastic, because I know that my students really enjoyed them. I am thankful to have had all the support of my team along the way and could not have done this great project without them. I feel as though action research taught me a lot as an educator and hopefully I will continue to implement aspects of action research into my teaching in future.

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APPENDICES

APPENDIX A

LIKERT SURVEY

Name _____

Student Survey

Please circle the word that describes how you feel.

1.I like coming to school.

Always **Sometimes** **Never**

Why or why not?

2. I get excited for science class.

Always **Sometimes** **Never**

3. I think science is fun.

Always **Sometimes** **Never**

What do you like about science?

4. I think science is interesting.

Always **Sometimes** **Never**

5. Science is my favorite class.

Always **Sometimes** **Never**

6. I learn new things in science class.

Always **Sometimes** **Never**

If you agree, please provide an example of something new you learned in science?

7. I feel like I know what is going on in science class.

Always **Sometimes** **Never**

8. I always try my best in science class.

Always **Sometimes** **Never**

9. I enjoy the activities we do in science.

Always **Sometimes** **Never**

What activity have you enjoyed the most this year?

10. Do you have any other comments you would like to share about science?

APPENDIX B

STUDENT INTERVIEW

Student Interview

Name _____

1. How do you feel about school?

If you enjoy school, please explain what you enjoy the most?

If you do not enjoy school, please explain what parts of school you dislike?

2. How do you feel about science class?

Please explain your answer.

3. How would you describe science class?

Why do you feel this way?

4. What are your favorite parts about science class?

5. What parts of science class do you like the least?

Why do you feel this way?

6. Do you feel like you are learning new things in science?

Why or why not?

7. What is your favorite thing we have done in science class so far?

If you do not have a favorite, what would be something you would enjoy doing?

8. Is there anything else you want to tell me about science or school in general?

APPENDIX C

IRB EXEMPTION FORM

MONTANA STATE UNIVERSITY

INSTITUTIONAL REVIEW BOARD

For the Protection of Human Subjects
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MEMORANDUM

TO: Joanna Shern and Walt Woolbaugh

FROM: Mark Quinn, Chair Mark Quinn CJ

DATE: November 5, 2012

RE: *"The Effects of Implementing Science Notebooks on Student Achievement" [JS110512-EX]*

The above research, described in your submission of November 5, 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:

_X_ (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.

_X_ (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.

APPENDIX D

POST SURVEY LIKERT SURVEY RESPONSES

Survey Questions # of Responses

1. I like coming to school	**Never**	2	**Sometimes**	19	**Always**	19
2. I get excited for science class	**Never**	4	**Sometimes**	18	**Always**	18
3. I think science is fun.	**Never**	2	**Sometimes**	16	**Always**	22
4. I think science is interesting.	**Never**	4	**Sometimes**	21	**Always**	15
5. Science is my favorite class.	**Never**	6	**Sometimes**	24	**Always**	10
6. I learn new things in science class.	**Never**	6	**Sometimes**	22	**Always**	11
7. I feel like I know what is going on in science class.	**Never**	4	**Sometimes**	16	**Always**	20
8. I always try my best in science class.	**Never**	1	**Sometimes**	7	**Always**	32
9. I enjoy the activities in science class.	**Never**	2	**Sometimes**	19	**Always**	19

APPENDIX E

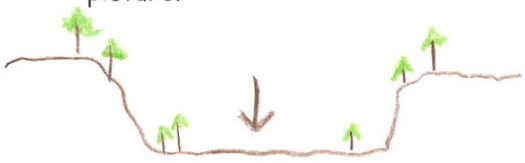
LANDFORM QUIZ

Name _____

Landform Quiz

Word Bank:	lake	valley
river	island	

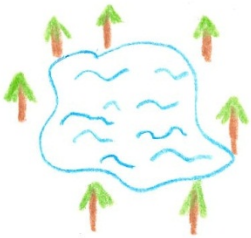
1. Please write the name of the landform under the correct picture.



_____



_____



_____



_____

2. Please complete the sentences.

A lake is surrounded by _____.

The water in a river is always _____.

APPENDIX F

DAY AND NIGHT QUIZ

Name_____

Earth and Sky Quiz

1. Please draw how the earth moves to cause day and night.

2. How many hours in a day? _____

3. Please draw how the earth moves to make a year.

4. How many days in a year? _____

5. What causes the seasons?

The Earth's rotation The Earth's tilt The Earth's orbit

6. A constellation is a _____

_____

APPENDIX G

SOLIDS QUIZ

Name _____

Solids Quiz

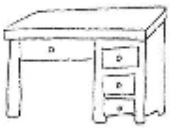
1. Circle the items below that ARE solids.











2. All solids have their own _____.

3. All solids are hard.

True False

4. Solids take the shape of the container they are in.

True False

APPENDIX H

LIQUIDS QUIZ

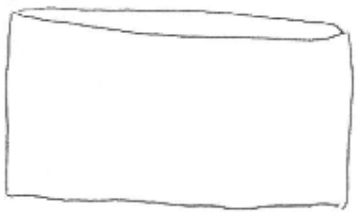
Name _____

Please draw how a liquid would fill each container.

1.



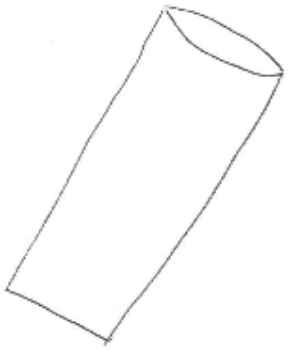
2.



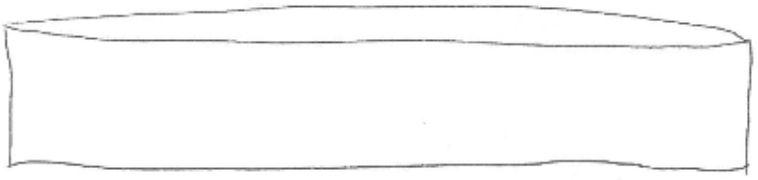
3.



4.



5.



APPENDIX I

GASES QUIZ

Name _____

Gases Quiz

1. Please circle the pictures of gases.



2. Please write an example of a gas.

3. Gases have their own shape.

True False

4. You can walk through gases.

True False

5. Gases _____ the space they are in.

APPENDIX J

CHANGING STATES OF MATTER QUIZ

Changing States of Matter Quiz

Name _____

1. To get a **liquid** to change into a **solid** you have to

_____ it.

2. To get a **solid** to change back into a **liquid** you have to

_____ it.

3. Please draw what would happen to an ice cube if it were left out on a table in the sun.

4. Please draw the steps water goes through from a liquid, to a solid, to a gas.

APPENDIX K

EARTH AND SKY DISTRICT TEST

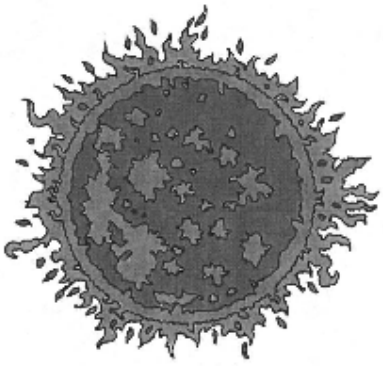
Grade 1
Earth/Space Science
Earth and Sky Assessment

Name _____

1. In the box below, draw a picture showing what the sky looks like in the morning.

2. Look at the pictures below.
   A. Draw a **box** around the picture of the moon.
   B. Draw an **X** through the picture of the sun.





3. Circle the names of the objects in the sky that you can see during the day.

SUN MOON STARS

4. Is the arrow in the picture below pointing to the part of Earth experiencing DAY or NIGHT?

Circle the correct answer: DAY NIGHT



Explain your answer to your teacher.

5. Draw a line from the name of each landform to the correct picture.









LAKE **PLAINS** **MOUNTAIN** **OCEAN** **RIVER**

APPENDIX L

SOLIDS, LIQUIDS AND GASES DISTRICT TEST

Grade 1
Physical Science Assessment

Name _____

1.

Place an X over the solid, liquid or gas that does NOT belong in each column.











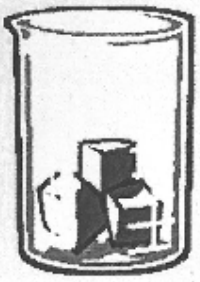








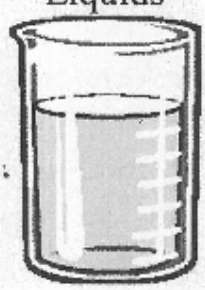
Solids



Gases



Liquids



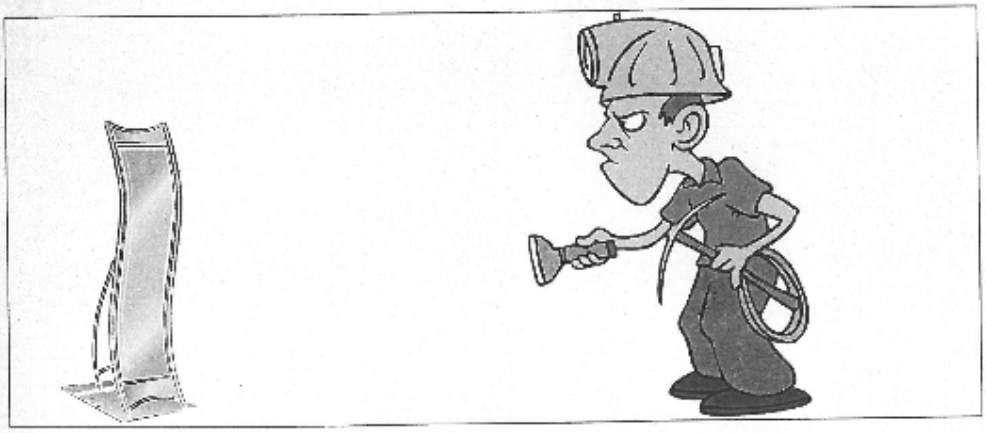
2. In the space below DRAW a picture of water as a SOLID and water as a LIQUID.

3. Draw a picture to show what happens when water in a teapot is heated.



4. A. In the box below draw an arrow to show how light travels from the flashlight to the mirror.

B. Draw an arrow from the mirror showing happens when the light from the flashlight hits it.



APPENDIX M

STUDENT NOTEBOOK SAMPLES

Date 1-10-2013

Is play-doh a gas, a solid or a liquid?

Play-doh is a solid because it is not a gas or liquid.



Date 2/12/13



I didn't know that not every thing is a matter. Light is not mater it is energe

Date 10\16\12

Day & Night

Which Earth rotates that cause day & night





1 day = 12 hrs.
1 Night = 12 hrs
The holle thing is 24 hor. When the Earth tilts owae from the Sun it casts Night and when the Earth is facing the sun is day.